INFINITY

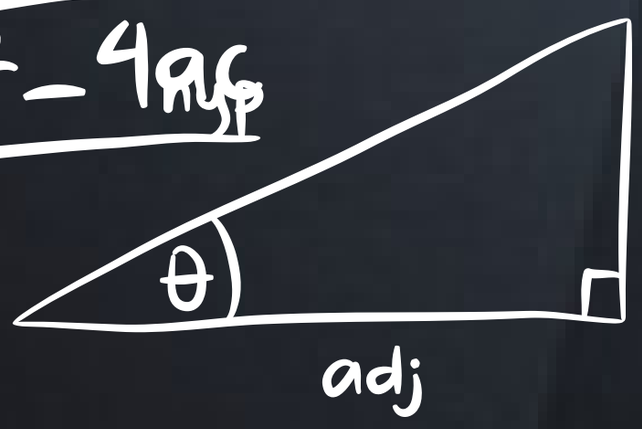
THINK BEYOND.....

AN EDUCATIONAL INSTITUTE

10th

Volume - I

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



$$\sin(\theta) = \frac{opp}{hyp}$$

$$\sqrt{16} = 4$$

$$(a+b)^2$$

Unit - I Number system

Unit - II Algebra

Mathematics - X

By Deepika Bhati (8743011101)

C O N T E N T S

Hello Folks

This is Deepika Bhati,

Having taught Mathematics passionately since 2006, I have devoated myself to this subject . No matter how I feel, I feel better when I teach. I am always delighted when students tell me they hated Math before and could never learn it, but taking math with me has made it Understandable and even a little enjoyable.

Every book, study material or practice material I have written, tries to teach serious math in a way that allows the students to learn math without being afraid. I prefer writting the mathematical concept in my books in the interactive format which makes learning them enjoyable that too without stress.

I am qualified as an M.phil (Operational Research) from DU. Due to my passion towards mathematics,
I did maths (Hons) at graduation as well as at post graduation level from DU.
To me, teaching Mathematics is always a great joy. I hope I can give you some of this joy!

I would be more than pleased if anyone points out any mistakes / errors in any material provided here. Please feel free to share your views with me about anything which doesn't make sense. It will be really good for me, many future students and above all, for the Mathematics.

I really feel good when I learn from my students as well. Sometimes they give or suggest with there own methods to solve many
Questions which is helpful for other students also. I want to specially thanks to these students and welcome there keen ideas and suggestion in classroom discussions.

I hope my efforts will be fruitful and, it will prove beneficial for all of you!

Regards
Deepika Bhati

Maths Enthusiast
INFINITY

CH – 1 – REAL NUMBERS

Natural Number : Counting numbers 1, 2, 3, 4, 5, 6, ... 99, 100, etc. are called natural numbers.

N = The set of natural numbers
= {1, 2, 3, 4, ... 25 }

Remarks :

(i) The set N is infinite i.e., it has unlimited members.

(ii) N has the smallest element namely 'l'.

(iii) N has no largest element, i.e., give me any natural number, we can find the bigger number from the given number.

(iv) N does not contain '0' is not a member of the set N.

Whole Number : 0, 1, 2, 3, ... 98, 99, ...1000 are called whole numbers i.e., all natural numbers together with 0 are called the whole numbers.

W = The set of whole numbers
= {0, 1, 2, 3, 4, ... }.

Remarks :

(i) The set of whole number is infite (unlimited elements).

(ii) This set has the smallest members as '0' i.e., '0' the smallest whole number. i.e., set W contain '0' as a member.

(iii) The set of whole numbers has no largest member.

(iv) Every natural number is a whole number.

(v) Non - zero smallest whole number is '1'.

Integers : The set of numbers which consists of natural numbers, negative of natural numbers. The set of integers

Z = {..... – 4, –3, –2, –1, 0, 1, 2, 3, 4,..}

Remarks :

(i) The set Z is infinite.

(ii) It has neither the grestest nor the least element.

(iii) Every natural number is an integer.

(iv) Every whole number is an integer.

(v) The set of non - negative integer
= {0, 1, 2, 3, 4, ... 81}

(vi) The set of non - positive integer
= {....., –4, –3, –2, –1, 0 }

Rational Numbers : The set of all numbers of the form $\frac{p}{q}$ for every p and q are integers and $q \neq 0$ is known as the set of rational numbers and is denoted by Q.

$Q = \frac{1}{3}, \frac{5}{2}, \frac{7}{3}, -\frac{5}{2}, -\frac{9}{7}, \frac{4}{2}, \frac{3}{6}, \frac{9}{3}, \frac{0}{3}, \frac{-15}{-25}$

Remarks :

(i) Every integer is a rational number.

(ii) Every terminating deimal is a rational number.

(iii) Every recurring decimal is a rational number.

(iv) A non terminating repeating decimal is called a recurring decimal.

(v) Between any two rational numbers there are an infinite number of rational numbers. This property is known as the density of rational numbers.

Irrational Numbers : A number which can not be expressed in the form $\frac{p}{q}$ where p and q are integers and $q \neq 0$. We denote the set of irrational by $Q = \sqrt{2}, \sqrt{3}, \sqrt{5}, \sqrt{7}, 21\sqrt{7}, 3+2\sqrt{5}, 6-\sqrt{2}$ π, e are examples of irrational numbers.

Even Numbers : A natural number is said to be even if it is multiple of 2 or it is divisible by 2. 2, 4, 6, 8, 10, 12 ..... are examples of even numbers.

E = The set of even numbers

= {2, 4, 6, 8, 10, 12, ... }

Odd Numbers : A natural number is said to be odd, if it is not even or if it is not divisible by 2. 1, 3, 5,7, 9, ... are examples of odd numbers.

O = The set of odd natural numbers

= {1,3, 5, 7, 9, 11, 13,.. }

Consecutive Numbers : A series of natural numbers each differ by one is called consecutive numbers. e.g., 50, 51, 52, 53 are consecutive numbers.

Prime Number : A natural number is said to be prime if it has only two different (distant) factors namely one and itself. 2, 3, 5, 7, 11 are prime numbers.

Remarks :

(i) 1 is not a prime number.

(ii) The only even prime number is 2.

(iii) The smallest prime number is 2.

(iv) **All prime numbers are odd except 2.**

Twin – Prime : A pair of prime numbers is said to be twin – prime if they differ by 2. For example (3, 5), (11, 3), (17, 19), (29, 31), (41, 43), (71, 73) are all twin – prime.

Composite Numbers : A natural number is said to be composite if it has atleast three different factors. 4, 6, 12 are all composite numbers.

(i) 1 is not composite.

(ii) 4 is the smallest composite number.

(iii) **1 is neither prime nor composite.**

Remarks :

Co - prime : A pair of numbers is said to be co– prime if the numbers have no common factor other than one.

Perfect Number : A number is said to be perfect if it is equal to the sum of its factors other than itself. For example : 6 = (1 + 2 + 3) ; 28 = (1 + 2 + 4 + 7 + 14) therefore 6 and 28 are perfect numbers.

Fundamental theorem of Arithmetic : Every composite number can be expressed as product of primes, and this decomposition is unique, a part from the order in which the prime factors occur in general, given a composite number X and we decompose it as

$x = P_1 \le P_2 \le P_3$ .....P_n are primes in ascending order then the way the number is decomposed is unique.

To find HCF by fundamental theorem of Arithmetic use the following steps.

Step (i) Factorise the numbers into primes.

Step (ii) Select the lowest of the power of commom primes.

Step (iii) The product of powers of common primes is HCF.

To find LCM by fundamental theorem of Arithmetic use the following steps.

Step (i) Factorise the number into primes.

Step (ii) Select the highest of the power of the prime. Present in all or some of the numbers.

Step (iii) The product of powers of the common primes is LCM.

Important Results :

(i) HCF = Product of least powers of common factors.

(ii) LCM = Product of highest powers of all the factors.

(iii) Product of two numbers = HCF x LCM

Note : This result is not true for more than two numbers.

(iv) HCF of 3 Nos. is the HCF of the HCF of any two of them and the 3rd No.

(v) HCF of given numbers always divides their LCM.

(vi) HCF of pair of Co-primes is 1.

(vii) LCM of pair of co prime = product of co-primes.

Revisiting of Irrational Numbers

Rational numbers : A number of the form p / q where $q \neq 0$ are known as rational numbers.There are two types of rational numbers (i) terminating decimal (ii) non - terminating decimal.

Terminating Decimals : The rational numbers with a finite decimal part after finite numbers of steps are known as terminatring decimals. Ex. $\frac{7}{8}, \frac{35}{16}, \frac{15}{2}, \frac{79}{32}, \frac{193}{4}$....etc are the examples of terminal decimal.

Non Terminating recurring Decimals : Those numbers in which the division process never comes to an end. In such cases a digit or block of digits repeat itself, 0.333, 0.24741 etc ....., are the examples of non terminating recurring decimals divided into two categories :

a. Pure Recurring Decimals

b. Mixed Recurring Decimals.

(a) **Pure recurring decimals :** A decimal number in which all the figures after the decimal points are repeated. $0.\bar{3}, 0.\overline{16}, 4.\overline{13}$ ..... .etc are the examples of pure recurring decimals.

(b) **Mixed recurring decimal :** A decimal number in which after the decimal point, at least on figure is not repeated. $0.1\overline{62}$, $0.573\overline{412}$ ..... etc are the examples of mixed recurring decimals.

Irrational number : A number which can not be put in the form p / q, where p and q are integers and $q \neq 0$ is called an irrational number.

Properties on irrational number :

Property – 1 : Negative of an irrational number is an irrational number

Ex.1 $\sqrt{3}$ is an example of irrational number.

$\therefore -\sqrt{3}$ is an irrational number.

Property – 2 : Sum of rational and irrational number is irrational number.

Ex.1 2 is a irrational number and $\sqrt{3}$ is an irrational number, hence $\left(2+\sqrt{3}\right)$ is an irrational number.

Property : 3 : Product of non-zero rational and irrational number is irrational.

Ex.2 2 is a irrational number and $\sqrt{3}$ is an irrational number, hence $2\sqrt{3}$ is an irrational number.

Property – 4 : Division of non zero irrational number and irrational number is irratonal.

Ex.1 2 is a rational number and $\sqrt{3}$ is an irrational number, hence $2\div\sqrt{3}$ is an irrational number.

Property : 5 : Sum of two irrational number may be rational or irrational. For Ex.

Ex.1 $\sqrt{2}$ and $\sqrt{3}$ both are irrational number then $\sqrt{2}+\sqrt{3}$ is an irrational number.

Ex.2 $\left(2+\sqrt{3}\right)$ and $\left(2-\sqrt{3}\right)$ both are irrational number but $\left[\left(2+\sqrt{3}\right)+\left(2-\sqrt{3}\right)\right]=4$ is a rational number.

Property : 6 : Difference of two irrational number may rational or irrational. For Ex.

Ex.1 $2+\sqrt{3}$ and $2-\sqrt{3}$ both are irrational numbers then $\left(2+\sqrt{3}\right)-\left(2-\sqrt{3}\right)=2\sqrt{3}$ is an irrational numbers.

Ex.2 $2+\sqrt{3}$ and $-2+\sqrt{3}$ both are irrational numbers then $\left(2+\sqrt{3}\right)-\left(-2+\sqrt{3}\right)=4$ is a rational numbers.

Property : 7 : Product of two irrational number may rational or irrational. For Ex.

Ex.1 If $\sqrt{2}$ and $\sqrt{3}$ both are irrational number then $\sqrt{2}$and$\sqrt{3}$ both are irrational number then $\sqrt{2}\times\sqrt{3}=\sqrt{6}$ is also is an irrational number.

Ex.2 $\left(3-\sqrt{2}\right)$ and $\left(3+\sqrt{2}\right)$ both are irrational number but $\left(3-\sqrt{2}\right)\left(3+\sqrt{2}\right)=9-2=7$ is a rational number.

Property : 8 : Division of two irrational number may be rational or irrational. For eg.,

Ex.1 $\sqrt{18}$ and$\sqrt{3}$, are irrational numbers therefore $\sqrt{18}\div\sqrt{3}=\sqrt{6}$ is an irrational number $\sqrt{12}\div\sqrt{3}=\sqrt{4}=2$ is a rational number.

Ex. 2 $\sqrt{12}$ and $\sqrt{3}$ are irrational number, but $\sqrt{12}\div\sqrt{3}=\sqrt{4}=2$ is a irrational number

Important Points

(i) A rational number is either a terminating or a non terminating but recurring decimal.

(ii) An irrational number $\left(\sqrt{2},\sqrt{3}....\right)$ is an non-terminating and non-recurring decimal.

(iii) Every terminating or non-terminating recurring decimal expression can be put in the form of p / q.

Therorem : If P is a prime number and p divides a^2, then p divides a where a is positive number.

Therorem : Let *x* be a rational number whose decimal expension terminates then *x* can be expressed in the form of p / q, where p and q are co-pirme, and the prime factorisation of q is of the form 2^m5^n where m and n are positively integer.

Therorem : Let x = p / q be a rational number such that the prime factorisation of q is of the form of $2^m.5^n$. Where m, n are non negative integers then *x* is terminating decimal.

Therorem : Let x = p / q be rational number such that the prime factorisation q is not the form of $2^m.5^n$ where m, n are non negative intergers then *x* is non terminating decimal.

PRACTICE EXERCISE 1.1

Q1. Express each of the following integers as a product of its prime factors :

(i) 420 (ii) 468 (iii) 945 (iv) 7325

Q2. Determine the prime factorisation of each of the following positive integer :

(i) 20570 (ii) 58500 (iii) 45470971

Q3. Find the LCM of 135 and 225 by the prime factorization method.

Q4. Find the LCM of 196 and 38220 by the prime factorization method.

Q5. Find the HCF and LCM of 90 and 144 by the prime factorisation method.

Q6. Find the HCF of 867 and 255 by the prime factorization method.

Q7. Find the HCF and LCM of 32 and 54 by the prime factorization method.

Q8. Find the HCF and LCM of 18 and 24 by the prime factorization method.

Q9. Find the HCF and LCM of 144, 180 and 192 by prime factorisation method.

Q10. Find the HCF and LCM of 510 and 92 by prime factorisation method.

Q11. The LCM and HCF of two numbers are 180 and 6 respectively. If one of the numbers is 30, find the other number.

Q12. The HCF of two numbers is 16 and their product is 3072. Find their LCM.

Q13. The HCF of two numbers is 145 and their LCM is 2175. If one number is 725, find the other.

Q14. Given that HCF (306, 1314) = 18, find LCM (306, 1314).

Q15. Find the LCM and HCF of 120, 105 and 150 by the prime factorization method.

Q16. Given that HCF (306, 657) = 9, find LCM (306, 657).

Q17. Find the HCF and LCM of the following integers by prime factorization method :

(i) 24, 60, 150

(ii) 6, 72, 120

Q18. Given that HCF (2520, 6800) = 40 and LCM (2520, 6800) = 252 K . Find the value of K.

Q19. If HCF(12576, 48624) = 12 K, find the value of K.

Q20. Find the LCM and HCF of the following pairs of integers and verify that $LCM \times HCF$ = Product of the integers :

(i) 26 and 91 (ii) 510 and 92

Q21. For positive integers a and b, write the relation between a, b, HCF (a, b) and LCM (a, b).

Q22. Show that $2 \times 3 \times 7 \times 13 \times 17 + 13$ is a composite number.

Q23. Show that 23 is a prime factor of the number $2 \times 7 \times 11 \times 17 \times 23 + 23$.

Q24. Show that the number 7^n can not end with the digit 0.

Q25. Show that the number 5^n can not end with the digit 0.

Q26. Show that the number 9^n can not end with the digit 2 for any natural number n.

Q27. Show that the number 5^n can not end with the digit 2 for any natural number n.

Q28. Show that the number 13^n can not end with the digit 0.

Q29. Show that the number 7^n can not end with the digit 0.

Q30. Show that $9 \times 7 \times 6 \times 5 + 6 \times 5$ is a composite number.

PRACTICE EXERCISE 1.2

Q1. A rectangular court yard is 18 m 72 cm long and 13 m 20 cm broad. It is to be paved with square tiles of the same size. Find the least possible number of such tiles.

Q2. In a morning walk three person step of together, their steps measure 80 cm, 85cm and 90cm respectively. What is the minimum distance each should walk so that he can cover the distance in complete steps ?

Q3. A circular field has a circumference of 360km. Three cyclists start together and can cycle 36, 60 and 72km a day, round the field. When will they meet again ?

Q4. In a seminar, the number of participants in Hindi, English and Mathematics are 60, 84 and 108 respectively. Find the minimum number of rooms required if in each room the same number of participants are to be seated and all of them being in the same subject.

Q5. In a school there are two sections - section A and section B of class X. There are 32 students in section A and 36 students in section B. Determine the minimum number of books required for their class library so that they can be distributed equally among students of section A or section B.

Q6. A rectangular field has a dimension 100 m × 80m. Three cyclist start together and can cycle 24m, 30m and 36 m per minute around the field. After how many minutes all the three meet again at the starting point.

Q7. Radius of a circular track is 63 m. Two cyclist surjeet and jacob start together from the same position, at the same time and in the same direction with speed 33 m / min and 44 m / min. After how many minutes they meet again at the starting point.

Q8. There is a circular path around a sport field. Sonia taes 18 min to drive one round of the field, while ravi takes 12 min for the same. Suppose they both start at the same point and at the same time, and go in the same direction. After how many minutes will they meet again at the starting point.

Q9. Sandeep donate 75 glucose biscuits and 45 monaco biscuits to the students of a class. These are to be packed in identical packets. The two type of biscuits are to be packed seperately and each containing the equal number of biscuits. Find the least number packets which can be made for the two types and also the number of biscuits in each packet.

Q10. An army contigent of 798 is to march behind an army band of 28 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns in which they can march.

Q11. There are 120 boys and 114 girls in class of a school. Principal of the school decided as a policy matter to have maximum number of mixed sectons, each section has to accommodate equal number of boys and equal number of girls. What is the maximum number of such sections.

Q12. The length and breadth of a rectangular field are 55 m and 45 m, respectively. Determine the length in metres of the largest rod which can measure the length and breadth of the field exactly.

Q13. A book seller purchased 117 books out of which 45 books are of mathematics and the remaining 72 books are of physics. Each book has same size. Mathematics and physics books are to be packed in seperate bundles and each bundle must contain same number of books. Find the least number of bundles which can be made for these 117 books.

PRACTICE EXERCISE - 1.3

Q1. Two tankers contain 850 litres and 680 litres of petrol respectively. Find the maximum capacity of a container which can measure the petrol of either tanker in exact number of times.

Q2. In a seminar, the number of participants in Hindi, English and Mathematics are 60, 84 and 108, respectively. Find the minimum number of rooms required if in each room the same number of participants are to be seated and all of them being in the same subject.

Q3. Three sets of English, Hindi and Mathematics books have to be stacked in such a way that all the books are stored topic-wise and the height of each stack is the same, The number of English books is 96, the number of Hindi books is 240 and the number of Mathematics books is 336. Assuming that the books are of the same thickness, determine the number of stacks of English, Hindi and Mathematics books.

Q4. 105 goats, 140 donkeys and 175 cows have to be taken across a river. There is only one boat which will have to make many trips in order to do so. The lady boatman has his own conditions for transporting them. He insists that he will take the same number of animals in every trip and they have to be of the same kind. He will naturally like to take animals in every trip and they have to be of the same kind. He will naturally like to take the largest possible number each time. Can you tell how many animals went in each trip?

Q5. A mason has to fit a bathroom with square marble tiles of the largest possible size. The size of the bathroom is 10 ft. by 8 ft. What would be the size in inches of the tile required that has to be cut and how many such tiles are required?

Q6. Two brands of chocolates are available in packs of 24 and 15 respectively. If I need to buy an equal number of chocolates of both kinds, what is the least number of boxes of each kind I would need to buy?

Q7. 144 cartons of Coke Cans and 90 cartons of Pepsi Cans are to be stacked in a Canteen. If each stack is of the same height and is to contain cartons of the same drink, what would be the greates number of cartons each stack would have ?

Q8. During a sale, colour pencils were being sold in packs of 24 each and crayons in packs of 32 each. If you want full packs of both and the same number of pencils and crayons, how many of each would you need to buy ?

Q9. A merchant has 120 litres of oil of one kind, 180 litres of another kind and 240 litres of third kind. He wants to sell the oil by filling the three kinds of oil in tins of equal capacity. What should be the greatest capacity of such a tin?

Q10. The length, breath and height of a room are 8 m 25 cm, 6 m 75 cm and 4 m 50 cm respectively. Determine the longest rod which can measure the three dimensions of the room exactly.

Q11. 15 pastries and 12 biscuits packets have been donated for a school fate. These are to be packet in several smaller identical boxes in each. How many biscuits packets and how many pastries will each box contain.

Q12. A sweet seller has 420 kaju barfies and 130 badam barfies. She wants to stack them in such a way that each stack has the same number, and they take up the least area of the tray. What is the number of that can be placed in each stack for this purpose.

Q13. Two Tankers contain 20 liters and 15 liters of Petrol respectively. Find the maximum capacity of container which can measure the petrol of either Tanker in Exact no of times.

PRACTICE EXERCISE 1.4

Q1. Prove that $\sqrt{3}$ is an irrational number.

Q2. Prove that $\sqrt{11}$ is an irrational number.

Q3. If p is a prime number, then prove that $\sqrt{p}$ is an irrational number.

Q4. Show that $2\sqrt{3}$ is an irrational number.

Q5. Show that $3\sqrt{5}$ is an irrational number.

Q6. If a is a nonzero rational and $\sqrt{a}$ is irrational, then show that $a\sqrt{b}$ is an irrational number.

Q7. Show that $\left(2+\sqrt{3}\right)$ is an irrational number.

Q8. Show that $\left(4-\sqrt{3}\right)$ is an irrational number.

Q9. If a is rational and $\sqrt{b}$ is irrational, then prove that $\left(a+\sqrt{b}\right)$ is an irrational number.

Q10. Prove that $\left(3+5\sqrt{2}\right)$ is an irrational number.

Q11. Show that $\left(5-2\sqrt{3}\right)$ is an irrational number.

Q12. Show that $\frac{1}{\sqrt{2}}$ is an irrational number.

Q13. Write a rational number between $\sqrt{2}$ and $\sqrt{3}$.

Q14. Prove that $\left(\sqrt{2}+\sqrt{3}\right)$ is an irrational number.

Q15. Classify the $\frac{22}{7}$ as rational or irrational.

Q16. Classify the 3.1416 as rational or irrational.

Q17. Classify the π as rational or irrational.

Q18. Classify the $3.\overline{142857}$ as rational or irrational.

Q19. Classify the 5.636363 as rational or irrational.

Q20. Classify the $2.040040004...$ as rational or irrational number.

Q21. Classify the $1.5353355333....$ as rational or irrational number.

Q22. Classify the $3.121221222....$ as rational or irrational number.

Q23. Classify the $\sqrt{21}$ as rational or irrational number.

Q24. Classify the $\sqrt[3]{3}$ as rational or irrational.

Q25. Prove that $\sqrt{6}$ is an irrational number.

Q26. Prove that $\left(2-\sqrt{3}\right)$ is an irrational number.

Q27. Prove that $\left(3+\sqrt{2}\right)$ is an irrational number.

Q28. Prove that $\left(2+\sqrt{5}\right)$ is an irrational number.

Q29. Prove that $\left(5+3\sqrt{2}\right)$ is an irrational number.

Q30. Prove that $3\sqrt{7}$ is an irrational number.

Q31. Prove that $\frac{3}{\sqrt{5}}$ is an irrational number.

Q32. Prove that $\left(2-3\sqrt{5}\right)$ is an irrational number.

Q33. Prove that $\left(\sqrt{3}+\sqrt{5}\right)$ is an irrational number.

Q34. Prove that $\frac{1}{\sqrt{3}}$ is an irrational number.

Q35. Give an example of two irrational whose sum is a rational number.

Q36. Give an examples of two irrationals whose product is a rational number.

Q37. State whether the given statement is true or false:

(a) The sum of two rationals is always rational.

(b) The product of two rationals is always rational.

(c) The sum of two irrationals is an irrational.

(d) The product of two irrationals is an irrational.

(e) The sum of a rational and an irrational is irrational.

(f) The product of a rational and an irrational is irrational.

(g) The quotient of rational and irrational is irrational.

(h) The product of a rational and irrational always irrational.

PRACTICE EXERCISE 1.5

Q1. Without actual division show that $\frac{121}{\left(2^3 \times 3^2 \times 7^5\right)}$ is a non-terminating repeating decimal.

Q2. Without actual division show that $\frac{17}{90}$ is a non-terminating repeating decimal.

Q3. Without actual division show that $\frac{53}{343}$ is a non-terminating repeating decimal.

Q4. Without actual division show that $\frac{66}{180}$ is a non-terminating repeating decimal.

Q5. Without actual division show that $\frac{31}{\left(2^2 \times 5^3\right)}$ is a terminating decimal. Express in decimal form.

Q6. Without actual division show that $\frac{33}{50}$ is a terminating decimal. Express in decimal form.

Q7. Without actual division show that $\frac{17}{625}$ is a terminating decimal. Express in decimal form.

Q8. Without actual division show that $\frac{41}{1000}$ is a terminating decimal. Express in decimal form.

Q9. The decimal expansion of the rational number $\frac{43}{2^4.5^3}$, will terminate after how many places of decimals?

Q10. Express $0.\overline{6}$ as a rational number in simplest form or in the form of p/q.

Q11. Express $1.\overline{8}$ as a rational number in simplest form or in the form of p/q.

Q12. Express $0.1\overline{6}$ as a rational number in simplest form or in the form of p/q.

Q13. Express $0.\overline{32}$ as a fraction in simplest form.

Q14. Express $0.2\overline{54}$ as a fraction in simplest form.

Q15. Without actual division, show that $\frac{11}{\left(2^3 \times 3\right)}$ is a non-terminating repeating decimal.

Q16. Without actual division, show that $\frac{73}{\left(2^2 \times 3^3 \times 5\right)}$ is a non-terminating repeating decimal.

Q17. Without actual division, show that $\frac{9}{35}$ is a non-terminating repeating decimal.

Q18. Without actual division, show that $\frac{32}{147}$ is a non-terminating repeating decimal.

Q19. Without actual division, show that $\frac{64}{455}$ is a non-terminating repeating decimal.

Q20. Without actual division, show that $\frac{77}{210}$ is a non-terminating repeating decimal.

Q21. Without actual division, show that $\frac{29}{343}$ is a non-terminating repeating decimal.

Q22. Without actual division, show that $\frac{129}{\left(2^2 \times 5^7 \times 7^5\right)}$ is a non-terminating repeating decimal.

Q23. Without actual division, show that $\frac{23}{\left(2^3 \times 5^2\right)}$ is a terminating decimal. Express each in decimal form.

Q24. Without actual division, show that $\frac{24}{125}$ is a terminating decimal. Express each in decimal form.

Q25. Without actual division, show that $\frac{17}{320}$ is a terminating decimal. Express each in decimal form.

Q26. Without actual division, show that $\frac{171}{800}$ is a terminating decimal. Express each in decimal form.

PRACTICE EXERCISE 1.6 (V.V.I QUESTIONS)

Q1. State the Fundamental Theorem of Arithemetic.

Q2. **Define Irrational numbers.**

Q3. Can the decimal expansion of an irrational number be either terminating or non - terminating recurring ?

Q4. Write the condition to be satisfied by q so that a rational number p / q has a terminating decimal expansion.

Q5. Write the condition to be satisfied by q so that a rational number p / q has a non - terminating recurring decimal expansion.

Q6. Given that HCF (26, 91) = 13, find LCM (26, 91).

Q7. The LCM and HCF of two numbers are 180 and 6 respectively. If one of the numbers is 30, find the other number.

Q8. Show that the sum of two irrational numbers $5+\sqrt{3}$ and $5-\sqrt{3}$ is a rational number.

Q9. Show that the product of two irrational numbers $2+\sqrt{5}$ and $2-\sqrt{5}$ is rational number.

Q10. Without actually performing the long division, state whether the rational number $\frac{64}{455}$, will have a terminating decimal expansion or a non - terminating repeating decimal expansion as non terminating repeating.

Q11. Identify rational and irrational numbers from the following :

(i) 1.898989..... (iii) $2.\overline{73}$

(ii) 2.109853217..... (iv) $6-2\sqrt{3}$

Q12. Select rational and irrational numbers from the following :

(i) $x^2=27$ (ii) $y^3=27$

(iii) $x^3=0.001$ (iv) $z^5=32$

Q13. Prove that $3+6\sqrt{7}$ is an irrational number.

Q14. Select terminating and non terminating decimals from the following numbers :

(i) $\frac{1637}{625}$ (ii) $\frac{1893}{34}$

Q15. Explain why 7 × 11 × 13 + 13 and 7 × 6 × 5 × 4 × 3 × 2 × 1 + 5 are composite number.

Q16. Check whether 6^n can end with the digit 0 for any $n \in N$

Q17. If d = HCF (18, 24), then write the value of d.

Q18. Write down the following real number in the form of $\frac{p}{q}$: (i) $0.\overline{36}$ (ii) $33.\overline{3}$

Q19. Prove that $5+\sqrt{2}$ is an irrational number.

PRACTICE EXERCISE 1.7 (MCQ)

Q1. Euclid's division lemma states that for any positive integers a and b, there exist unique integers q and r such that $a = bq + r$, where r must satisfy

(a) $1 < r < b$ (b) $0 < r \le b$

(c) $0 \le r < b$ (d) $0 < r < b$ **Ans.**(c)

Q2. What is the largest number that divides each one of 1152 and 1664 exactly ?

(a) 32 (b) 64

(c) 128 (d) 256 **Ans.**(c)

Q3. What is the largest number that divides 70 and 125, leaving remainders 5 and 8 respectively?

(a) 13 (b) 9

(c) 3 (d) 585 **Ans.**(a)

Q4. What is the largest number that divides 245 and 1029, leaving remainder 5 and each case?

(a) 15 (b) 16

(c) 9 (d) 5 **Ans.**(b)

Q5. The simplest form of $\frac{1095}{1168}$ is

(a) $\frac{17}{26}$ (b) $\frac{25}{26}$

(c) $\frac{13}{16}$ (d) $\frac{15}{16}$ **Ans.**(d)

Q6. If the HCF of 65 and 117 is of the form $(65m - 117)$, then m = ?

(a) 1 (b) 2

(c) 3 (d) 4 **Ans.**(b)

Q7. A number when divided by 143 leaves 31 as remainder. What will be the remainder when the same number is divided by 13?

(a) 0 (b) 1

(c) 3 (d) 5 **Ans.**(d)

Q8. For some positive integer m, every positive even integer is of the form

(a) $m - 1$ (b) $m + 1$

(c) $2m$ (d) $2m + 1$ **Ans.**(c)

Q9. For some positive integer n, every positive odd integer is of the form

(a) n (b) $n + 1$

(c) $2n$ (d) $2n + 1$ **Ans.**(d)

Q10. $(n^2 - 1)$ is divisible by 8, if n is

(a) any natural number

(b) any integer

(c) any odd positive integer

(d) any even positive integer **Ans.**(c)

Q11. If a and b are positive integers such that $a = x^3y^2$ and $b = xy^3$, where x, y are prime numbers, then HCF $(a, b) = ?$

(a) xy (b) xy^2

(c) x^2y^2 (d) x^3y^3 **Ans.**(b)

Q12. If p and q are positive integers such that $p = ab^2$ and $q = a^3b$, where a, b are prime numbers, then $\text{LCM}(p, q) = ?$

(a) ab (b) a^2b^2

(c) a^3b^2 (d) a^3b^3 **Ans.**(c)

Q13. If $a = (2^2 \times 3^3 \times 5^4)$ and $b = (2^3 \times 3^2 \times 5)$, then $\text{HCF}(a, b) = ?$

(a) 90 (b) 180

(c) 360 (d) 540 **Ans.**(b)

Q14. HCF of $(2^3 \times 3^2 \times 5)$, $(2^2 \times 3^3 \times 5^2)$ and $(2^3 \times 3 \times 5^3 \times 7)$ is

(a) 30 (b) 48

(c) 60 (d) 105 **Ans.**(c)

Q15. Which of the following is a pair of co-primes?

(a) (14, 35) (b) (18, 25)

(c) (31, 93) (d) 32, 62) **Ans.**(b)

Q16. LCM of $(2^3 \times 3 \times 5)$ and $(2^4 \times 5 \times 7)$ is

(a) 40 (b) 560

(c) 1680 (d) 1120 **Ans.**(c)

Q17. What is the least number that is divisible by all the natural numbers from 1 to 10 (both inclusive)?

(a) 100 (b) 1260

(c) 2520 (d) 5040 **Ans.**(c)

SELF EVALUATION TEST SERIES

M.M : 24 **M.T: 60 min.**

T E S T - 1

Q1 find HCF of 210 and 55 and also find their LCM. **1**

Q2. Prove the $3+\sqrt{5}$ is an irrational number. **1**

Q3. The HCF of 210 and 55 is expressible in the form $210\times5+55y$, find y. **2**

Q4. Find the largest number which divides 245 and 1029 leaving remainder 5 in each case. **3**

Q5. Prove that $7\sqrt{5}$ is an irrational. **3**

Q6. Insert two rational and two irrational between $\sqrt{2}$ and $\sqrt{5}$ **3**

Q7. Show that $13\times12\times11+13\times12$ and $10\times5\times4\times3\times2\times1+4\times3$ are composite number. **6**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

M.M : 24 **M.T: 60 min.**

T E S T - 2

Q1. State fundamental theorem of aritmetic. **1**

Q2. Given that HCF (2520, 6800) = 40 and LCM (2520, 6800) = 252 K. Find the value of K. **1**

Q3. If $a=bq+r$ is division algorithm, give limits of r. **2**

Q4. Represent $0.\bar{3}$ in the form of p/q. **3**

Q5. The length, breath and height of a room are 8m 25cm, 6m 75cm and 4m 50cm respectively. Determine the longest rod which can measure the three dimensions of the room exactly. **3**

Q6. Prove that $\sqrt{2}$ is irrational number. **3**

Q7. Check whether 6^n can end with the digit 0 for any $n\in N$. **6**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

SELF EVALUATION TEST SERIES

M.M : 24 **M.T: 60 min.**

TEST - 3

Q1. Prove that HCF of 12, 65, 77 are relatively prime. **1**

Hint : Show that their HCF is 1.

Q2. If the LCM of $(a,b) = 2646,$, HCF of $(a,b) = 27$ and b = 540, find 'a'. **1**

Q3. Write the decimal representation of $\frac{3}{3125}$ without actually performing the long division method. **2**

Q4. Find the HCF and LCM of 12 and 21 by the prime factorisation method. **3**

Q5. Prove that $3+3\sqrt{3}$ is an irrational number. **5**

Q6. Prove that $7\sqrt{5}$ is an irrational number. **3**

6

Q7. An army contingent of 616 members is to march behind any army band of 32 members in a parade the two groups are to march in the same no of columns. What is the maximum number of columns in which they can march. **6**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

M.M : 30 **M.T: 60 min.**

TEST - 4

Q1. Show that $3\sqrt{3}$ is an irrational number. **1**

Q2. There is a circular path around a sport field. Sonia takes 18 minutes to derive one round of the field. While Ravi takes 12 minutes for the same suppose they both start at the same point and go in the same direction. After how many minutes will they meet again at the starting point. **1**

Q3. State fundamental theorem of arithematic with example. **2**

Q4. Identify rational and irrational number from the following :

(i) 6.875 (ii) 1.8953267 ..... **3**

(iii) 1.131313..... (iv) $2.76\overline{5}$

Q5. Show that the product of two irrational numbers need not be irrational, giving examples in support your answer. **3**

Q6. In a seminar, the number of participants in Hindi, English and Mathematics are 60, 84 and 108, respectively. Find the minimum number of rooms required if in each room the same number of participants are to be seated and all of them being in the same subject. **3**

Q7. A circular field has a circumference of 360km. Three cyclists start together and can cycle 48, 60 and 72km a day, round the field. When will they meet again? **6**

Q8. Show that $\sqrt{3}+\sqrt{2}$ is an irrational number

6

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

ANSWER SHEET

PRACTICE EXERCISE - 1.1

1. (i) $2^3 \times 3 \times 5 \times 7$ (ii) $2^3 \times 3^2 \times 13$ (iii) $3^3 \times 5 \times 7$

(iv) $5^2 \times 293$ **2.** (i) $2 \times 5 \times 11^2 \times 17$ (ii) $2^2 \times 3^2 \times 5^3 \times 13$

(iii) $7^2 \times 13^2 \times 17^2 \times 19$ **3.** 675 **4.** 38220 **5.** 18, 720
6. 51 **7.** 2, 864 **8.** 6, 72 **9.** 12, 2880 **10.** 2, 864

11. 36 **12.** 192 **13.** 435 **14.** 22338 **15.** 15, 4200
16. 22338 **17.** (i) 6, 600 (ii) 15, 4200 **18.** 1700
19. 4 **20.** (i) 182, 13 (ii) 234602, 2 (iii) 2520
(iv) 1420, 30s

21. a × b = HCF (a, b) × LCM (a, b)

PRACTICE EXERCISE - 1.2

1. 4290 **2.** 122m, 40 cm **3.** 30 **4.** 21 **5.** 288
6. 60 min **7.** 36 min **8.** 36 min **9.** 5, 3, 15
10. 14 **11.** 6 **12.** 5 m **13.** 9, 8, 5

PRACTICE EXERCISE - 1.3

1. 170 **2.** 21 **3.** 2, 5, 7 **4.** 35 **5.** 24 inch, 20tiles
6. 5, 8 **7.** 18 **8.** 4, 3 **9.** 60 litres **10.** 75 cm
11. 4, 6 **12.** 10 **13.** 5 Ltr.

PRACTICE EXERCISE - 1.4

13. 1.5 **15.** rational **16.** rational **17.** irrational
18. rational **19.** rational **20.** irrational
21. irrational **22.** irrational **23.** irrational
24. irrational **35.** $3+\sqrt{5}, 3-\sqrt{5}$ **36.** $3+\sqrt{5}, 3-\sqrt{5}$
37. (a) True (b) True (c) False (d) False
(e) True (f) True (g) False (h) False

PRACTICE EXERCISE - 1.5

5. 0.062 **6.** 0.66 **7.** 0.0272 **8.** 0.041 **9.** 4 places
10. 2/3 **11.** $\frac{17}{9}$ **12.** $\frac{1}{6}$ **13.** $\frac{32}{99}$ **14.** $\frac{14}{55}$

23. 0.115 **24.** 0.192 **25.** 0.053125 **26.** 0.21375

PRACTICE EXERCISE - 1.6

4. $q = 2^m \times 5^n$ **5.** $q \neq 2^m \times 5^n$ **6.** 182 **7.** 36
10. Non terminating **11.** (i) rational (ii) rational
(iii) rational (iv) irrational
12. (i) irrational (ii) rational (iii) rational
(iv) rational **14.** (i) terminating
(ii) non terminating **18.** (i) $\frac{12}{33}$ (ii) $\frac{100}{3}$ **24.** 6

TEST - 1

1. 5, 2310 **3.** –19 **4.** 16

TEST - 2

2. 1700 **3.** $0 \geq r < b$
4. $\frac{1}{3}$ **5.** 75

TEST - 3

2. 1323 **3.** 0.00096
4. 3, 420 **8.** 8

TEST - 4

2. 36
4. (i) irrational (ii) irrational
6. 21 **7.** 60 deep

— Notes —

CH – 2 – POLYNOMIALS

Definition : A function of type : $a_0x^n + a_1x^{n-1} + a_2x^{n-2} + ...a_nx^0$ where x is a variable and a, b, c,..... a_n are real numbers and **'n'** is a positive integer. Then $p(x)$ is called a polynomial in variable x.

(i) ax^n, bx^{n-1}, cx^{n-2},..... etc are called **terms** of the polynomial.

(ii) $a, b, c, ...$ are the **coefficients** of the terms.

(iii) The highest power of x in a polynomial is called **degree** of polynomial

Types of polynomials on the basis of degree

There are five types of polynomials on the basis of degree:

1. **Constant polynomial :** A Polynomial of zero degree is called a constant polynomial The general form of a constant polynomial is **p(x) = k** where k is constant.

   Examples:

   $p(x) = 5, p(x) = \pi, p(x) = 2/7$ .....etc.

2. **Zero polynmial :** A polynomial whose constant term is zero is called zero polynomial. The general form f aconstant polynomial is $p(x) = 0$.

3. **Linear polynomial:** A polynomial of degree one is called linear polynomial. The general form of a linear polynomial is **p(x) = ax + b** where $a \neq 0$

   Examples: $3x-2,\ 5/2y+7$.....etc

4. **Quadratic polynomial :** A polynomial of degree two is called quadratic polynomial. The general form of a quadratic polynomial is **p(x) = ax² + bx + c** where $a \neq 0$

   Examples: $3/2x^2 - 3x,\ 5y^2 + 9/7,$

   $\sqrt{5}x + 1/2x^2 - 8$ .....etc)

5. **Cubic polynomial :** A polynomial of degree 3 is called cubic polynomial. The general form of a cubic polynomial is **p(x) = ax³ + bx² + cx + d** where $a \neq 0$

   Examples: $5 - x^2, \sqrt{6}x^3, 7 - x^2 + x^3,$

   $27x^3 - 10x^2 + x - 20$ ..... etc.

6. **Biquadratic polynomial :** A polynomial of degree 4 is called Biquadratic polynomial. The genaral form of biquadratic polynomial is **p(x) = ax³ + bx² + cx + d,** where $a \neq 0$

   Examples : $2/5x^4 - 3x^3 + x^2 - \sqrt{2}x - 1/7,$

   $7y^4 + 4,\quad \sqrt{2}y^4 - 5y^2 - 2.$.....etc.

Types of polynomials on the basis of term

1. **Monomial polynomial :** A polynomial having only 1 term is called monomial. Examples : 5x, $6x^7$, $3x^{11}$ .....etc.

2. **Bionomial polynomial :** A polynomial having two terms is called bionomial. Examples : 3x + 5, $6x^2$ - 11.....etc.

3. **Trinomial polynomial :** A polynomial having only three terms is called trinomial.

   Examples : $6x^3$ + 13x – 5, $2x^4$–

   7x +6 .....etc.

4. **Value of a polynomial :** If $p(x)$ be a polynomial in x and if α is any real number, then the value obtained by replacing x by α is called value of $p(x)$ at $x = \alpha$. It is denoted by $p(\alpha)$.

5. **Zero of a polynomial :** If value of $p(x)$ at $x = k$ is zero, then k is called zero of the polynomial.

GRAPH OF POLYNOMIALS

Graphs of linear polynomial : The graph of linear polynomials is a straight line. Consider a linear polynomial $p(x)=ax+b=y$. The graph line intersect x - axis at point $\left(\frac{-b}{a},0\right)$

Graphs of quadratic polynomials :

(i) Graph of a qudaratic polynomial $p(x) = ax^2 + bx + c$ is a parabola. Parabola open upwards ($\cup$) if $a > 0$

(ii) Graph of a qudaratic polynomial $p(x) = ax^2 + bx + c$ is a parabola. Parabola open downward ($\cap$) if $a < 0$

Note : In general a polynomial p(x) of degree n intersect the x - axis at most n points.

The intersection points of a parabola

For $p(x) = ax^2 + bx + c$, $b^2 - 4ac$ is known as its discriminant 'D', where $D = b^2 - 4ac$.

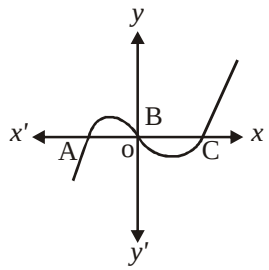
(i) If $D > 0$, graph of $p(x) = ax^2 + bx + c$ will intersect the x - axis at two distinct points.

(ii) If $D = 0$, graph of $p(x) = ax^2 + bx + c$ will touch or (intersect) the x - axis at one point.

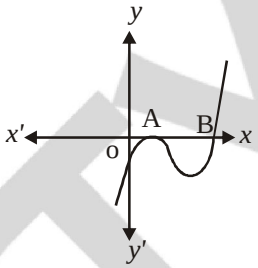
(iii) If $D < 0$, graph of $p(x) = ax^2 + bx + c$ will neither touch nor intersect the x - axis.

Graphs of cubic polynomials : For any cubic polynomials $p(x)=ax^3+\ bx^2+cx+d=y$. The graph will intersect at one, two or three points on *x*-axis, making same number of zeros.

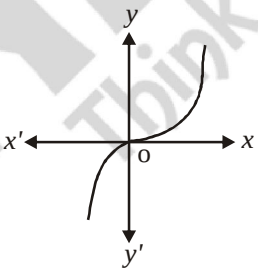
Case - 1 : If $p(x)=ax^3+bx^2+cx+d=y$, can be factorise into 3 linear non repeating factors, then it will intersect *x*-axis at 3 distinct points



Case - 2 : If $p(x)$ can be factorised into 3 linear factors, out of which two are identical, then the graph will intersect *x*-axis at two distinct points.



Case - 3: If $p(x)$ can be factorised into three repeated factors, then the graph will intersect *x*-axis at one points.



Relationship between the Zeros and the coefficients of a polynomial

1. **Quadratic Polynomial :** Let α and β be the two zeros of the quadratic polynomial $ax^2+bx+c=0,\ ,\ a\neq 0,$ so

(i) Sum of zeros = $-\frac{\text{coefficeint of x}}{\text{coefficient of x}^2}$

$$(\alpha+\beta)=-\frac{b}{a}$$

(ii) Product of zeros = $\frac{\text{constant term}}{\text{coefficient of x}^2}$

$$(\alpha\beta)=\frac{c}{a}$$

Formation of Quadratic Polynomial

Let α and β be the zeros of the quadratic polynomial, then required polynomial p(x) is given by

$p(x) = k\left[x^2 - sx + p\right]$; where k is a constant.

Where, S = Sum of the zeroes $(\alpha+\beta)$

P = Product of the zeroes $(\alpha\beta)$

or $p(x) = x^2 - (\alpha + \beta)x + \alpha\beta$

or $p(x) = (x-\alpha)(x-\beta)$

2. **Cubic Polynomial :** Let α, β and γ be the three zeros of the cubic polynomial $p(x)=ax^3+bx^2+cx+d=0,\ a\neq 0$; then

(i) Sum of zeros $= -\frac{\text{coefficient of } x^2}{\text{coefficient of } x^3}$

$$(\alpha+\beta+\gamma)=-\frac{b}{a}$$

(ii) The sum of the product of two zeros taken together.

$$= \frac{\text{coefficient of } x}{\text{coefficient of } x^3}$$

$$(\alpha\beta+\beta\gamma+\gamma\alpha)=\frac{c}{a}$$

(iii) Product of zeros $= -\frac{\text{constant term}}{\text{coefficient of } x^3}$

$$(\alpha\beta\gamma)=-\frac{d}{a}$$

4. **Formation of a Cubic Polynomial :** Let α, β and γ be the zeros of the cubic polynomial then, Required polynomial $P(x)$ $= \left\{x^3-(\alpha+\beta+\gamma)x^2+(\alpha\beta+\beta\gamma+\alpha\gamma)x-\alpha\beta\gamma\right\}$ or Required cubic polynomial is given by $=(x-\alpha)(x-\beta)(x-\gamma)$.

Division Algorithm for polynomials

If $p(x)$ and $g(x)$ are any two polynomials of degree n and m respectively such that $g(x)\neq 0$, then there exist unique polynomials $q(x)$ and $r(x)$ is either zero polynomial or degree $r(x)$ less than degree of $g(x)$ such that

p(x) = g(x).q(x) + r(x)

where $p(x)$ is called **dividend,** $g(x)$ is called **divisor,** $q(x)$ is called **quotient and** $r(x)$ is called **remainder**

Note: If $r(x)=0$, then $g(x)$ is factor of $p(x)$.

Factor Theorem

(i) If $(x-a)$ is a factor of $p(x)$ then $p(a)=0$ i.e. a is zeros of $p(x)$

(ii) Let p(x) is a polynomial if p(a) = 0, then (x – a) is a factor of p(x)

Remainder theorem

If polynomial $p(x)$ is divided by $(x-a)$, then the required remainder is $p(a)$.

Relationship between the zeroes and coefficients of a quadratic polynomial

Let α and β be the zeros of a quadratic polynomial $P(x) = ax^2 + bx + c$. By factor theorem $(x-\alpha)$ and $(x-\beta)$ are the factor of P(x).

$P(x)=k(x-\alpha)(x-\beta)$, where k is a constant

$$ax^2+bx+c=k\left\{x^2-(\alpha+\beta)x+\alpha\beta\right\}$$

$$ax^2+bx+c=kx^2-k(\alpha+\beta)x+k\alpha\beta$$

Comparing the coefficients of x^2, x and constant terms on both sides, we get

$$a=k, b=-k(\alpha+\beta) \text{ and } c=k\alpha\beta$$

$$\alpha+\beta=-\frac{b}{a} \text{ and } \alpha\beta=\frac{c}{a}$$

$$\alpha+\beta=\frac{-\text{coefficient of } x}{\text{coefficient of } x^2}$$

and $$\alpha\beta=\frac{\text{constant term}}{\text{coefficient of } x^2}$$

PRACTICE EXERCISE 2.1

Q1. Identify polynomial from the given algebric expression.

(i) $x^2+6x^{-1}-5$ (ii) $2x^2+3x^{1/3}+5$

(iii) $(x-1)(2x+1)$ (iv) $x^2+\sqrt{x}+\sqrt{7}$

(v) $3x^2+9\sqrt[3]{x}-5$ (vi) $x^3+x^{1/3}-\dfrac{1}{x^{-1/3}}+5$

(vii) $2x(x^2+3)$ (viii) $2x^2+\sqrt{x}+3$

(ix) $\dfrac{x}{2}+6x^{-3}(x^3+x^5)$ (x) $x^{-2}+3x+5$

(xi) $9x^2+\sqrt{3}\times\dfrac{\sqrt{2}}{x^{-1/2}}+5$ (xii) $\dfrac{2}{x^{-2}}-2x^2+3$

(xiii) $5x^2(x+3)$ (xiv) $\dfrac{1}{x^{-2}}-x^2+3x+5$

(xv) $6x(x^{-1}-5)$ (xvi) $9x^2(x^{-3}+x^{-2})$

(xvii) $2x(x-1)$ (xviii) $2x^2+3\sqrt{x}-5$

(xix) $\sqrt[5]{x^{5/2}}+9x^2+11x+8$ (xx) $2\sqrt{x^2}+3x$

(xxi) $6x+9x^{-2}+11x$ (xxii) $x^7+3x^{-1}+8$

(xxiii) $\dfrac{2x^{-3}}{x^{-2}}+2x+7x^{11}$ (xxiv) $(2x+1)(x^{-2}+3)$

(xxv) $(x^2+5)(x+3)$ (xxvi) $(x^{-2}+3)x^3$

(xxvii) $(x-1)(x+1)$ (xxviii) $x^{-1}\times x^3(x+1)$

(xxix) $2x^{-3}+5x+6$ (xxx) $6x^2+2\sqrt{3}x-9$

Q2. Find the degree of the following polynomial.

(i) 6 (ii) $2x$

(iii) $x^2(x-2)$ (iv) $6x^3(x^{-2}-5)$

(v) $2x^2\left(\dfrac{3}{x^{-2}}+5\right)$ (vi) $x^{-2}\times x^3+2$

(vii) $(x+3)(x-3)(x^2+9)(x^2-9)$

(viii) $(6x-9)\times-\dfrac{3}{2}$ (ix) $2x^2(x-3)$

(x) $\dfrac{1}{x^{-2}}\left(\dfrac{3}{x^{-3}}+5\right)$ (xi) $x^{-2}\times(x^3-2x^{-2})$

(xii) $x^2(x^{1000}-2)$ (xiii) $(x^2-5)(x^2+3)$

(xiv) $x^{11}+2x^{-2}(x^3+x^{-1})$ (xv) $x^{-2}(x^2+5)$

(xvi) $3x^2(x^5+6x^3)$ (xvii) $3x\left(\dfrac{1}{x^2}-\dfrac{1}{x^2}\right)$

(xviii) $x^{-3}(x^4-3x^3)$ (xix) $(2x+7)(x-3)$

(xx) $2x^2+(3x^2-2)\times x$ (xxi) $(x-1)x^{-2}$

(xxii) $(9x^2+5x)(3x^2+7x)(x^2-3)+6x^2+2$

(xxiii) $2x-9+6x^3$ (xxii) $x^{-2}+\left(3x^3-\dfrac{-1}{x^2}\right)-3x^3$

Q3. Select, constant, zero, linear, quadratic, cubic, bi-quadratic polynomials from the following algebric expression.

(i) $(x-1)(x+1)$ (ii) $x^{-1}\times\dfrac{1}{x^{-2}}+3$

(iii) $(x-2)(0)$ (iv) $2\sqrt{2}x^2+6\sqrt{3}x$

(v) $(x)(x^2+x+1)$ (vi) $\sqrt{x^2}+3x-9+2$

(vii) $(x+1)(x^2-x+1)+3x(x-1)(x+2)$

(viii) $(x-1)(x+1)(x^2+1)+(x-2)(x+3)$

(ix) $2x^3(x-1)$ (x) $x^2(x^2+3x)+6$

(xi) $2x^{-3}(x^{-3}+x^5)-2x^6+3x(x^3-1)+8$

(xii) $(6x^2+1)(6x^2-1)+(3x-1)(x^3+1)$

(xiii) $(x^2+1)(x-1)$ (xiv) $(x^2-3)(x^2+3)$

(xv) $(2x+7)(2x-7)+(6x^3+1)(x-1)$

(xvi) $6x(x^2-3x)$ (xvii) $\dfrac{3(x+1)}{x^{-2}}+2x^2$

(xviii) $(6x+1)(6x-1)+3x(x^{-1}+2x)+5$

(xix) $2x+x^2(x^{-2}+3)+(2x-3)+5x-6$

(xx) $x(x+1)(x-1)+(2x-5)(x+1)-3$

(xxi) $x^{-2}\times x^3+x^{-2}\times x^3+(x-1)x^2+5x$

(xxii) $(6x+3)(6x-5)+(2x^3-1)(x+5)$

PRACTICE EXERCISE 2.2

Find the value of following polynomials at a given value of x.

Q1. $p(x) = x + 3$ at $x = -1$

Q2. $p(x) = 2x - 5$ at $x = -3$

Q3. $p(x) = x^3 - 2$ at $x = 1$

Q4. $p(x) = 2x^2 + 5$ at $x = -2$

Q5. $p(x) = 3x^2 - \frac{6}{5}$ at $x = -1$

Q6. $p(x) = 5x^2 - 3x$ at $x = 3$

Q7. $p(x) = 6x(x+1)$ at $x = \frac{-1}{3}$

Q8. $p(x) = x^3 + 2$ at $x = \frac{-1}{3}$

Q9. $p(x) = 2x^2 - 5x + 11$ at $x = -5$

Q10. $p(x) = 3x^2 + 6x - 9$ at $x = \frac{-3}{2}$

Q11. $p(x) = 2x^2$ at $x = \frac{-1}{3}$

Q12. $p(x) = 3x^2 - 5x + 7$ at $x = -1$

Q13. $p(x) = 6x^2 + 9x + 7$ at $x = -3$

Q14. $p(x) = 2x^2 \frac{-7}{3}x + \frac{1}{2}$ at $x = -1$

Q15. $p(x) = 2x^3 + 7x$ at $x = \frac{-1}{2}$

Q16. $p(x) = (x-1)(x+2)$ at $x = \frac{5}{2}$

Q17. $p(x) = 9x^4 - 3x + 4$ at $x = -5$

Q18. $p(x) = \frac{3}{2}x^4 - 8x + 7$ at $n = -1$

Q19. $p(x) = \sqrt{3}x^2 - \sqrt{3}x + 5\sqrt{3}$ at $x = \sqrt{3}$

Q20. $p(x) = ax^2 - a^2 + 6$ at $x = a$

Q21. $p(x) = \frac{6}{3}x^3 - 2x + 8$ at $x = \frac{-1}{2}$

Q22. $p(x) = \sqrt{5}x^2 - 2\sqrt{5}x + 3\sqrt{5}$ at $x = -\sqrt{5}$

Q23. $p(x) = 6\sqrt{3}x^2 - 5\sqrt{3}x + 11$ at $x = \sqrt{3}$

Q24. $p(x) = 25x^2 - 6x + 7$ at $x = -1$

Q25. $p(x) = 13x^2 + 6x - 7$ at $x = -2$

Q26. $p(x) = \frac{5}{3}x^3 - \frac{1}{2}x^2 + \frac{11}{2}$ at $x = -1$

Q27. $p(x) = \frac{1}{7}x^4 = \frac{1}{3}x + \frac{1}{2}$ at $x = -3$

Q28. $p(x) = \frac{2}{3}x^{13} + 7x + \frac{11}{2}$ at $x = 1$

Q29. $p(x) = \frac{1}{3}x^7 - 7x^6 + \frac{1}{2}$ at $n = -1$

Q30. $p(x) = 6x^2 - 8x + 9$ at $x = \frac{-3}{2}$

Q31. $p(x) = 2x^3 - 6x^2 + 11$ at $x = \frac{-1}{2}$

Q32. $p(x) = \frac{1}{2}x^2 - 1$ at $x = \frac{-3}{2}$

Q33. $p(x) = \frac{9}{3}x^3 - \frac{1}{2}x^5 + 1$ at $x = 11$

Q34. $p(x) = \frac{9}{3}x^2 - \frac{1}{7}x$ at $x = k$

Q35. $p(x) = \frac{9}{7}x^{13} - 8x^2 + 11x$ at $x = -1$

Q36. $p(x) = 6x^2 - 6$ at $x = -1$

Q37. $p(x) = 9x^3 - 5x + 8$ at $x = -5$

Q38. $p(x) = \frac{1}{7}x^2 - \frac{1}{3}x + \frac{8}{3}$ at $x = 1$

Q39. $p(x) = 3(2x+1)(x+3)$ at $x = -5$

Q40. $p(x) = (4x^2 + 1)(x+1)$ at $x = 5$

Q41. $p(x) = 9x^2 + 8x + 13$ at $x = -5$

Q42. $p(x) = (x^2 + 5)(2x^3 + 5)$ at $x = -1$

Q43. $p(x) = (x^2 - 5)(x^3 + 3)$ at $x = \frac{-1}{7}$

Q44. $p(x) = (6x^2 - 9)$ at $x = -9$

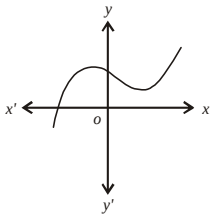
Q45. $p(x) = x^2 + 3 + 5x + 9x^3$ at $x = 1$

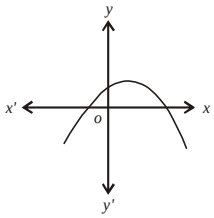
Q46. $p(x) = 6x^3 - 11x^2 + 5x$ at $x = \frac{1}{2}$

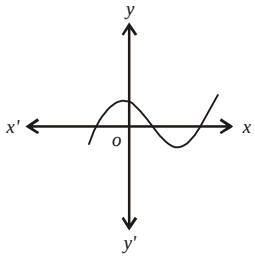
Q47. $p(x) = (2x+1)(2x)(4x^2+1)$ at $x = -1$

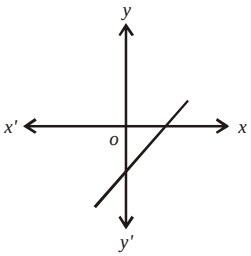
PRACTICE EXERCISE 2.3

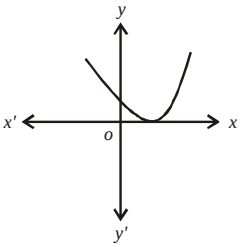
Q1. Look at the graphs below for some polynomials for each graph, find number of zeros of $p(x)$.

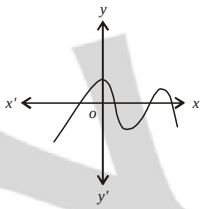
(i) 

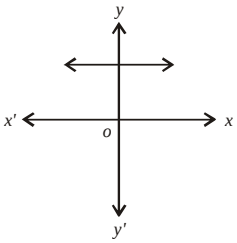
(ii) 

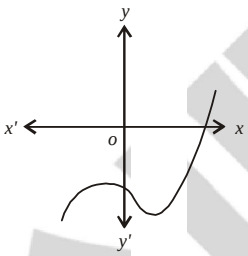
(iii) 

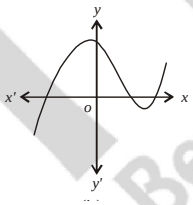
(iv) 

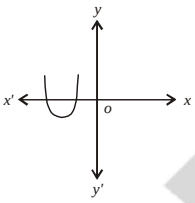
(v) 

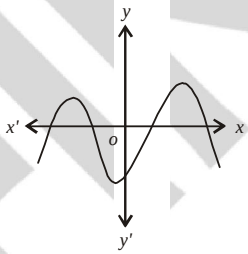
(vi) 

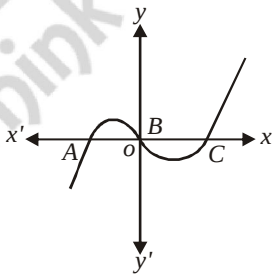
(vii) 

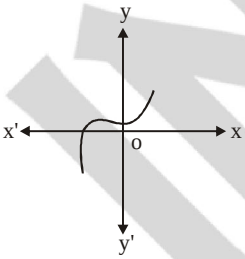
(viii) 

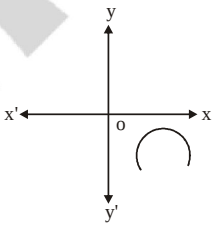
(ix) 

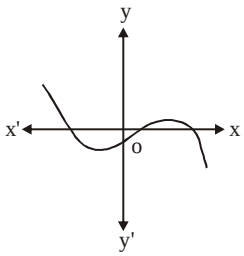
(x) 

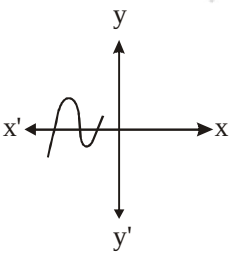
(xi) 

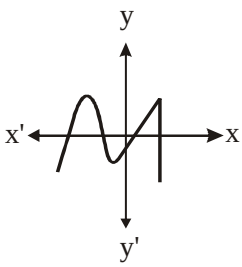
(xii) 

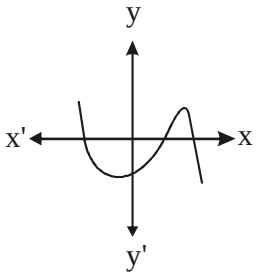
(xiii) 

(xiv) 

(xv) 

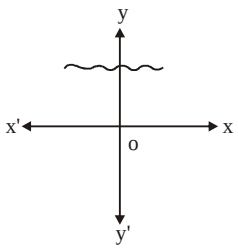
(xvi) 

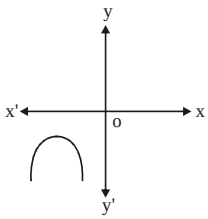
(xvii) 

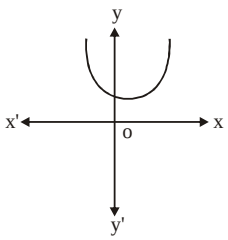
(xviii) 

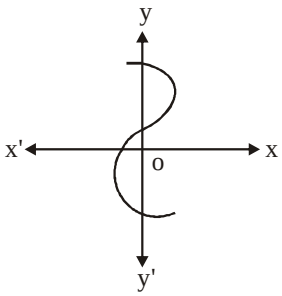
PRACTICE EXERCISE 2.4

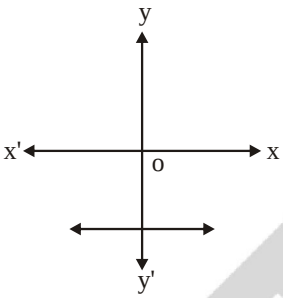
Q1. Look at the graphs below for some polynomials for each graph, find number of zeros of $p(x)$.

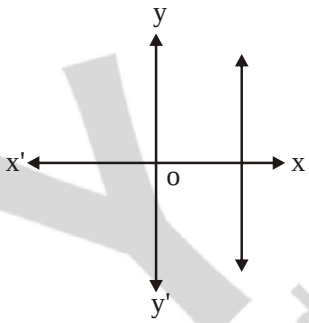
(i) 

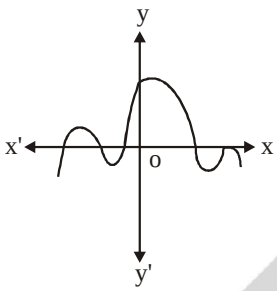
(ii) 

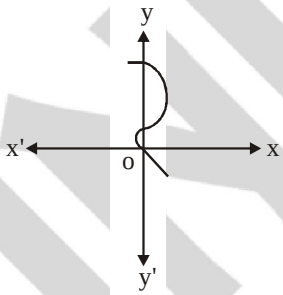
(iii) 

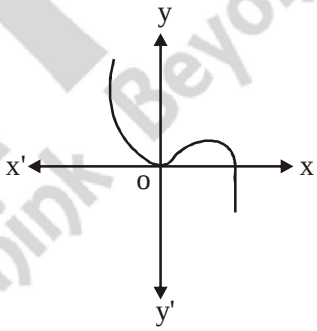
(iv) 

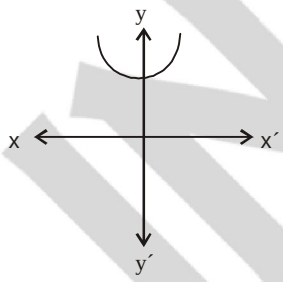
(v) 

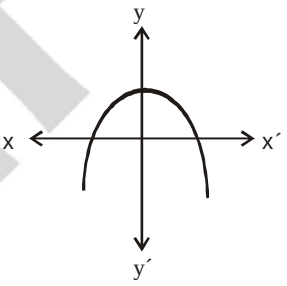
(vi) 

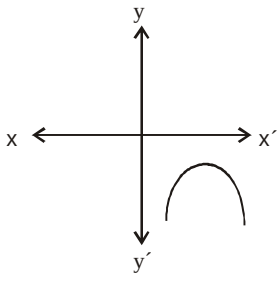
(vii) 

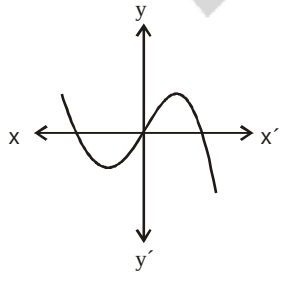
(viii) 

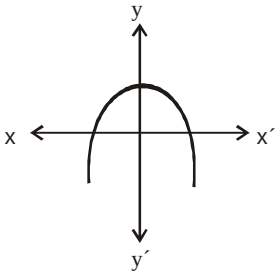
(ix) 

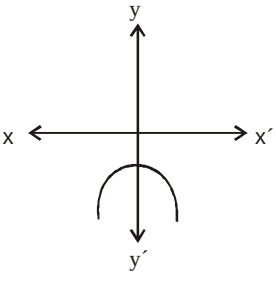
(x) 

(xi) 

(xii) 

(xiii) 

(xiv) 

(xv) 

PRACTICE EXERCISE 2.5

Q.1 Find the zeroes of the polynomial, $P(x) = x^2 - 2x - 8$ and verify the relationship between the zeroes and their coefficient.

Q.2 Find the zeroes of the polynomial, $P(s) = 4s^2 - 4s + 1$ and verify the relationship between the zeroes and their coefficient.

Q.3 Find the zeroes of the polynomial, $P(t) = t^2 - 15$ and verify the relationship between the zeroes and their coefficient.

Q.4 Find the zeroes of the polynomial, $P(x) = x^2 - 25x$ and verify the relationship between the zeroes and their coefficient.

Q.5 Find the zeroes of the polynomial, $P(x) = 4s^2 - 4s + 1$ and verify the relationship between the zeroes and their coefficient.

Q.6 Find the zeroes of the polynomial, $P(x) = 6x^2 - 7x - 3$ and verify the relationship between the zeroes and their coefficient.

Q.7 Find the zeroes of the polynomial, $P(x) = 2x^2 - \frac{5}{6}x + \frac{1}{12}$ and verify the relationship between the zeroes and their coefficient.

Q.8 Find the zeroes of the polynomial, $P(x) = \sqrt{3}x^2 + 11x + 6\sqrt{3}$ and verify the relationship between the zeroes and their coefficient.

Q.9 Find the zeroes of the polynomial, $P(x) = 4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ and verify the relationship between the zeroes and their coefficient.

Q.10 Find the zeroes of the polynomial, $P(x) = 7x^2 + 2\sqrt{14}x + 2$ and verify the relationship between the zeroes and their coefficient.

Q.11 Find the zeroes of the polynomial, $P(x) = 2x^2 - 5$ and verify the relationship between the zeroes and their coefficient.

Q.12 Find the zeroes of the polynomial, $P(x) = \sqrt{3}x^2 + 6x$ and verify the relationship between the zeroes and their coefficient.

Q13. Find the zeroes of the polynomial $p(x) = x^2 - 3x + 2$ and verify the relationship between the zeores and their coefficient.

Q14. Find the zeroes of the polynomial $p(x) = x^2 + 3x - 10$ and verify the relationship between the zeores and their coefficient.

Q15. Find the zero's of polynomial $p(x) = 2\sqrt{7}x^2 - 9x + \sqrt{7}$ and also verify the relationship between zero's and coefficients.

Q16. Find the zeroes of the polynomial $p(x) = 4x^2 - 4x - 3$ and verify the relationship between the zeores and their coefficient.

Q17. Find the zeroes of the polynomial $p(x) = 8x^2 - 4$ and verify the relationship between the zeores and their coefficient.

Q18. Find the zeroes of the polynomial $p(x) = x^2 - 2$ and verify the relationship between the zeores and their coefficient.

Q19. Find the zeroes of the polynomial $p(x) = \sqrt{3}x^2 - 8x + 4\sqrt{3}$ and verify the relationship between the zeores and their coefficient.

Q20. Find the zeroes of the polynomial $p(x) = x^2 - (\sqrt{3} + 1)x + \sqrt{3}$ and verify the relationship between the zeores and their coefficient.

Q21. Find the zeroes of the polynomial $p(x) = a(x^2 + 1) - x(a^2 + 1)$ and verify the relationship between the zeores and their coefficient.

Q22. Find the zeroes of the polynomial $p(x) = 4x^2 + 5\sqrt{2}x + 3$ and verify the relationship between the zeores and their coefficient.

PRACTICE EXERCISE 2.6

Q1. Find the zeros of the following polynomials and verify the relationship between zeros and its coefficient.

(i) $p(x) = 5x^2$ (ii) $p(x) = ax^2$ (iii) $p(x) = mx^2$

(iv) $p(x) = zx^2$ (v) $p(x) = zx^2$ (vi) $p(x) = \sqrt{3}x^2$

(vii) $p(x) = \sqrt{5}x^2$ (viii) $p(x) = \left(2+\sqrt{3}\right)x^2$ (ix) $p(x) = \pi x^2$

(x) $p(x) = \left(\sqrt{3}+\sqrt{2}\right)x^2$ (xi) $p(x) = 6\sqrt{2}x^2$ (xii) $p(x) = 3x^2$

Q2. (i) $p(x) = 3x^2 - 9x$ (ii) $5x^2 - 25x$ (iii) $2x^2 - 18x$

(iv) $6x^2 - 36x$ (v) $36x^2 - 6x$ (vi) $7x^2 - 21x$

(vii) $\sqrt{2}x^2 - 4x$ (viii) $\sqrt{3}x^2 - 3x$ (ix) $2\sqrt{5}x^2 - 20x$

(x) $\sqrt{7}x^2 - 14x$ (xi) $2\sqrt{7}x^2 - 14x$ (xii) $6\sqrt{3}x^2 - 6x$

(xiii) $\sqrt{13}x^2 - 13x$ (xiv) $2\sqrt{5}x^2 - 10x$ (xv) $5\sqrt{3}x^2 - 75x$

(xvi) $3x^2 - \sqrt{3}x$ (xvii) $5x^2 - 2\sqrt{5}x$ (xviii) $6\sqrt{7}x^2 - 63x$

(xix) $2x^2 - \sqrt{2}x$ (xx) $3\sqrt{11}x^2 - 11x$ (xxi) $x^2 - 9x + 18$

Q3. Find the zeros of the following polynomials and verify the relationship between zeros and its coefficient.

(i) $x^2 + 11x + 30$ (ii) $x^2 + 18x + 32$ (iii) $x^2 + 7x - 18$

(iv) $x^2 + 5x - 6$ (v) $x^2 - 4x + 32$ (vi) $x^2 - 21x + 108$

(vii) $x^2 - 11x - 80$ (viii) $x^2 - x - 156$ (ix) $x^2 - 32x - 105$

(x) $40 + 3x - x^2$ (xi) $6 - x - x^2$ (xii) $7x^2 + 49x + 84$

(xiii) $x^2 + 17yx - 84y^2$ (xiv) $5x^2 + 16x + 3$ (xv) $6x^2 + 17x + 12$

(xvi) $9x^2 + 18x + 8$ (xvii) $14x^2 + 9x + 1$ (xviii) $2x^2 + 3x - 90$

(xix) $2x^2 + 11x - 21$ (xx) $3x^2 - 14x + 8$ (xxi) $3\sqrt{3}x^2 - 6x$

Q4. Find the zeros of the following polynomials and verify the relationship between zeros and its coefficient.

(i) $\sqrt{2}x^2 + 3x + \sqrt{2}$ (ii) $\sqrt{5}x^2 + 2x - 3\sqrt{5}$ (iii) $2\sqrt{3}x^2 + x - 5\sqrt{3}$

(iv) $5\sqrt{5}x^2 + 2x + 3\sqrt{5}$ (v) $7\sqrt{2}x^2 - 10x - 4\sqrt{2}$ (vi) $6\sqrt{3}x^2 - 47x + 5\sqrt{3}$

(vii) $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ (viii) $\sqrt{3}x^2 + 11x + 6\sqrt{3}$ (ix) $2\sqrt{3}x^2 - 7x + \sqrt{3}$

(x) $\sqrt{5}x^2 - 6x + \sqrt{5}$ (xi) $2x^2 + 3\sqrt{3}x + 3$ (xii) $7x^2 + 2\sqrt{14}x + 2$

(xiii) $6x^2 - 3\sqrt{3}x - 5$ (xiv) $10x^2 + 7\sqrt{3}x + 3$ (xv) $8x^2 - 2\sqrt{2}x - 2$

(xvi) $16x^2 + 6\sqrt{2}x + 1$ (xvii) $10x^2 + \sqrt{5}x - 3$ (xviii) $5x^2 + 5\sqrt{5}x + 6$

(xix) $7x^2 + 4\sqrt{2}x - 6$ (xx) $21x^2 + 10\sqrt{2} + 2$ (xxi) $20x^2 + 7\sqrt{2}x + 1$

PRACTICE EXERCISE 2.7

Q1. Find the zeros of the following polynomials and verify the relationship between zeros and its coefficient.

(i)	$6x^2-15$	(ii)	$3x^2-2$	(iii)	$3x^2-8$
(iv)	$18x^2-25$	(v)	$6x^2-2$	(vi)	$8x^2-15$
(vii)	$3\sqrt{3}x^2-15\sqrt{3}$	(viii)	$32x^2-8$	(ix)	$36x^2-49$
(x)	$5x^2-2$	(xi)	$3x^2-4$	(xii)	$100x^2-3$
(xiii)	$25x^2-4$	(xiv)	$5x^2-6$	(xv)	$49x^2-16$
(xvi)	$12x^2-144$	(xvii)	$8x^2-3$	(xviii)	$3x^2-5$
(xix)	$3x^2-6$	(xx)	$2x^2-7$	(xxi)	$13x^2-5$

Q2. Find the zeros of the following polynomials and verify the relationship between zeros and its coefficient.

(i)	$a^2x^2-4b^2$	(ii)	$9x^2-9b^2$	(iii)	$b^2x^2-a^2$
(iv)	$a^4x^2-0.01$	(v)	$9b^2x^2-16a^2$	(vi)	x^2-16a^2
(vii)	$16a^2x^2-25b^2$	(viii)	$25a^2x^2-0.04$	(ix)	$16a^2b^2x^2-25z^2$
(x)	$25x^2-49a^2$	(xi)	$0.01x^2-25b^2$	(xii)	$4a^2x^2-9b^2$
(xiii)	$0.25x^2-0.16b^2$	(xiv)	$25a^4b^4x^2-16p^2$	(xv)	$36a^2x^2-25b^2$
(xvi)	x^2-49b^4	(xvii)	$p^4x^2-16q^4$	(xviii)	$16p^2x^2-64q^4$
(xix)	$16p^2q^2x^2-121z^2$	(xx)	$0.01a^2x^2-0.25z^2$	(xxi)	$0.04x^2-0.16$

Q3. Find the zeros of the following polynomials and verify the relationship between zeros and its coefficient.

(i)	$a^2x^2+2abx+b^2$	(ii)	$4x^2+4ax+a^2$	(iii)	$9x^2+24bx+16b^2$
(iv)	$16a^4+24a^2b^2x+9b^2$	(v)	$6a^2x^2+16ab^2+ab^2$	(vi)	$12a^2b^2.x^2+10abx-2$
(vii)	$\sqrt{3}x^2+\left(\sqrt{3}+1\right)x+1$	(viii)	$a^2x^2+4abx+4b^2$	(ix)	$9a^4x^2+5a^2x-4$
(x)	$4a^2x^2-4a^2b^2x-8b^4$	(xi)	$12a^2x^2+13ax+3$	(xii)	$6a^4x^2-18a^2b^2x+12b^4$

Q4. Find the zeros of the following polynomials and verify the relationship between zeros and its coefficient.

(i)	$7x^2+4\sqrt{2}x-6$	(ii)	$21x^2+10\sqrt{2}x+2$	(iii)	$6\sqrt{7}x^2-25x+2\sqrt{7}$
(iv)	$\sqrt{5}x^2-6x+\sqrt{5}$	(v)	$3\sqrt{7}x^2-10x+\sqrt{7}$	(vi)	$\sqrt{13}x^2-10x-3\sqrt{13}$
(vii)	$3\sqrt{2}x^2-10x+4\sqrt{2}$	(viii)	$\sqrt{3}x^2+2x-\sqrt{3}$	(ix)	$8\sqrt{2}x^2-6x-\sqrt{2}$
(x)	$\sqrt{3}x^2+\left(\sqrt{3}+1\right)x+\sqrt{3}$	(xi)	$\sqrt{5}x^2+x-4\sqrt{5}$	(xii)	$6\sqrt{7}x^2-x-\sqrt{7}$
(xiii)	$5\sqrt{3}x^2-x-6\sqrt{3}$	(xiv)	$10\sqrt{10}x^2-20x+\sqrt{10}$	(xv)	$2\sqrt{21}x^2+5x-3\sqrt{21}$
(xvi)	$\sqrt{7}x^2-15x+2\sqrt{7}$	(xvii)	$3\sqrt{15}x^2-9x-2\sqrt{15}$	(xviii)	$2\sqrt{20}x^2-6x-4\sqrt{20}$
(xix)	$4x^2+4\sqrt{2}x-6$	(xx)	$9x^2-8\sqrt{3}x+4$	(xxi)	$10x^2+2\sqrt{2}x-7$

PRACTICE EXERCISE 2.8

Q1. Is 2 is a zero of the polynomial $p(x) = x^2 - 5x + 6$.

Q2. Verify that 2 and 3 are the zeros of the polynomial $p(x) = x^2 - 5x + 6$.

Q3. Find the value of k, if 1 is a zero of the polynomial $p(x) = x^2 - 2kx + 5$.

Q4. For what value of k, (-4) is a zero of the polynomial $p(x) = x^2 - x - (2k + 2)$.

Q5. For what value of p, (-4) is a zero of the polynomial $p(x) = x^2 - 2x - (7p + 3)$.

Q6. If one zero of the quadratic polynomial $2x^2 + px + 4$ is 2, find the other zeros. Also find the value of p.

Q7. If 2 and 3 are zeroes of polynomial $3x^2 - 2kx + 2m$ find the value of k and m.

Q8. Find the quadratic polynomial whose zeroes are 2 and -6. Verify the relation between the coefficients and zeros of the polynomial.

Q9. Find the quadratic polynomial whose zeros are $\frac{2}{3}$ and $\frac{-1}{4}$. Verify the relation between the coefficients and the zeros of the polynomial.

Q10. Find a quadratic polynomial whose zeroes are $3, -5$.

Q11. Form a quadratic polynomial whose zeroes are $3 + \sqrt{5}$ and $3 - \sqrt{5}$.

Q12. Form a quadratic polynomial whose zeroes are $-\sqrt{5}$ and $3\sqrt{5}$.

Q13. Form a quadratic polynomial whose zeroes are $2\sqrt{7}$ and $-5\sqrt{7}$.

Q14. Form a quadratic polynomial whose zeroes are $\frac{3-\sqrt{3}}{5}$ and $\frac{3+\sqrt{3}}{5}$.

Q15. Form a quadratic polynomial whose zeroes are $\frac{5-\sqrt{2}}{3}$ and $\frac{5+\sqrt{2}}{3}$.

Q16. Form a quadratic polynomial whose zeroes are $-2\sqrt{3}$ and $-\sqrt{3}$.

Q17. Form a quadratic polynomial whose zeroes are $\frac{1}{2+\sqrt{3}}$ and $\frac{1}{2-\sqrt{3}}$.

Q18. Frind a quadratic polynomial whose one zero is 5 and product of zeroes is 30.

Q19. Find a quadratic polynomial whose one zeroes is 7 and product of zeroes is -18.

Q20. Form a quadratic polynomial whose are zero is $2+\sqrt{5}$ and product of zeroes is -1.

Q21. Form a quadratic polynomial whose one zeroe is $\sqrt{5}$ and the product of the zeroes is $-2\sqrt{5}$.

Q22. Find a quadratic polynomial, the sum and product of whose zeros are -5 and 6.

Q23. Find a quadratic polynomial, sum of whose zeroes is 8 and their product is 12. Hence, find the zeroes of the polynomial.

Q24. Find a quadratic polynomial, the sum of whose zeroes is -5 and their product is 6. Hence find the zeroes of the polynomial.

Q25. Find a quadratic polynomial, the sum of whose zeroes is $\frac{5}{2}$ and their product is 1. Hence find the zeros of the polynomial.

Q26. Find aquadratic polynomial. The sum of whose zeros is -1 and their product is -1.

Q27. Find a quadratic polynomial. The sum of whose zeros is -5 and their product is 2.

Q28. Find a quadratic polynomial. The sum of whose zeros is -5 and their product is 11.

Q29. Form a quadratic polynomial whose zeros are 5 and 6.

Q1. Form a quadratic polynomial whose zeros are -3 and 6.

PRACTICE EXERCISE 2.9

Q2. Form a quadratic polynomial whose zeros are -6 and -3.

Q3. Form a quadratic polynomial whose zeros are 2 and $\frac{1}{3}$.

Q4. Form a quadratic polynomial whose zeros are -2 and $\frac{5}{2}$.

Q5. Form a quadratic polynomial whose zeros are -3 and $\frac{-1}{2}$.

Q6. Form a quadratic polynomial whose zeros are $\frac{1}{2}$ and $\frac{1}{3}$.

Q7. Form a quadratic polynomial whose zeroes are $\frac{-1}{3}$ and $\frac{1}{7}$.

Q8. Form a quadratic polynomial whose zeros are $\frac{-2}{3}$ and $\frac{-1}{7}$.

Q9. Form a quadratic polynomial whose zeros are $\sqrt{3}$ and $2\sqrt{3}$.

Q10. Form a quadratic polynomial whose zeros are $\sqrt{5}$ and $-\sqrt{5}$.

Q11. Form a quadratic polynomial whose zeros are $-3\sqrt{7}$ and $-\sqrt{7}$.

Q12. Form a quadratic polynomial whose zeros are $-\sqrt{7}$ and $\frac{1}{3}\sqrt{7}$.

Q13. Form a quadratic polynomial whose zeros are $-5\sqrt{2}$ and $\frac{-1}{3}\sqrt{2}$.

Q14. Form a quadratic polynomial whose zeros are $\frac{\sqrt{5}}{2}$ and $\frac{2\sqrt{5}}{3}$.

Q15. Form a quadratic polynomial whose zeros are $\frac{-\sqrt{3}}{2}$ and $\frac{6}{7}\sqrt{3}$.

Q16. Form a quadratic polynomial whose zeros are $\frac{-2}{3}\sqrt{7}$ and $\frac{-5}{2}\sqrt{7}$.

Q17. Form a quadratic polynomial whose zeros are $3-\sqrt{2}$ and $3+\sqrt{2}$.

Q18. Form a quadratic polynomial whose zeros are $\frac{1}{3+2\sqrt{2}}$ and $\frac{1}{3-2\sqrt{2}}$.

Q19. Form a quadratic polynomial whose zeros are a and $\frac{1}{a}$.

Q20. Form a quadratic polynomial whose zeros are $(a-b)$ and $(2a+3b)$.

Q21. Form a quadratic polynomial whose zeros are $2\sqrt{3}\,a$ and $6\sqrt{3}\,a$.

Q22. Form a quadratic polynomial whose zeros are $\left(2\sqrt{3}a-\sqrt{5}b\right)$ and $\left(2\sqrt{3}a+\sqrt{5}b\right)$.

Q23. Form a quadratic polynomial whose zeros are a^p and $2a^p$.

Q24. Form a quadratic polynomial whee zeros are $-3a$ and $-4a$.

Q25. Form a quadratic polynomial whose zeros are $-\sqrt{5}$ ad $\sqrt{125}$.

Q26. Form a quadatic polynomial whose zeros are $\sqrt{27}$ and $-2\sqrt{3}$.

Q27. Form a quadatic polynomial whose zeros are $\frac{1}{\sqrt{3}}$ and $\frac{2}{\sqrt{3}}$

Q28. Form a quadratic polynominal whose zeros are $(a+b)$ and $(a-b)$.

Q29. Form quadratic polynomial whose zeros are $\sqrt{27}$ and $\sqrt{75}$.

PRACTICE EXERCISE 2.10

Q1. Form a quadratic polynomial, the sum of whose zeros is 5 and one zero is 2.

Q2. Form a quadratic polynomial whose one zero is 4 and and the product of zeros is -12.

Q3. Form a quadratic polynomial, the sum of whose zeros is $\frac{5}{2}$ and one zero is 1.

Q4. Form a quadratic polynomial, the product of zeros is $\frac{-2}{14}$ and one zero is $\frac{-1}{2}$.

Q5. Form a quadratic polynomial, the sum of whose zeros is 0 and one zero is $\sqrt{3}$.

Q6. Form a quadratic polynomial, the product of whose zeros is $9a^2-16b^2$ and one zero is $3a-4b$.

Q7. Form a quadratic polynomial, the sum of whose zero is 11 and one zero is 6.

Q8. Form a quadratic polynomial. The sum of whose zeros is $\frac{7}{3}$ and one zero is 2.

Q9. Form a quadratic polynomial. The product of whose zero is $\frac{3}{2}$ and one zero is $-\frac{1}{2}$.

Q10. Form a quadratic polynomial. The product of whose zeros is $\frac{1}{6}$ and one zero is $-\frac{1}{2}$.

Q11. Form a quadratic polynomial. The sum of whose zeros is $3\sqrt{3}$ and product is 6.

Q12. Form a quadratic polynomial. The sum of whose zeros is 0 and one zero is $-\sqrt{5}$.

Q13. Form a quadratic polynomial. The sum of whose zeros is $-4\sqrt{7}$ and one zero is $-\sqrt{7}$.

Q14. Form a quadratic polynomial. The product of whose zeros is 15 and one zero is $\frac{5}{2}\sqrt{3}$.

Q15. Form a quadratic polynomial. The sum of whose zeros is $\frac{-2\sqrt{7}}{3}$ and one zero is $-\sqrt{7}$.

Q16. Form a quadratic polynomial. The sum of whose zero is $\frac{5\sqrt{3}}{14}$ and one zero is $\frac{-\sqrt{3}}{2}$.

Q17. Form a quadratic polynomial. The sum of whose zeros is $\frac{-19\sqrt{7}}{6}$ and one zero is $\frac{-5\sqrt{7}}{2}$.

Q18. Form a quadratic polynomial. The sum of whose zeros is 10 and one zero is $\left(5-\sqrt{3}\right)$.

Q19. Form a quadratic polynomial. The sum of whose zero is 6 and one zero is $\left(3-2\sqrt{3}\right)$.

Q20. Form a quadratic polynomial. The sum whose zero is 2 a and one zero is $(a-b)$.

Q21. Form a quadratic polynomial. The sum of whose zeros is 6 and one zero is $\frac{1}{3+2\sqrt{2}}$.

Q22. Form a quadratic polynomial. The product of whose zero is $(a-b)$ and one zero is $\left(\sqrt{a}+\sqrt{b}\right)$.

Q23. Form a quadratic polynomial. The sum of whose zeros is $\frac{a^2+1}{a}$ and one zero is a.

Q24. Form a quadratic polynomial. The product of two zeros is $2a^2+ab-3b^2$ and one zero is $(a-b)$.

Q25. Form a quadratic polynomial. The product of whose zeros is $36a^2$ and one zero is $6\sqrt{3}a$.

Q26. Form a quadratic polynomial. The product of whose zeros is $12a^2-5b^2$ and one zero is $\left(2\sqrt{3}a-\sqrt{5}b\right)$.

Q27. Form a quadraratic polynomial. The product of whose zeros is $\sqrt{15}$ and one of zero is $\sqrt{3}$.

PRACTICE EXERCISE 2.11

Q1. α and β are the zeroes the polynomial $p(x)=2x^2-6x+2$ then find the value of following expressions :

(i) $\alpha\beta$ (ii) $\alpha+\beta$

(iii) $(\alpha\beta)^3$ (iv) $\alpha^7\beta^7$

(v) $\alpha^2+\beta^2$ (vi) $\alpha^{-1}\beta^{-1}$

(vii) $\alpha^3+\beta^3$ (viii) $\alpha^{-2}+\beta^{-2}$

(ix) $\frac{1}{\alpha^2}+\frac{1}{\beta^2}$ (x) $\frac{1}{\alpha^{-2}\beta^{-2}}$

(xi) $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$ (xii) $\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}$

(xiii) $\frac{\alpha}{\beta^2}+\frac{\beta}{\alpha^2}$ (xiv) $(\alpha+\beta)^2$

(xv) $\alpha^{-3}+\beta^{-3}$ (xvi) $\frac{\alpha^{-1}}{\beta}+\frac{\beta^{-1}}{\alpha}$

(xvii) $\frac{\alpha^2}{\beta^2}+\frac{\beta^2}{\alpha^2}$ (xviii) $1\alpha^{-2}\beta^{-2}$

Q2. If α and β are the zeroes of polynomial $p(x)=3x^2+7x+5$ then find the value of following expression.

(i) $\alpha\beta$ (ii) $\alpha+\beta$

(iii) $\alpha^2\beta^2$ (iv) $(\alpha\beta)^3$

(v) $\alpha^7\beta^7$ (vi) $\alpha-\beta$

(vii) $\alpha^2+\beta^2$ (viii) $\alpha^{-1}\beta^{-1}$

(ix) $\alpha^{-2}\beta^{-2}$ (x) $\alpha^3+\beta^3$

(xi) $\alpha^{-2}+\beta^{-2}$ (xii) $(\alpha\beta)^5$

(xiii) $\frac{1}{\alpha^2}+\frac{1}{\beta^2}$ (xiv) $\frac{1}{\alpha^{-2}\beta^{-2}}$

(xv) $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$ (xvi) $\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}$

(xvii) $\frac{\alpha}{\beta^2}+\frac{\beta}{\alpha^2}$ (xviii) $(\alpha+\beta)^2$

(xix) $\alpha^{-3}+\beta^{-3}$ (xx) $\frac{\alpha^{-1}}{\beta}+\frac{\beta^{-1}}{\alpha}$

(xxi) $\frac{\alpha^2}{\beta^2}+\frac{\beta^2}{\alpha^2}$ (xxii) $\frac{1}{\alpha^3}\times\frac{1}{\beta^3}$

Q3. If α and β are the zeros of the polynomial $p(x)=5x^2-10x+15$. Find the values of following expression.

(i) $\alpha\beta$ (ii) $\alpha+\beta$

(iii) $\alpha^2\beta^2$ (iv) $\alpha^{-3}\beta^{-3}$

(v) $\alpha-\beta$ (vi) $\alpha^2+\beta^2$

(vii) $\alpha^3+\beta^3$ (viii) $\alpha^{-1}+\beta^{-1}$

(ix) $\alpha^{-2}\beta^{-2}$ (x) $\alpha^{-2}+\beta^{-2}$

(xi) $\alpha^2\beta+\alpha\beta^2$ (xii) $\alpha^3\beta+\beta^3\alpha$

(xiii) $\frac{1}{\alpha}+\frac{1}{\beta}$ (xiv) $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$

(xv) $\frac{\alpha}{\beta^2}+\frac{\beta}{\alpha^2}$ (xvi) $\frac{\alpha^{-2}}{\beta^{-1}}+\frac{\beta^{-2}}{\alpha^{-1}}$

(xvii) $\frac{1}{\alpha^{-3}}+\frac{1}{\beta^{-3}}$ (xviii) $\frac{\alpha^3}{\beta}+\frac{\beta^3}{\alpha}$

(xix) $\frac{1}{\alpha^{-2}}+\frac{1}{\beta^{-2}}$ (xx) $\alpha^{-4}+\beta^{-4}$

(xxi) $\frac{\alpha^{-5}}{\alpha^3}+\frac{\beta^{-5}}{\beta^{-3}}$ (xxii) $\frac{\alpha^{-7}\times\beta^{-7}}{\alpha^2\beta^2}$

Q4. If α and β are the zeros of the polynomial of $p(x)=2x^2-5x+7$. Find the value of following expression.

(i) $\alpha\beta$ (ii) $\alpha+\beta$

(iii) $\alpha^2\beta^2$ (iv) $\alpha^{-3}\beta^{-3}$

(v) $\alpha-\beta$ (vi) $\alpha^2+\beta^2$

(vii) $\alpha^3+\beta^3$ (viii) $\alpha^{-1}+\beta^{-1}$

(ix) $\alpha^{-2}\beta^{-2}$ (x) $\alpha^{-2}+\beta^{-2}$

(xi) $\alpha^2\beta+\alpha\beta^2$ (xii) $\alpha^3\beta+\beta^3\alpha$

(xiii) $\frac{1}{\alpha}+\frac{1}{\beta}$ (xiv) $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$

(xv) $\frac{\alpha}{\beta^2}+\frac{\beta}{\alpha^2}$ (xvi) $\frac{\alpha^{-2}}{\beta^{-1}}+\frac{\beta^{-2}}{\alpha^{-1}}$

(xvii) $\frac{1}{\alpha^{-3}}+\frac{1}{\beta^{-3}}$ (xviii) $\frac{\alpha^3}{\beta}+\frac{\beta^3}{\alpha}$

(xix) $\frac{1}{\alpha^{-2}}+\frac{1}{\beta^{-2}}$ (xx) $\alpha^{-4}+\beta^{-4}$

(xxi) $\frac{\alpha^{-5}}{\alpha^{-3}}+\frac{\beta^{-5}}{\beta^{-3}}$ (xxii) $\frac{\alpha^{-7}\times\beta^{-7}}{\alpha^2\beta^2}$

PRACTICE EXERCISE 2.12

Q1. If α and β are the zeros of the polynomial $p(x) = 2x^2 + 6x - 8$. Form a quadratic polynomial whose zeros are $-\alpha$ and $-\beta$.

Q2, If α and β are the zeros of polynomials $p(x) = 7x^2 - 14x + 21$. Form a quadratic polynomial whose zeros are α^{-1} and β^{-1}.

Q3. If α and β are the zeros of the polynomial $p(x) = 5x^2 - 15n + 20$. Form a quadratic polynomial whose zeros are 2α and 2β.

Q4. If α and β are the zeros of the polynomials $p(x) = 6x^2 - 18x + 12$. Form a quadratic polynomial whose zeros are -5α and -5β.

Q5. If α and β are the zeros of the polynomial $p(x) = 7x^2 - 21x + 14$. Form a quadratic polynomial whose zeros are $\frac{1}{\alpha} + \frac{1}{\beta}$.

Q6. If α and β are the zeros of the polynomial $p(x) = 3x^2 - 15x + 21$. Form a quadratic polynomial whose zeros are α^{-2} and β^{-2}.

Q7. If α and β are the zeros of the polynomial $p(x) = 6x^2 + 18x - 36$. Form a quadratic polynomial whose zeros are $\frac{\alpha^2}{\beta}$ and $\frac{\beta^2}{\alpha}$.

Q8. If α and β are the zeros of the polynomial $p(x) = 2x^2 - 5x + 7$. Form a quadratic polynomialwhose zeros are 3α and 3β.

Q9. If α and β are the zeros of the polynomial $p(x) = 7x^2 - 5x - 8$. Form a quadratic polynomial whose zeros are $(\alpha + 1)$ and $(\beta + 1)$.

Q10. If α and β are the zeros of the polynomial $p(x) = 6x^2 - 5x + 12$. Form a quadratic polynomial whose zeros are $(\alpha^{-1} + 1)$ and $(\beta^{-1} + 1)$.

Q11. If α and β are the zeros of the polynomial $p(x) = 6x^2 - 3x + 2$. Form a quadratic polynomial whose zeros as $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

Q12. If α and β are the zeros of the polynomial $p(x) = 2x^2 - 7x + 5$. Form a quadratic polynomial whose zeros are $\frac{1}{(\alpha + 1)}$ and $\frac{1}{(\beta + 1)}$.

Q13. If α and β are the zeros of the polynomial $p(x) = 6x^2 - 7x + 5$. Form a quadratic polynomial whose zeros are $\frac{1}{\alpha^{-2}}$ and $\frac{1}{\beta^{-2}}$.

Q14. If α β are the zeros of the polynomial $p(x) = 2x^2 - 3x + 5$. Form a quadratic polynomial whose zeros are $(2\alpha + 2\beta)$ and $(\alpha + \beta)$.

Q15. If α and β are the zeros of the polynomial $p(x) = ax^2 + bx + c$. Form a quadratic polynomial whose zeros are -3α and -3β.

Q16. If α and β are the zeros are the polynomial $p(x) = 6x^2 - 7x + 8$. Form a quadratic polynomial whose zeros are $(\alpha + 2)$ and $(\beta + 2)$.

Q17. If α and β are the zeros of the polynomial $p(x) = 3x^2 - 6x + 9$. Form a quadratic polynomial whose zeros are $\left(\frac{1}{\alpha\beta} + 1\right)$ and $\frac{1}{(\alpha\beta + 1)}$

Q18. If α and β are the zeros of the polynomial $p(x) = lx^2 + mx + n$. Form a quadratic polynomial whose zeros as $\frac{1}{(\alpha\beta + 1)}$ and $\frac{1}{(\alpha\beta - 1)}$.

Q19. If α and β are the zeros of the polynomial $p(x) = 3x^2 - 4x + 9$. Form a quadratic polynomial whose zeros are $(\alpha\beta + 1)$ and $(\alpha\beta - 1)$

PRACTICE EXERCISE 2.15

Q1. Verify that 2, 1, 1 are zeros of cubic polynomial $p(x) = x^3 - 4x^2 + 5x - 2$. Also verify the relationship between the zeros and their coefficient.

Q2. Verify that $2, -5$ and 3 are zeros of cubic polynomial $p(x) = x^3 - 19x + 30$. Also verify the relationship between the zeros and their coefficient.

Q3. Verify that $3, -\frac{1}{2}$ and $\frac{5}{2}$ are zeros of cubic polynomial $p(x) = 4x^3 - 20x^2 + 19x + 15$. Also verify the relationship between the zeros and their coefficient.

Q4. Verify that $\sqrt{3}, 2\sqrt{3}$ and $-5\sqrt{3}$ are zeros of cubic polynomial $p(x) = x^3 + 2\sqrt{3}x^2 - 39x + 30\sqrt{3}$. Also verify the relationship between the zeros and their coefficient.

Q5. Verify that $\frac{1}{2}, -\frac{1}{3}$ and $2/5$ are zeros of cubic polynomial $p(x) = 30x^3 - 17x^2 - 3x + 2$. Also verify the relationship between the zeros and their coefficient.

Q6. Verify that $2\sqrt{5}, -3\sqrt{5}, 7\sqrt{5}$ are zeros of cubic polynomial $p(x) = x^3 - 6\sqrt{5}x^2 - 65x + 210\sqrt{5}$. Also verify the relationship between the zeros and their coefficient.

Q7. Verify that $-5\sqrt{3}, 2\sqrt{3}$ and $6\sqrt{3}$ are zeros of cubic polynomial $p(x) = x^3 - 3\sqrt{3}x^2 - 84x + 180\sqrt{3}$. Also verify the relationship between the zeros and their coefficient.

Q8. Verify that $3, -2, 1$ are zeros of cubic polynomial $p(x) = x^3 - 2x^2 - 5x + 6$. Also verify the relationship between the zeros and their coefficient.

Q9. Verify that $5, -2, \frac{1}{3}$ are zeros of cubic polynomial $p(x) = 3x^3 - 10x^2 - 27x + 10$. Also verify the relationship between the zeros and their coefficient.

Q10. Verify that -2, 1, 5 are zeros of cubic polynomial $p(x) = x^3 - 4x^2 - 7x + 10$. Also verify the relationship between the zeros and their coefficient.

Q11. Verify that $-1, -4, -1$ are zeros of cubic polynomial $p(x) = x^3 + 6x^2 + 9x + 4$. Also verify the relationship between the zeros and their coefficient.

Q12. Verify that $\sqrt{2}, -\sqrt{2}$ and $\frac{1}{2}$ are zeros of cubic polynomial $p(x) = 2x^3 - 4x - x^2 + 2$. Also verify the relationship between the zeros and their coefficient.

Q13. Verify that $\frac{1}{2}, 1, -2$ are zeros of cubic polynomial $p(x) = 2x^3 + x^2 - 5x + 2$. Also verify the relationship between the zeros and their coefficient.

Q14. Verify that 2, 1, 1 are zeros of cubic polynomial $p(x) = x^3 - 4x^2 + 5x - 2$. Also verify the relationship between the zeros and their coefficient.

Q15. Verify that $\sqrt{3}, -\sqrt{3}$ and 4 are zeros of cubic polynomial $p(x) = x^3 - 4x^2 - 3x + 12$. Also verify the relationship between the zeros and their coefficient.

Q16. Verify that $3, -1$ and $-\frac{1}{3}$ are zeros of cubic polynomial $p(x) = 3x^3 - 5x^2 - 11x - 3$. Also verify the relationship between the zeros and their coefficient.

Q17. Verify that $\sqrt{2}, \sqrt{2}, -3$ are zeros of cubic polynomial $p(x) = x^3 + 3x^2 - 2x - 6$. Also verify the relationship between the zeros and their coefficient.

PRACTICE EXERCISE 2.16

Q.1 Form a cubic polynomial whose zeros are $2, -5$ and 3.

Q2. Form a cubic polynomial whose zeros are 3, $-\frac{1}{2}$ and $5/2$.

Q3. Form a cubic polynomial whose zeros are $\sqrt{3}, 2\sqrt{3}$ and $5\sqrt{3}$.

Q.4 Find a cubic polynomial with the sum, sum of the product of its zeroes taken two at a time, and product of its zeroes as 5, –6 and –20 respectively.

Q.5 From a cubic polynomial whose zeroes are 2, –1 and 5.

Q.6 Form a cubic polynomials whose zeroes are 2, 1, 1.

Q.7 Form a cubic polynomial whose zeroes are $\frac{1}{2}, 1 \text{and} -2$.

Q.8 Form a cubic polynomials whose zeroes are $\frac{1}{3}, -1 \text{and} 3$

Q.9 Write a cubic polynomial whose zeroes are $\left(2-2\sqrt{5}\right), \left(2+2\sqrt{5}\right) \text{and} 1$.

Q.10 Write a cubic polynomial whose zeroes are $\frac{2+\sqrt{5}}{2}, \frac{2-\sqrt{5}}{2}, 4$.

Q.11 If α, β, γ are zeroes of polynomial $6x^3 + 3x^2 - 5x + 1$, then find the value of $\alpha^{-1} + \beta^{-1} + \gamma^{-1}$

Q.12 Find a cubic polynomial with the sum of the zero. Sum of two zeros taken together product of its zeroes are 5, –6 and –20 respectively.

Q.13 If the zeroes of the polynomial $p(x) = x^3 - 3x^2 + x + 1$ are a – b, a and a + b, find a and b.

Q.14 Find a cubic polynomial whose sum sum of zeroes, sum of the product of two zeroes taken together and product of its zeroes taken as 5, –6 and –20 respectively.

Q.15 Find a cubic polynomial shose sum of zeroes, sum of the product of its zeroes taken two at a time and product of its zeroes are $3, \frac{1}{2}, \frac{3}{4}$ respectively.

Q.16. Form a cubic polynomial with the sum of the product of its zeros taken two at a time, and product of its zeros as 12, -18 and 30.

Q.17 Write a cubic polynomial whose zeroes are $2\sqrt{5}, -3\sqrt{5} \text{and} 3\sqrt{5}$.

Q.18 α, β, γ are the zeroes of cubic polynomial $kx^3 - 5x + 9$ if $\alpha^3 + \beta^3 + \gamma^3 = 27$. Find the value of k.

Q.19 Form a cubic polynomial whose zeroes are $2+\sqrt{5}, 2-\sqrt{5} \text{and} 1$.

Q.20 Form a cubic polynomial whose zeroes are $\frac{1}{2-\sqrt{5}}, \frac{1}{2+\sqrt{5}} \text{and} 1$.

Q.21 Form a cubic polynomial whose zeros are $\frac{1}{2}, \frac{-1}{3}$ and $2/5$.

Q.22 Form a cubic polynomial whose zeros are $\frac{1}{2\sqrt{3}}$, $-3\sqrt{3}$ and $6\sqrt{3}$.

Q.23 Form a cubic polynomial whose zeros are $2\sqrt{5}, -3\sqrt{5}$ and $7\sqrt{5}$.

Q.24 Form a cubic polynomial with the sum of the product of its zeros taken two at a time and product of its zeros are $-5\sqrt{3}$, $2\sqrt{3}$ and $6\sqrt{3}$.

SOLVED HOT QUESTIONS

Q1. **Prove that $x^2 + 6x + 15$ has no zero.**

Sol. Let $p(x) = x^2 + 6x + 15$

$p(x) = x^2 + 6x + 9 + 6$

$= [x^2 + 2.3x + (3)^2] + 6$

$= (x + 3)^2 + 6$

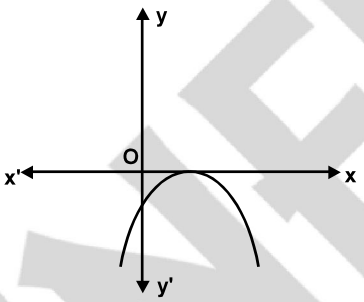
As for every real number, values of $(x + 3)^2$ and 6 are never negative.

$\therefore$ The value of p(x) is always greater than or equal to 6. Thus, p(x) is not zero for any value of x and as such has no zero.

Q2. **How many zeroes can, a polynomial of degree n have ?**

Sol. A polynomial of degree n has at the most n zeroes.

Q3. **The graph of the polynomial $y = ax^2 + bx + c$ is shown in figure. Write the value of $b^2 - 4ac$.**



$y = ax^2 + bc + c$

Sol. The graph of the polynomial is a parabola and it intersects the x-axis at two points.

$\therefore$ It corresponds to a quadratic polynomial and the number of zeroes is two.

Q4. **Graph of a linear polynomial is a straight line. If points (1, –1), (2, 1), (3/2, 0) lie on this graph of polynomial. Write the zero of the polynomial.**

Sol. $\frac{3}{2}$

Q5. **If one root of the polynomial $p(x) = 5x^2 + 13x + K$ is reciprocal of the other. Find the value of K.**

Sol. We have, $p(x) = 5x^2 + 13x + K$

Here a = 5, b = 13, c = K

Let first root be α, then other root = $\frac{1}{\alpha}$

Now, product of the roots = $\frac{\text{Constant term}}{\text{Coeff. of } x^2}$

$\Rightarrow \quad \alpha.\frac{1}{\alpha} = \frac{K}{5}$

$\Rightarrow \quad 1 = \frac{K}{5}$

$\Rightarrow \quad K = 5$

Hence, K = 5 **Ans.** K = 5

Q6. **If sum of the squares of zeroes of the quadratic polynomial $p(x) = x^2 - 8x + K$ is 40, find the value of K.**

Sol. We have, $p(x) = x^2 - 8x + K$

Here a = 1, b = – 8, c = K

Let α and β are the zeroes of the quadratic polynomial, $p(x) = x^2 - 8x + 8$, then

$(\alpha + \beta) = -bza$

$= \alpha + \beta = \frac{-(-8)}{1} = 8$

$= \alpha\beta$

We have, $\alpha^2 + \beta^2 = 40$

$(\alpha + \beta)^2 - 2\alpha\beta = 40$

$\Rightarrow \quad (8)^2 = 40 - 2(K)$

$\Rightarrow$ $64 - 2K = 40 \Rightarrow 2K = 24$

$\Rightarrow$ $K = 12$ Hence, $K = 12$

Ans. $K = 12$

Q7. **What are parabola ?**

Sol. For any quadratic polynomial $ax^2 + bx + c = 0$, $a \neq 0$ the graph of the corresponding equation $y = ax^2 + bx + c$ has one of the two shapes either open upwards like this $\cup$ or downwards like this $\cap$ depending on whether a > 0 or a < 0. These curves are called parabolas.

Q8. **If α and β are the zeroes of the polynomial $ax^2 + bx + c$ then find**

(a) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ (b) $\alpha^2 + \beta^2$

Sol. Since, α and β are the the zeroes of the quadratic polynomial $ax^2 + bx + c$

$\therefore$ $\alpha + \beta = \frac{-b}{a}$ and $\alpha.\beta = \frac{c}{a}$

(a) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2 + \beta^2}{\alpha\beta}$

$= \frac{(\alpha+\beta)^2 - 2\alpha\beta}{2\alpha\beta}$

$= \frac{\left(\frac{-b}{a}\right)^2 - 2\left(\frac{c}{a}\right)}{\frac{c}{a}}$

$= \frac{\frac{b^2}{a^2} - \frac{2c}{a}}{\frac{c}{a}} = \frac{\frac{b^2 - 2ac}{a^2}}{\frac{c}{a}}$

$= \frac{b^2 - 2ac}{a^2} \times \frac{a}{c} = \frac{b^2 - 2ac}{ac}$

(b) $\alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$

$= \left(\frac{-b}{a}\right)^2 - 2\left(\frac{c}{a}\right) = \frac{b^2}{a^2} - \frac{2c}{a}$

$= \frac{b^2 - 2ac}{a^2}$

Q9. **If α and β are the zeroes of the quadratic polynomial $p(x) = ax^2 + bx + c$. Find the value of $\alpha^2 - \beta^2$.**

Sol. Since α and β are the zeroes of the quadratic polynomial $ax^2 + bx + c$, then

$\alpha + \beta = \frac{-b}{a}$ and $\alpha\beta = \frac{c}{a}$

Now, $\alpha^2 - \beta^2 = (\alpha+\beta)(\alpha-\beta)$

$= (\alpha+\beta)\sqrt{(\alpha+\beta)^2 - 4\alpha\beta}$

$= \left(\frac{-b}{a}\right)\sqrt{\left(\frac{-b}{a}\right)^2 - 4\times\frac{c}{a}}$

$= \left(\frac{-b}{a}\right)\sqrt{\frac{b^2}{a^2} - \frac{4c}{a}}$

$= \frac{-b}{a}\sqrt{\frac{b^2 - 4ac}{a^2}}$

$= \frac{-b\sqrt{b^2 - 4ac}}{a^2}$

Q10. **If α and β are the zeroes of the quadratic polynomial $P(x) = Kx^2 + 4x + 4$ such that $\alpha^2 + \beta^2 = 24$, find the value of K.**

Sol. Since α and β are the zeroes of the quadratic polynomial $P(x) = Kx^2 + 4x + 4$, then

$\alpha + \beta = \frac{-b}{a} = \frac{-4}{K}$

and $\alpha\beta = \frac{c}{a} = \frac{K}{4}$

It is given that $\alpha^2 + \beta^2 = 24$

$\Rightarrow (\alpha+\beta)^2 - 2\alpha\beta = 24$

$\Rightarrow \left(\frac{-4}{K}\right)^2 - 2\left(\frac{4}{K}\right) = 24$

$\Rightarrow \frac{16}{K^2} - \frac{8}{K} = 24$

$\Rightarrow \frac{16 - 8K}{K^2} = 24$

$\Rightarrow 16 - 8K = 24K^2$

$\Rightarrow 24K^2 + 8K - 16 = 0$

$\Rightarrow 8(3K^2 + K - 2) = 0$

$\Rightarrow 3K^2 - K - 2 = 0$

$\Rightarrow 3K^2 + 3K - 2K - 2 = 0$

$\Rightarrow 3K(K + 1) - 2(K + 1) = 0$

$\Rightarrow (3K - 2)(K + 1) = 0$

$\Rightarrow 3K - 2 = 0$ or $K + 1 = 0$

$\Rightarrow K = \frac{2}{3}$ or $K = -1$

Ans. $k = \frac{2}{3}$ and $k = -1$

Q11 **. If α, β are the zeroes of the quadratic polynomial $2x^2 - 3x - 5$, form a polynomial whose zeroes are $2\alpha + 1$ and $2\beta + 1$.**

Sol. Since α, β are the zeroes of the quadratic polynomial $2x^2 - 3x - 5$, then

$$\alpha + \beta = \frac{-b}{a} = \frac{3}{2}$$

and $$\alpha\beta = \frac{c}{a} = \frac{-5}{2}$$

Now, sum of zeros $= 2\alpha + 1 + 2\beta + 1$

$= 2\alpha + 2\beta + 2$

$= 2(\alpha + \beta + 1)$

$= 2\left(\frac{3}{2} + 1\right) = 2 \times \frac{5}{2} = 5$

Product of zeros $= (2\alpha + 1)(2\beta + 1)$

$= 4\alpha\beta + 2\alpha + 2\beta + 1$

$= 4\alpha\beta + 2(\alpha + \beta) + 1$

$= 4\left(\frac{-5}{2}\right) + 2\left(\frac{3}{2}\right) + 1$

$= -10 + 3 + 1 = -6$

So, required quadratic polynomial be

$p(x) = k\left[x^2 - 5x + p\right]$

$p(x) = K\{x^2 - (\alpha + \beta)x + \alpha\beta\}$

$= K\{x^2 - 5x - 6\}$

Ans. $k\left[x^2 - 5x - 6\right]$

Q12. **If α, β are the zeroes of quadratic polynomial $p(x) = x^2 - 3x + 2$, from a quadratic polynomial whose roots are $-\alpha$ and $-\beta$.**

Sol. Since α, β are the zeroes of quadratic polynomial $x^2 - 3x + 2$, then

$\alpha + \beta = \frac{-b}{a} = \frac{3}{1}$ and $\alpha\beta = \frac{c}{a} = \frac{2}{1}$

Now, sum $= -\alpha + (-\beta)$

$= -\alpha - \beta = -(\alpha + \beta) = -3$

$= (-\alpha) \times (-\beta) = \alpha\beta$

Product $= \frac{c}{a} = \frac{2}{1}$

So, required quadratic polynomial be

$p = k\left[x^2 = 5x + p\right]$

$= K\{x^2 - (-3)x + 2\} = K\{x^2 + 3x + 2\}$

Q13. **If the polynomial $6x^4 + 8x^3 + 17x^2 + 21x + 7$ is divided by another polynomial $3x^2 + 4x + 1$, the remainder comes out to be $(ax + b)$, find a and b.** **V.V.I.**

Sol.

$$\begin{array}{r} 2x^2 + 5 \\ 3x^2 + 4x + 1 \overline{)\, 6x^4 + 8x^3 + 17x^2 + 21x + 7} \\ 6x^4 + 8x^3 + 2x^2 \\ - \quad - \quad - \\ \hline 15x^2 + 21x + 7 \\ 15x^2 + 20x + 5 \\ - \quad - \quad - \\ \hline x + 2 \end{array}$$

But the given remainder is $ax + b$.

$\therefore \quad ax + b = x + z$

$\therefore \quad a = 1$ and $b = 2$.

Q14. If α and β are the zeros of the quadratic polynomial $p(x) = ax^2 + bx + c$. Then find the value of $\alpha^4 + \beta^4$.

Ans. $\dfrac{\left(b^2 - 2ac\right)^2 - 2a^2c}{a^4}$

Q15. If p and q are zeros of the quadratic polynomial $p(x) = x^2 + px + q$. Find p and q.

Ans. $p = 0, q = 0$

Q16. Given that the zeros of the cubic polynomial $x^3 - 6x^2 + 3x + 10$ are the form a, a + b, $a + 2b$ for some real number a and b, find the values of a and b and also find the zero of the given polynomial.

Ans. 1 or 5 b = 3 or -3

Q17. For which value of a and b, are the zeros of $g(x) = x^3 + 2x^2 + a$, also the zeros of the polynomial $f(x) = x^5 - x^4 - 4x^3 + 3x^2 + 3x + b$? Which zero of $f(x)$ are not the zeros of $g(x)$. (**Hint :** Pradeep)

Q18. If α and β be two zeros of the quadratic polynomial $p(x) = ax^2 + bx + c$ then find the value of $\dfrac{1}{(a\alpha + b)^2} + \dfrac{1}{(a\beta + b)^2}$

Ans. $\dfrac{b^2 - 2ac}{a^2c^2}$

Note :

Note :

ANSWERS SHEET

PRACTICE EXERCISE 2.1

1. (i) No (ii) No (iii) Yes (iv) No (v) No (vi) Yes (vii) Yes (viii) No (ix) Yes (x) No (xi) Yes (xii) Yes (xiii) Yes (xiv) Yes (xv)Yes (xvi) No (xvii) Yes (xviii) No (xix) No (xx)Yes (xxi) No (xxii) No (xxiii) No (xxiv) No (xxv) Yes (xxvi) Yes (xxvii) Yes (xxviii) Yes (xxix) No (xxx) Yes

2. (i) 0 (ii) 1 (iii) 0 (iv) 3 (v) 4 (vi) 1(vii) 4 (viii) 1 (ix) 3 (x) 5 (xi) 1 (xii) 1002 (xiii) 4 (xiv) 11 (xv) 7 (xvi) 0 (xvii) 1 (xviii) 2 (xix) 4 (xx) 6 (xxi) 3 (xxii) 0

3. (i) Quadratic (ii) Linear (iii) Zero (iv) Quadratic (v) Cubic (vi) Linear (vii)Cubic (viii) Bi-quadratic (ix) Bi-quadratic (x) Bi-quadratic (xi) Bi-quadratic (xii) Bi-quadratic (xiii) Cubic (xiv)Bi-quadratic (xv) Bi-quadratic (xvi) Cubic (xvii) Cubic (xviii) Quadratic (xix) Quadratic (xx)Cubic (xxi) Cubic (xxii) Bi-quadratic

PRACTICE EXERCISE 2.2

1. 2 **2.** –11 **3.** –1 **4.** 13 **5.** $\frac{9}{5}$ **6.** 36 **7.** $\frac{-4}{3}$ **8.** $\frac{53}{27}$ **9.** 36 **10.** $\frac{-45}{4}$ **11.** $\frac{2}{9}$ **12.** 15 **13.** 34 **14.** $\frac{39}{6}$ **15.** $\frac{-15}{4}$ **16.** $\frac{27}{4}$ **17.** 2519 **18.** $\frac{33}{2}$ **19.** $8\sqrt{3}-3$ **20.** 6 **21.** $\frac{35}{4}$ **22.** $8\sqrt{5}+10$ **23.** $18\sqrt{3}-4$ **24.** 38 **25.** 33 **26.** 20/6 **27.** $\frac{283}{14}$ **28.** $\frac{79}{6}$ **29.** $\frac{-41}{6}$ **30.** 69/2 **31.** $\frac{37}{4}$ **32.** $\frac{1}{8}$ **34.** $\frac{21k^2-k}{7}$ **35.** $\frac{-134}{7}$ **36.** 0 **37.** –1092 **38.** $\frac{52}{21}$ **39.** 54 **40.** –404 **41.** 198 **42.** 18 **44.** 477 **45.** 18 **46.** $\frac{1}{2}$ **47.** 75

PRACTICE EXERCISE 2.3

1. (i) 2 (ii) 2 (iii) 3 (iv) 1 (v) 1 (vi) 4 (vii) 0 (viii) 1 (ix) 3 (x) 2 (xi) 4 (xii) 3 (xiii) 1 (xiv) 0 (xv) 3 (xvi) 3 (xvii) 4 (xviii) 3

PRACTICE EXERCISE 2.4

(i) 0 (ii) 0 (iii) 0 (iv) 0 (v) 0 (vi) 1 (vii) 5 (viii) 1 (ix) 2 (x) 0 (xi) 2 (xii) 0 (xiii) 3 (xiv) 2 (xv) 0

PRACTICE EXERCISE 2.5

1. -2, 4 **2.** $\frac{1}{2}$ **3.** $\pm\sqrt{15}$ **4.** 0, 25 **5.** 7, -3 **6.** $-\frac{3}{2},\frac{1}{3}$ **7.** $\frac{1}{4},\frac{1}{6}$ **8.** $-3\sqrt{3},\frac{-2}{\sqrt{3}}$ **9.** $\frac{-2}{\sqrt{3}},\frac{\sqrt{3}}{4}$ **10.** $-\sqrt{2},\frac{4}{2\sqrt{2}}$ **11.** $\frac{-\sqrt{5}}{\sqrt{2}},\frac{\sqrt{5}}{\sqrt{2}}$ **12.** $0,-2\sqrt{3}$ **13.** 2, 1 **14.** –5, 2 **15.** $\frac{\sqrt{7}}{2},\frac{\sqrt{7}}{7}$ **16.** $\frac{3}{2},-\frac{1}{2}$ **17.** $\frac{1}{\sqrt{2}},\frac{-1}{\sqrt{2}}$ **18.** $-\sqrt{2}$ & $\sqrt{2}$ **19.** $2\sqrt{3},\frac{2}{\sqrt{3}}$ **20.** $\sqrt{3},1$ **21.** $x = a, x = \frac{1}{a}$ **22.** $x = -\frac{1}{\sqrt{2}}, x = \frac{-3}{2\sqrt{2}}$

PRACTICE EXERCISE 2.6

1. (i) 0, 0 (ii) 0, 0 (iii) 0, 0 (iv) 0, 0 (v) 0, 0 (vi) 0, 0 (vii) 0, 0 (viii) 0, 0 (ix) 0, 0 (x) 0, 0 (xi) 0, 0 (xii) 0, 0 **2.** (i) 0, 3 (ii) 0, 5 (iii) 0, 9 (iv) 0, 6 (v) $0,\frac{1}{6}$ (vi) 0, 3 (vii) $0, 2\sqrt{2}$ (viii) $0, \sqrt{3}$ (ix) $0, \sqrt{5}$ (x) $0, 2\sqrt{7}$ (xi) $0, \sqrt{7}$ (xii) $0, 1/\sqrt{3}$ (xiii) $0, \sqrt{13}$ (xiv) $0, \sqrt{5}$ (xv) $0, 5\sqrt{3}$ (xvi) $0,\frac{1}{\sqrt{3}}$

(xvii) $0, \frac{2}{\sqrt{5}}$ (xviii) $0, \frac{3\sqrt{7}}{2}$ (xix) $0, \frac{1}{\sqrt{2}}$ (xx) $0, \frac{\sqrt{11}}{3}$

(xxi) $0, \frac{2}{\sqrt{3}}$ **3.** (i) $-6, -5$ (ii) $-16, -2$ (iii) $-9, 2$

(iv) $-6, 1$ (v) $3, 1$ (vi) $12, 9$ (vii) $16, -5$

(viii) $13, -12$ (ix) $35, -3$ (x) $-5, 8$ (xi) $2, -3$

(xii) $-4, -3$ (xiii) $-21y, 4y$ (xiv) $-3, -\frac{1}{5}$

(xv) $\frac{-4}{3}, \frac{-3}{2}$ (xvi) $\frac{-4}{3}, \frac{-2}{3}$ (xvii) $-\frac{1}{2}, \frac{-1}{7}$

(xviii) $\frac{-15}{2}, 6$ (xix) $-7, \frac{3}{2}$ (xx) $4, \frac{2}{3}$ (xxi) $7, 2$

4. (i) $-\sqrt{2}, \frac{-1}{\sqrt{2}}$ (ii) $-\sqrt{5}, \frac{3}{\sqrt{5}}$ (iii) $-\sqrt{3}, \frac{5}{2\sqrt{3}}$

(iv) $\frac{-3}{5\sqrt{5}}, \frac{-\sqrt{5}}{5}$ (v) $-\sqrt{2}, \frac{4}{7\sqrt{2}}$ (vi) $\frac{5\sqrt{3}}{2}, \frac{1}{3\sqrt{3}}$

(vii) $\frac{-2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$ (viii) $-3\sqrt{3}, \frac{-2}{\sqrt{3}}$ (ix) $\frac{1}{2\sqrt{3}}, \sqrt{3}$

(x) $\sqrt{5}, \frac{1}{\sqrt{5}}$ (xi) $-\sqrt{3}, -\frac{\sqrt{3}}{2}$ (xii) $\frac{-\sqrt{2}}{\sqrt{7}}, \frac{-\sqrt{2}}{\sqrt{7}}$

(xiii) $\frac{-1}{\sqrt{3}}, \frac{5}{2\sqrt{3}}$ (xiv) $\frac{-\sqrt{3}}{5}, \frac{-\sqrt{3}}{2}$ (xv) $\frac{-\sqrt{2}}{4}, \frac{\sqrt{2}}{2}$

(xvi) $\frac{-1}{4\sqrt{2}}, \frac{-1}{2\sqrt{2}}$ (xvii) $\frac{1}{\sqrt{5}}, \frac{-3}{2\sqrt{5}}$ (xviii) $\frac{-2}{\sqrt{5}}, \frac{-3}{\sqrt{5}}$

(xix) $\frac{3\sqrt{2}}{7}, -2$ (xx) $\frac{-\sqrt{2}}{7}, \frac{-\sqrt{2}}{3}$

PRACTICE EXERCISE 2.7

1. (i) $\frac{-\sqrt{15}}{\sqrt{6}}, \frac{\sqrt{15}}{\sqrt{6}}$ (ii) $\frac{-\sqrt{2}}{\sqrt{3}}, \frac{\sqrt{2}}{\sqrt{3}}$ (iii) $\frac{2\sqrt{2}}{3}, \frac{-2\sqrt{2}}{3}$

(iv) $\frac{5}{3\sqrt{2}}, \frac{-5}{3\sqrt{2}}$ (v) $\frac{\sqrt{2}}{\sqrt{6}}, \frac{-\sqrt{2}}{\sqrt{6}}$ (vi) $\frac{\sqrt{15}}{2\sqrt{2}}, \frac{-\sqrt{15}}{2\sqrt{2}}$

(vii) $\sqrt{5}, -\sqrt{5}$ (viii) $\frac{1}{2}, \frac{-1}{2}$ (ix) $\frac{7}{6}, \frac{-7}{6}$

(x) $\frac{\sqrt{2}}{\sqrt{5}}, \frac{-\sqrt{2}}{\sqrt{5}}$ (xi) $\frac{2}{\sqrt{3}}, \frac{-2}{\sqrt{3}}$ (xii) $\frac{\sqrt{3}}{10}, \frac{-\sqrt{3}}{10}$

(xiii) $\frac{2}{5}, \frac{-2}{5}$ (xiv) $\frac{\sqrt{6}}{\sqrt{5}}, \frac{-\sqrt{6}}{\sqrt{5}}$ (xv) $\frac{\sqrt{6}}{7}, \frac{-\sqrt{6}}{7}$

(xvi) $2\sqrt{3}, -2\sqrt{3}$ (xvii) $\frac{\sqrt{3}}{2\sqrt{2}}, \frac{-\sqrt{3}}{2\sqrt{2}}$ (xviii) $\frac{\sqrt{5}}{\sqrt{3}}, \frac{-\sqrt{5}}{\sqrt{3}}$

(xix) $\sqrt{2}, -\sqrt{2}$ (xx) $\frac{\sqrt{9}}{\sqrt{2}}, \frac{-\sqrt{7}}{\sqrt{2}}$ (xxi) $\frac{\sqrt{5}}{\sqrt{13}}, \frac{-\sqrt{5}}{\sqrt{13}}$

2.(i) $\frac{-2b}{a}, \frac{2b}{a}$ (ii) $\frac{-3b}{3}, \frac{3b}{3}$ (iii) $\frac{-a}{b}, \frac{a}{b}$

(iv) $\frac{-4a}{x}, \frac{4a}{x}$ (v) $\frac{0.01}{a^2}, \frac{0.1}{a^2}$ (vi) $\frac{-4a}{3b}, \frac{4a}{3b}$

(vii) $\frac{-5b}{4a}, \frac{5b}{4a}$ (viii) $\frac{-0.2}{5a}, \frac{0.2}{5a}$ (ix) $\frac{-5z}{4ab}, \frac{5z}{4ab}$

(x) $\frac{-7a}{5}, \frac{7a}{5}$ (xi) $\frac{-5b}{0.1}, \frac{5b}{0.1}$ (xii) $\frac{-3b}{2a}, \frac{3b}{2a}$

(xiii) $\frac{-0.4b}{0.5}, \frac{0.4b}{0.5}$ (xiv) $\frac{-4p}{5a^2b^2}, \frac{4p}{5a^2b^2}$ (xv) $\frac{-5b}{6a}, \frac{5b}{6a}$

(xvi) $-7b^2, 7b^2$ (xvii) $\frac{-4a^2}{p^2}, \frac{4a^2}{p^2}$ (xviii) $\frac{-8q^2}{4p}, \frac{8q^2}{4p}$

(xix) $\frac{-11z}{41q}, \frac{11z}{4pq}$ (xx) $\frac{0.05z}{0.1a}, \frac{0.5z}{0.1a}$ (xxi) $\frac{0.4}{0.2} - \frac{0.4}{0.2}$

3.(i) $-b/a, -b/a$ (ii) $-a/2, -a/2$ (iii) $\frac{-4b}{3}, \frac{-4b}{3}$

(iv) $\frac{-3b^2}{4a^2}, \frac{-3b^2}{4a^2}$ (v) $\frac{-3b}{2a}, \frac{-3b}{2a}$ (vi) $\frac{1}{6ab}, \frac{-1}{ab}$

(vii) $\frac{-b^2}{a^2}, \frac{4b^2}{a^2}$ (viii) $\frac{-2b}{a}, \frac{-2b}{a}$ (ix) $\frac{3}{9a^2}, \frac{-1}{a^2}$

(x) $\frac{-b^2}{a^2}, \frac{b^2}{a^2}$ (xi) $\frac{-1}{3a}, \frac{-3}{4a}$ (xii) $\frac{b^2}{a^2}, \frac{b^2}{2a^2}$

4.(i) $\frac{3\sqrt{2}}{7}, -2$ (ii) $\frac{-\sqrt{2}}{7}, \frac{-\sqrt{2}}{3}$ (iii) $\frac{\sqrt{7}}{2}, \frac{2}{3\sqrt{7}}$

(iv) $\sqrt{5}, \frac{1}{\sqrt{5}}$ (v) $\frac{\sqrt{7}}{3}, \frac{1}{\sqrt{7}}$ (vi) $\frac{-3}{\sqrt{13}}, \sqrt{13}$

(vii) $\frac{4}{3\sqrt{2}}, \sqrt{2}$ (viii) $\frac{1}{\sqrt{3}}, -\sqrt{3}$ (ix) $\frac{-\sqrt{2}}{8}, \frac{1}{\sqrt{2}}$

(xx) $-\sqrt{3}, \frac{-1}{\sqrt{3}}$ (xi) $\frac{4}{\sqrt{5}}, -\sqrt{5}$ (xii) $\frac{-3\sqrt{3}}{5}, \frac{2}{\sqrt{3}}$

(xiii) $\frac{\sqrt{10}}{10}, \frac{1}{\sqrt{10}}$ (xiv) $\frac{3\sqrt{3}}{2\sqrt{7}}, \frac{\sqrt{7}}{\sqrt{3}}$ (xv) $\frac{3\sqrt{3}}{2\sqrt{7}}, \frac{\sqrt{7}}{\sqrt{3}}$

(xvi) $\frac{1}{\sqrt{7}}, 2\sqrt{7}$ (xvii) $\frac{-2}{\sqrt{5}}, \frac{\sqrt{15}}{3}$ (xviii) $\frac{4}{\sqrt{5}}, \frac{-2\sqrt{5}}{4}$

(xix) $\frac{2}{2\sqrt{2}}, \frac{-3}{\sqrt{2}}$ (xx) $\frac{2}{3\sqrt{3}}, \frac{2}{\sqrt{3}}$ (xxi) $\frac{1}{\sqrt{2}}, \frac{-7}{5\sqrt{2}}$

PRACTICE EXERCISE 2.8

1. Yes **2.** Yes **3.** k = 3 **4.** k = 9 **5.** p = 3

6. 1, p = 6 **7.** $k = 15/2, m = 9$ **8.** $x^2 + 4x - 12$

9. $12x^2 - 5x + 2$ **10.** $x^2 + 2x - 15$ **11.** $x^2 - 6x + 4$

12. $x^2 - 2\sqrt{5} - 15$ **13.** $x^2 + 3\sqrt{7}x - 70$

14. $25x^2 - 30x + 6$ **15.** $9x^2 - 15x + 23$

16. $x^2 + 3\sqrt{3}x + 6$ **17.** $x^2 - 4x + 1$ **18.** $x^2 - 11x + 30$

19. $7x^2 - 31x - 126$ **20.** $x^2 - 4x - 1$

21. $x^2 + (2 - \sqrt{5})x = 2\sqrt{5}$ **22.** $x^2 + 5x + 6$

23. $x^2 - 8x + 12; (6, 2)$ **24.** $x^2 + 5x + 6; (-3, -2)$

25. $2x^2 - 5x + 2, \left(2, \frac{1}{2}\right)$ **26.** $k[x^2 + x - 1]$

27. $k[x^2 + 5x + 2]$ **28.** $k[x^2 + 5x + 11]$

29 $-k(x^2 - 11x + 30)$

PRACTICE EXERCISE 2.9

1. $k(x^2 - 3x - 18)$ **2.** $k(x^2 + 9x + 18)$

3. $k(3x^2 - 7x + 2)$ **4.** $k(2x^2 - x - 10)$

5. $k(2x^2 + 7x + 3)$ **6.** $k[6x^2 - 5x + 1]$

7. $k[21x^2 + 4x - 1]$ **8.** $k[21x^2 + 17x + 2]$

9. $k[x^2 - 3\sqrt{3}x + 6]$ **10.** $k[x^2 - 5]$

11. $k[x^2 + 4\sqrt{7}x + 21]$ **12.** $k(3x^2 + 2\sqrt{7}x - 7)$

13. $k(3x^2 + 16\sqrt{2}x + 10)$ **14.** $k[6x^2 - 7\sqrt{5}x + 10]$

15. $k(4x^2 - 5\sqrt{3}x - 18)$ **16.** $k[6x^2 + 19\sqrt{7}x + 70]$

17. $k(x^2 - 6x + 7)$ **18.** $k(x^2 - 6x + 1)$

19. $k[ax^2 - (a^2 + 1)x + a]$

21. $k[x^2 - (3a + 2b)x + (2a^2 + ba + 3b^2)]$

21. $k[x^2 - 8\sqrt{3}ax = 36a^2]$

22. $k[x^2 - (4\sqrt{3}a)x + (12a^2 - 5b^2)]$

23. $k(x^2 - (3a^p)x + 2a^{2p})$ **24.** $k[x^2 + 7ax + 12a^2]$

25. $k[x^2 - 4\sqrt{5}x - 25]$ **26.** $k[x^2 - \sqrt{3}x - 18]$

27. $3x^2 - 3\sqrt{3}x + 2$ **28.** $k[x^2 - 2ax + (a^2 - b^2)]$

29. $k[x^2 - 8\sqrt{3}x + 45]$

PRACTICE EXERCISE 2.10

1. $k(x^2 - 5x + 6)$ **2.** $k(x^2 - x - 12)$ **3.** $k(2x^2 - 5x + 3)$

4. $k(14x^2 + 3x - 2)$ **5.** $k(x^2 - 3)$

6. $k[x^2 - (6a)x + (9a^2 - 16b^2)]$

7. $k(x^2 - 11x + 30)$ **8.** $k(3x^2 - 7x + 2)$

9. $k(2x^2 + 7x + 3)$ **10.** $k(6x^2 - 5x + 1)$

11. $k(x^2 - 3\sqrt{3}x + 6)$ **12.** $k(x^2 - 5)$

13. $k(x^2 + 4\sqrt{7}x + 2)$ **14.** $k[2x^2 - 9\sqrt{3}x + 30]$

15. $k(3x^2 + 2\sqrt{7}x - 7)$ **16.** $k(14x^2 - 5\sqrt{3}x - 18)$

17. $k(6x^2 + 19\sqrt{7}x + 70)$ **18.** $k(x^2 - 10x + 22)$

19. $k(x^2 - 6x + 1)$ **20.** $k[x^2 - 2ax + (a^2 - b^2)]$

21. $k[x^2 - 6x + 1]$ **22.** $k[x^2 + 2\sqrt{a}x + (a - b)]$

23. $k[ax^2 - (a^2 + 1)x + a]$

24. $k(x^2 - (3a + 2b)x + 2a^2 + ab - 3b^2)$

25. $k[x^2 - 8\sqrt{3}ax + 36a^2]$

26. $k(x^2 - (4\sqrt{3}a) + (12a^2 - 5b^2))$

27. $k[x^2 - (\sqrt{5} + \sqrt{3})x + \sqrt{15}]$

PRACTICE EXERCISE 2.11

1. (i) 1 (ii) 3 (iii) 1 (iv) 1 (v) 7 (vi) 1 (vii) 18(viii) 7 (ix) 7 (x) 1 (xi) 7 (xii) 18 (xiii) 18 (xiv) 9 (xv) 18 (xvi) 2 (xvii) 47 (xviii) 1 **2.** (i) $\frac{5}{3}$ (ii) $\frac{7}{3}$ (iii) $\frac{25}{9}$ (iv) $\frac{125}{27}$ (v) $\frac{78125}{2187}$ (vi) $\frac{\sqrt{-11}}{3}$ (vii) $\frac{19}{9}$ (viii) $\frac{3}{5}$ (ix) $\frac{9}{25}$ (x) $\frac{28}{27}$ (xi) $\frac{19}{25}$ (xii) $\frac{3125}{243}$ (xiii) $\frac{19}{25}$ (xiv) $\frac{25}{9}$ (xv) $\frac{19}{15}$ (xvi) $\frac{28}{45}$ (xvii) $\frac{84}{225}$ (xviii) $\frac{49}{9}$ (xix) $\frac{28}{125}$ (xx) $\frac{6}{5}$ (xxi) $\frac{89}{225}$ (xxii) $\frac{27}{125}$ **3.** (i) 3 (ii) 2 (iii) 9 (iv) $\frac{1}{27}$ (v) $\sqrt{-8}$ (vi) -2 (vii) -10 (viii) $\frac{2}{3}$ (ix) $\frac{1}{9}$ (x) $\frac{-2}{9}$ (xi) 6 (xii) -6 (xiii) $\frac{10}{9}$ (xiv) $\frac{-2}{3}$ (xv) $\frac{-2}{3}$ (xvi) $\frac{-10}{9}$ (xvii) -10 (xviii) $\frac{-14}{3}$ (xix) -2 (xx) $\frac{-14}{81}$ (xxi) $\frac{-2}{9}$ (xxii) $\frac{1}{19683}$ **4.** (i) $\frac{7}{2}$ (ii) $\frac{5}{2}$ (iii) $\frac{49}{4}$ (iv) $\frac{8}{343}$ (v) $\frac{\sqrt{-31}}{2}$ (vi) $\frac{-3}{4}$ (vii) $-\frac{85}{8}$ (viii) $\frac{5}{7}$ (ix) $\frac{4}{49}$ (x) $\frac{-3}{49}$ (xi) $\frac{35}{4}$ (xii) $\frac{-21}{8}$ (xiii) $\frac{5}{7}$ (xiv) $\frac{-3}{14}$ (xv) $\frac{-84}{98}$ (xvi) $\frac{-84}{98}$ (xvii) $\frac{-85}{8}$ (xviii) $\frac{-383}{56}$ (xix) $\frac{-3}{4}$ (xx) $\frac{-383}{2401}$ (xxi) $\frac{-3}{49}$ (xxii) $\left(\frac{2}{7}\right)^9$

PRACTICE EXERCISE - 2.12

1. $k\left[x^2-3x-4\right]$ **2.** $k\left[3x^2-2x+1\right]$

3. $k\left[x^2-6x+16\right]$ **4.** $k\left[x^2+15x+50\right]$

5. $k\left[2x^2-3x+1\right]$ **6.** $k\left[49x^2-11x+1\right]$

7. $k\left[2x^2-27x-12\right]$ **8.** $k\left[2x^2-15x+63\right]$

9. $k\left[7x^2-19x+4\right]$ **10.** $k\left[12x^2-29x+23\right]$

11. $k\left(2x^2-3x+6\right)$ **12.** $k\left(14x^2-11x+2\right)$

13. $k\left[36x^2+11x+25\right]$ **14.** $k\left[2x^2-9x+9\right]$

15. $k\left[ax^2-3bx+9c\right]$ **16.** $k\left[6x^2-31x+46\right]$

17. $k\left[12x^2-19x+4\right]$ **18.** $k\left[\left(n^2-l^2\right)x^2-2lx+l^2\right]$

19. $k\left[x^2-6x+8\right]$

PRACTICE EXERCISE - 2.13

1. 6 **2.** $k=-1$ or $k=\frac{2}{3}$ **3.** $k=2$ **4.** $k=12$

5. $p=\pm 18$ **6.** $k=\frac{-2}{3}$ **7.** 0 **8.** 4 **9.** $k=7$

10. $k=8$ **11.** $a=\frac{1}{2}, c=5$ **12.** $k=\frac{2}{3}$ or $k=-1$

13. $k=-2$ **14.** $k=\frac{71}{4}$ **15.** $a=-16$ **16.** $k=0$

17. $k=44$ **18.** $k=\frac{3}{2}$ **19.** $k=2$ **20.** $k=0$

21. $k=3$ **22.** $k=\frac{1}{2}$

PRACTICE EXERCISE - 2.14

1. $k=\frac{3}{2}$ **2.** $a=3$ **3.** $k=2$ **4.** $k=-27$ **5.** $k=\pm\frac{8}{3}$

6. $k=4$ **7.** $k=20$ **8.** $k=2$ and $k=3$ **9.** $k=-1872$

10. $k=+3$ **11.** $k=\frac{3}{2},-1$ **12.** $k=-2$ **13.** $k=2$

14. $\frac{-131}{9}$ **15.** $k=\frac{5}{3}$ **16.** 0 **17** $k=9$ **18** $\frac{-16}{9}$

19. $k=\pm 2$ **20.** -8 **21.** $3/4$

PRACTICE EXERCISE 2.16

1. $k\left[x^3-19x+3\right]$ **2.** $k\left[4x^3-20x+19x+15\right]$

3. $k\left(x^3-8\sqrt{3}x^2+51x-30\sqrt{3}\right)$ **4.** $k\,(x^3 - 5x^2 - 6x + 20)$

5. $k\,(x^3 - 6x^2 + 3x + 10)$ **6.** $k\,(x^3 - 4x^2 + 5x - 2)$

7. $k\,(2x^3 + x^2 - 5x + 2)$ **8.** $k\,(3x^3 - 5x^2 - 11x - 3)$

9. $k\,(x^3 - 5x^2 + 12x + 6)$ **10.** $(4x^3 - 24x^2 + 31x + 1)$

11. 5 **12.** $k\,(x^3 - 2x^2 - 7x + 14)$

13. $a = 1 ; b = \pm\sqrt{2}$ **14.** $k\ (x^3 - 5x^2 - 6x + 20)$

15. $k\ (4x^3 + 12x^2 - 2x - 3)$ **16.** $k\left[x^3 - 12x^2 - 18x - 30\right]$

17. $k\left(x^3 - 2\sqrt{5}x^2 - 45x - 90\sqrt{5}\right)$

18. $k = -1$ **19.** $k\left(x^3 - 5x^2 + 3x + 1\right)$

20. $k\left(x^3 + 3x^2 - 5x + 1\right)$ **21.** $k\left[30x^3 - 17x^2 - 3x + 2\right]$

22. $k\left[6x^3 - 19\sqrt{3}x^2 - 35x + 54\sqrt{3}\right]$

23. $k\left(x^3 - 6\sqrt{5}x^2 - 65x + 210\sqrt{5}\right)$

24. $k\ \sqrt{x^3} + 5\sqrt{3}x^2 + 2\sqrt{3}x - 6\sqrt{3}$

— Notes —

CH – 3 – LINEAR EQUATIONS IN TWO VARIABLES

Definition : An Equation of form $ax + by + c = 0$, where $a,b,c \in R$, and x,y are variables is called a linear equation in two variables. The graph of a linear equation is always a straight line.

1. Consistent system : A system of simultaneous linear equations is said to be consistent, if it has atleast one solution.

2.Inconsistent system : A system of simultaneous linear equations is said to be inconsistent, if it has no solution.

3.Dependent Equations : If a system of two linear equations is such that every solution of one of the equations is also a solution of the other, it is called a system of dependent equations.

4.Nature of Solutions : Let us consider two simultaneous equations :
$a_1 x + b_1 y = c_1$ and $a_2 x + b_2 y = c_2$, then.

a. If $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ then system has unique solution and system is consisten (Independent) in this case graph of the equations must be Interest each other. (X)

b. If $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ then system has no solution and system is Inconsistent in this case graph of the equations must be parallel lines. $(=)$

c. If $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$; then system has infinite many solutions and system is consistent (Dependent) in this case graph must be concide or overlaps. $\left(\overset{C}{\bullet}\!\!-\!\!-\!\!-\overset{A}{\bullet}\!\!-\!\!-\!\!-\overset{B}{\bullet}\!\!-\!\!-\!\!-\overset{D}{\bullet}\right)$

d. If the system has non zero solution then; $\frac{a_1}{a_2} = \frac{b_1}{b_2}$

Important Points

Point-1 If a point P (α,β) lies on a given line $ax + by = c$ then this point must satisfy the given equation i.e. $a\alpha + b\beta = c$ must be true.

Point-2 The graph of equation $x = 0$ is the y-axis.

Point-3 The graph of equation $y = 0$ is the x-axis.

Point-4 The graph of $x = a$ (constant) must be a straight line parallel to y-axis and a unit away from y axis

Point-5 The graph of $y = a$ (constant) must be a straight line parallel to the x-axis and a unit away from x axis.

Point-6 If the speed of Boat in still water is xkm/hr and the speed of stream is ykm/hr then the speed of boat.

(i) In down stream = (x + y) km/hr

(ii) In upstream = (x - y) km/hr.

Point-7 In a cyclic quadrilateral the sum of oppsite angles is 180^o.

Point-8 In a parallelogram, the sum of adjacent angles is 180^o.

Point-9 Profit = SP-CP, Profit % $= \frac{\text{Profit}}{CP} \times 100$

Point-10 Loss = C.P - S.P., Loss % $= \frac{\text{Loss}}{CP} \times 100$

Point-11 Simple Interest = P × R × T / 100

Point-12 If P (a,b) be any point then a and b are called abscissa and ordinates of point P.

ROOT : The value of a variable satisfying the equation is called the root of the equation.

Point-13 The point at which a straight line cross the x - axis, its y co-ordinate is zero and when crosses y - axis its x coordinate is zero.

PRACTICE EXERCISE 3.1

Q1. Write the condition for a pair of linear equations : $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ to have a unique solution.

Q2. Write the condition for a pair of linear equations : $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ to have a infinite number of solutions.

Q3. What is the condition for a system of linear equations : $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ to be inconsistent ?

Q4. Write the general form of a system of two simultaneious linear equations in two variables a and y ?

Q5. What is the name given to a syatem of simultaneous linear equations, if it has no solution ?

Q6. What is the minimum number of solutions that a system of simultaneous linear equations must have, if it is a consistent system ?

Q7. What is the maximum number of solutions that a system of simultaneous linear equations can have, if it is a consistent system ?

Q8. On comparing the ratios $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$ and without drawing the graph of the pair of linear equations $x - 4y + 5 = 0$, $2x - 3y + 5 = 0$, show that the lines represented by these equations intersect at a point.

Q9. What is the nature of graph of a system of linear equations which is consistent independent ?

Q10. What is the nature of graph of a system of linear equations which is inconsistent ?

Q11. The path of a train A is given by the equation $3x + 4y - 12 = 0$ and the path of another train B is given by the equation $6x + 8y - 48 = 0$. Represent this situation graphically ?

Q12. Gloria is walking along the path joining (–2, 3) and (2, –2), while Suresh is walking along the path joining (0, 5) and (4, 0). Represent the situation graphically ?

Q13. On comparing the ratios $\frac{a_1}{a_2}, \frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$, and without drawing them, find out whether the lines representing the following pairs of linear equations intersect at a point, are parallel or coincide ?

(i) $5x - 4y + 8 = 0$; $7x + 6y - 9 = 0$

(ii) $9x + 3y + 12 = 0$; $18x + 6y + 24 = 0$

(iii) $6x - 3y + 10 = 0$; $2x - y + 9 = 0$

Q14. Given the linear equation $2x + 3y - 8 = 0$, write another linear equation in two variables such that the geometrical representation of the pair so formed is : **V.V.I**

(i) intersecting lines

(ii) parallel lines

(iii) coincident lines

Q15. The cost of 2kg of apples and 1 kg of grapes on a day was found to be Rs. 160. After a month, the cost of 4kg of apples and 2kg of grapes is Rs. 300. Represent the situation algebraically and geometrically.

Q16. Form the pair of linear equations in the following problems, and find their solution graphically :

(i) 10 students of class X took part in Mathematics quiz. If the number of girls is 4 more than the number of boys, find the number of boys ans girls who took part in the quiz.

(ii) 5 pencils and 7 pens together cost Rs. 50, whereas 7 pencils and 5 pens together cost Rs. 46. Find the cost of pencil and a pens.

Q17. Given the linear equation $2x + 3y - 8 = 0$, write another linear equation in two variables such that geometrical representation of the pair so sormed is

(i) Intersecting lines

(ii) Parallel lines

(iii) Coincident lines

PRACTICE EXERCISE 3.2

Q1. Express y in terms of x, it being given that -2x + y - 7 = 0. Check whether the point (-3,-2) lies on the given line or not by graphical method. **V.V.I**

Q2. Express x in terms of y for the equation -3x + 5y = 11. Find the point where the line represented by the equation-3x + 5y = 11 cuts x-axis.

Q3. If the graph of the equation px - y = 11 passes through the point A(3,4), find the value of 'p'. Draw the graph of the given equation and plot the point A(3,4) on it.**V.V.I**

Q4. Show that (x = 3, y = 1) as well as (x = 4, y = -1) are the solutions of the equation: 2x + y = 7. Find two more solutions. How many solutions can you find? Draw the graph of the equation 2x + y = 7

Q5. Draw the graph of the line x - 2y = 3. From the graph, find the co-ordinates of the point when

(i) x = -5 (ii) y = 0 (iii) x = 0

Also write down the scale of graph.

Q6. Draw the graph of the linear equation 3x - y = 6 and check by plotting the point x = 2, y = 1 whether it lies on the line.

Q7. Determine by drawing graphs, whether the following system of linear equations has a unique solution or not : 2x - 3y = 6, x + y = 1

Q8. Show graphically the system of equation 2x + 4y = 1 and 3x + 6y = 12 has no solution. **V.V.I**

Q9. Show graphically system of equations: x - 2y = 2 and $\frac{1}{2}$x - y = 1 has infinitely many solutions.

Q10. Determine graphically whether the system of equations x - 2y = 2, and 4x - 2y = 5 is consistent (independent or dependent) or inconsistent. **V.V.I**

Q11. Solve the equations by drawing their graphs. Determine whether these are consistent (independent or dependent) or inconsistent: 2x + y - 4 = 0 and -2x + y + 3 = 0.

Q12. Find graphically the vertices of a triangle whose sides have following equations:

2y - x = 8, 5y - x = 14 and y - 2x = 1

Q13. Find graphically the vertices of a triangle whose sides have the follwing equations: y = x, y = 0 and 2x + 3y = 10

Q14. Use a single graph paper and draw the graph of the following equations:

y = x, y = -x and 2x + 3y = 6. Shade the triangle formed by these lines and find the vertices of triangle so formed.

Q15. Draw the graphs of the following equations on same graph paper: 3x - 2y = 6, 3x + y = 15. Find coordinates of the vertices of the triangle formed by the two straight lines and x axis.

Q16. Show graphically that the system of equations : 2x + 4y = 10 ; 3x + 6y = 12, has no solution.

Q17. Show graphically that the system of equations : 3x – y = 2 ; 9x – 3y = 6, has infinitely many solutions.

Q18. Use a single graph paper and draw the graph of the following equations : 2y – x = 8 ; 5y – x = 14, y – 2x = 1.

Q19. Solve the following system of equations graphically : x + 3y = 6 ; 2x – 3y = 12 and hence find the value of a, if 4x + 3y = a.

Q20. Solve the following system of linear equations graphically : 2x – y – 4 = 0 ; x + y + 1 = 0. Find the points where the lines meet y - axis.

Q21. Draw the graphs of 2x + y = 6 and 2x – y + 2 = 0. Shade the region bounded by these lines and x - axis. Find the area of the shaded region.

PRACTICE EXERCISE 3.3

Solve each of the following system of the equations by eliminating x (by substitution method).

Q1. $x + y = 7$
$2x - 3y = 11$

Q2. $x + y = 7$
$2x + 5y = 7$

Q3. $3x - 5y = -1$
$x - y = -1$

Q4. $x + 2y = -1$
$2x - 3y = 12$

Q5. $2x - 7y = 1$
$4x + 3y = 15$

Q6. $2x + 3y = 9$
$3x + 4y = 5$

Q7. $3x - 5y = 1$
$5x + 2y = 19$

Q8. $5x + 8y = 9$
$2x + 3y = 4$

Q9. $7x + 11y - 3 = 0$
$8x + y - 15 = 0$

Q10. $3x - y = 3$
$7x + 2y = 20$

Q11. $3x - y = 3$
$7x + 2y = 20$

Q12. $2x + 7y - 11 = 0$
$3x - y - 5 = 0$

Q13. $2x + y - 17 = 0$
$17x - 11y - 8 = 0$

Q14. $x + y = 7$
$3x - 2y = 11$

Q15. $x + y = 7$
$5x + 12y = 7$

Q16. $7x - 2y = 1$
$3x + 4y = 15$

Q17. $11x + 15y = -23$
$7x - 2y = 20$

Q18. $3x - 7y + 10 = 0$
$y - 2x - 3 = 0$

Q19. $5x + 3y = 70$
$3x - 7y = 60$

Q20. $11x - 8y = 27$
$3x + 5y = -7$ **V.V.I**

Q21. $x - 5y = 11$
$2x + 3y = -4$

Q22. $4x - 3y - 8 = 0$
$6x - y - 29/3 = 0$

Q23. $7x - 8y - 11 = 0$
$8x - 7y - 7 = 0$

Q24. $3x + 5y = 7$
$11x - 13y = 9$

Q25. $3x + 2y = 11/3$
$-7x + 5y = 31/3$

Q26. $2x - y = 11$
$5x + 4y = 1$

Q27. $-6x + 5y = 2$
$-5x + 6y = 9$

Q28. $4x + 7y = 20$
$21x - 13y = 21$

Q29. $2x + 3y = 0$
$3x + 4y = 5$

Q30. $23x - 17y + 11 = 0$
$31x + 13y - 57 = 0$

Q31. $x + y = 7$
$5x + 12y = 7$

Q32. $2x + 3y = 17$
$3x - 2y = 6$

Q33. $2x - y - 3 = 0$
$4x + y - 3 = 0$

Q34. $2x + y - 35 = 0$
$3x + 4y - 65 = 0$

Q35. $ax + by = a - b$
$bx - ay = a + b$

Q36. $x + y = a + b$
$ax - by = a^2 - b^2$

Q37. $x + 2y + 1 = 0$
$2x - 3y - 12 = 0$

Q38. $2x - y = 6$
$x - y = 2$

Q39. $ax + by = a - b$
$bx - ay = a + b$

Q40. $x + ay = b$
$ax - by = c$ **V.V.I**

Q41. $ax + by = a^2$
$bx - ay = b^2$

Q42. $\frac{x}{a} + \frac{y}{b} = 2$
$ax - by = a^2 - b^2$

Q43. $\frac{x}{a} + \frac{y}{b} = a + b$
$\frac{x}{a^2} + \frac{y}{b^2} = 2$

Q44. $mx - ny = m^2 + n^2$
$x + y = 2m$

PRACTICE EXERCISE 3.4

Solve each of the following system of the equations by equating the coefficient method. (or by elimination method)

Q1. $x + y = 7$
$2x - 3y = 11$

Q2. $x + y = 7$
$2x + 5y = 7$

Q3. $3x - 5y = -1$
$x - y = -1$

Q4. $x + 2y = -1$
$2x - 3y = 12$

Q5. $2x - 7y = 1$
$4x + 3y = 15$

Q6. $2x + 3y = 9$
$3x + 4y = 5$

Q7. $3x - 5y = 1$
$5x + 2y = 19$

Q8. $5x + 8y = 9$
$2x + 3y = 4$

Q9. $7x + 11y - 3 = 0$
$8x + y - 15 = 0$

Q10. $3x - y = 3$
$7x + 2y = 20$

Q11. $3x - y = 3$
$7x + 2y = 20$

Q12. $2x + 7y - 11 = 0$
$3x - y - 5 = 0$

Q13. $2x + y - 17 = 0$
$17x - 11y - 8 = 0$

Q14. $x + y = 7$
$3x - 2y = 11$

Q15. $x + y = 7$
$5x + 12y = 7$

Q16. $7x - 2y = 1$
$3x + 4y = 15$

Q17. $11x + 15y = -23$
$7x - 2y = 20$

Q18. $3x - 7y + 10 = 0$
$y - 2x - 3 = 0$

Q19. $5x + 3y = 70$
$3x - 7y = 60$

Q20. $11x - 8y = 27$
$3x + 5y = -7$

Q21. $x - 5y = 11$
$2x + 3y = -4$

Q22. $4x - 3y - 8 = 0$
$6x - y - 29/3 = 0$

Q23. $7x - 8y - 11 = 0$
$8x - 7y - 7 = 0$

Q24. $3x + 5y = 7$
$11x - 13y = 9$

Q25. $3x + 2y = 11/3$
$-7x + 5y = 31/3$

Q26. $2x - y = 11$
$5x + 4y = 1$

Q27. $-6x + 5y = 2$
$-5x + 6y = 9$

Q28. $4x + 7y = 20$
$21x - 13y = 21$

Q29. $2x + 3y = 0$
$3x + 4y = 5$

Q30. $23x - 17y + 11 = 0$
$31x + 13y - 57 = 0$

Q31. $x + y = 7$
$5x + 12y = 7$

Q32. $2x + 3y = 17$
$3x - 2y = 6$

Q33. $2x - y - 3 = 0$
$4x + y - 3 = 0$

Q34. $2x + y - 35 = 0$
$3x + 4y - 65 = 0$

Q35. $ax + by = a - b$
$bx - ay = a + b$

Q36. $x + y = a + b$
$ax - by = a^2 - b^2$

Q37. $x + 2y + 1 = 0$
$2x - 3y - 12 = 0$

Q38. $2x - y = 6$
$x - y = 2$

Q39. $ax + by = a - b$
$bx - ay = a + b$

Q40. $x + ay = b$
$ax - by = c$

Q41. $ax + by = a^2$
$bx - ay = b^2$

Q42. $\frac{x}{a} + \frac{y}{b} = 2$
$ax - by = a^2 - b^2$

Q43. $\frac{x}{a} + \frac{y}{b} = a + b$
$\frac{x}{a^2} + \frac{y}{b^2} = 2$

Q44. $mx - ny = m^2 + n^2$
$x + y = 2m$

PRACTICE EXERCISE 3.5

Solve each of the following system of the equations by equating the coeficient method.

Q1. $2x + 3y = 7$
$6x - 5y = 11$

Q2. $3x - 5y = 20$
$7x + 2y = 17$

Q3. $7x - 2y = 3$
$11x - 3/2y = 8$

Q4. $6x + 5y = 11$
$9x + 10y = 21$

Q5. $4x + 7y = 10$
$10x - 35/2y = 25$

Q6. $4x + 2/3y - 1 = 0$
$6x - y + 2 = 0$

Q7. $5/3x + 3/5y - 1 = 0$
$3/5x - 5/3y + 2 = 0$

Q8. $ax + by - a + b = 0$
$bx - ay - a - b = 0$

Q9. $x + y - (a + b) = 0$
$ax - by - (a^2 - b^2) = 0$

Q10. $\frac{x}{a} - \frac{y}{b} = a - b$
$ax + by = a^3 + b^3$

Q11. $x/a + y/b - 2 = 0$
$ax - by + b^2 - a^2 = 0$

Q12. $x/a + y/b = a + b$
$x/a^2 + y/b^2 = 2$

Q13. $x/a - y/b = 0$
$ax + by = a^2 + b^2$

Q14. $(a - b)x + (a + b)y = a^2 - 2ab - b^2$
$(a + b)(x + y) = a^2 + b^2$

Q15. $ax + by = c$
$bx + ay = 1 + c$

Q16. $x + ay = b$
$ax - by = c$

Q17. $ax + by = a^2$
$bx + ay = b^2$

Q18. $\frac{x}{a} + \frac{y}{b} = 2$
$ax - by = a^2 - b^2$

Q19. $\frac{x}{a} = \frac{y}{b}$
$ax + by = a^2 + b^2$

Q20. $2ax + 3by = a + 2b$
$3ax + 2by = 2a + b$

Q21. $ax + by = \frac{a + b}{2}$
$3x + 5y = 4$

Q22. $5ax + 6by = 28$
$3ax + 4by = 18$

Q23. $(a + 2b)x + (2a - b)y = 2$
$(a - 2b)x + (2a + b)y = 3$

Q24. $(a - b)x + (a + b)y = 2a^2 - 2b^2$
$(a + b)(x + y) = 4ab$

Q25. $a^2x + b^2y = c^2$
$b^2x + a^2y = d^2$

Q26. $x + y = 13$
$2x + 5y = 12$

Q27. $x - 2y = 5$
$2x + 3y = 10$

Q28. $3x + y + 1 = 0$
$2x - 3y + 8 = 0$

Q29. $2x + y - 3 = 0$
$2x - 3y - 7 = 0$

Q30. $x + y = 6$
$x - y = 2$

Q31. $x - 2y = 6$
$3x - 6y = 0$

Q32. $x + y = 4$
$2x - 3y = 3$

Q33. $2x + 3y = 4$
$x - y + 3 = 0$

Q34. $2x - 3y + 13 = 0$
$3x - 2y + 12 = 0$

Q35. $2x + 3y + 5 = 0$
$3x - 2y - 12 = 0$

Q36. $2x + 3y = 6$
$4x + 6y = 12$

Q37. $x - 2y = 5$
$3x - 6y = 15$

Q38. $2x - 3y = -8$
$6x + 5y = 11$

Q39. $x - y = -3$
$2x + y = 11$

PRACTICE EXERCISE 3.6

Q1. Find the value of k for which the following system of linear equations has an infinte number of solutions :

$5x + 2y = k, 2$;

$(k + 1)x + ky = 3k + 4$

Q2. Find the value of k so that the following system of linear equations has an infinite number of solutions :

$(k + 1)x + 2ky = k + 3$;

$(4k + 1)\, x + 12y = 15$

Q3. Find the value of k so that the following system of linear equations has an infinite number of solutions :

$x + (k + 2)y = 4$;

$(2k - 1)\, x + 25y = 6k + 2$

Q4. Find the value of k for which the following system of linear equations has an infinite number of solutions :

$x + (k + 1)y = 5$; $(k + 1)x + 9y = 8k - 1$

Q5. For what values of a and b, the following system of linear equations has an infinite number of solutions.

$3x - y = 14$;

$(a + b)x - 2by = 5a + 2b + 1$

Q6. Find the values of a and b for which the following system of linear equations has an infinite number of solutions :

$2x - 3y = 7$

$(a + b)n - (a + b - 3)y = 4a + b$

Q7. Fow what values of a and b, the following system of linear equations has an infinite number of solutions :

$2x + 3y = 7$; $2ax + (a + b)y = 28$

Q8. For what values of m and n, the following system of linear equations has an infinite number of solutions :

$3x + 4y = 12$;

$(m + n)x + 2\,(m - n)y = 5m - 1.$

Q9. For what values of a and b, the following system of linear equations has an infinite number of solutions :

$2x + 3y = 7$; $(a + b + 1)x +$

$(a + 2b + 2)y = 4(a + b) + 1.$

Q10. Find the value of α for which the following system of linear equations has an infinite number of solutions :

$x + (\alpha + 1)\, y = 4$;

$(\alpha + 1)x + 9y = (5\alpha + 2)$

Q11. For what value of k, the following system of linear equations has no solutions.

$3x + y = 1$; $(2k - 1)x + (k - 1)y = 2k + 1$

Q12. Determine the value of k for which the following system of linear equations has no solutions :

$(3k + 1)x + 3y - 2 = 0$

$(k^2 + 1)x + (k - 2)y - 5 = 0$

Q13. Find the value of k for which the following system of linear equations has no solutions :

$kx + 3y = k - 3$; $12x + ky = k$

Q14. Find the value of k if the following system of equations has no solution.

(i) $3x - 4y + 7 = 0$;
$kx + 3y - 5 = 0$

(ii) $2x - ky + 3 = 0$;
$3x + 2y - 1 = 0$

Q15. Find the valueof k for which the system of equations.

$kx - y = 2$; $6x - 2y = 3$

Q16. For what value of k will the equation $x + 2y + 7 = 0$, $2x + ky + 14 = 0$, represent coincident lines?

Q17. For what value of k, will the following system of equations has infinite many solutons ?

$2x + 3y = 4$; $(k + 2) + 6y = 3k + 2$

Q18. Find the value of p and q for which the following system of equations has infinite solution

$2x + 3y = 7$; $(p + q)x + (2p - q)y = 21$

Q19. For what value of k, will the system of equations

$x + 2y = 5$;

$3x + ky - 15 = 0$

has (i) unique solution (ii) no solution

PRACTICE EXERCISE 3.7

Q.1 For the following systems of equations determine the value of k for which the given system of equations has infinitely many solutions :

(i) $(k - 3)x + 3y = k$

$kx + ky = 12$

(ii) $kx + 3y = k - 3$

$12x + ky = k$

Q.2 For the following systems of equations determine the value of k for which the given system of equations has no solutions :

(i) $3x - 4y + 7 = 0$

$kx + 3y - 5 = 0$

(ii) $2x - ky + 3 = 0$

$3x + 2y - 1 = 0$

Q.3 Find the values of k for which the system of equations $kx - y = 2$; $6x - 2y = 3$

(i) Unique (ii) No solutoin

Q.4 For what value of k will the equations $x + 2y + 7 = 0$, $2x + ky + 14 = 0$ represent coincident lines ?

Q.5 For what value of k will the equations have infinely many solutions ?

$2x + 3y = 4$; $(k + 2)x + 6y = 3k + 2$

Q.6 For what value of k will the linear equations has no solution ?

$3x + y = 1$; $(2k - 1)x + (k - 1)y = 2k + 1$

Q.7 Find the value of k for which the following systems of linear equations has infinite solutions :

$x + (k + 1)y = 5$; $(k + 1)x + 9y = 8k - 1$

Q.8 Find the values of p and q for which the following systems of linear equations has infinite number of solutions :

$2x + 3y = 7$; $(p + q)x + (2p - q)y = 21$

Q.9 For what values of k, will the system of equations $x + 2y = 5$; $3x + ky - 15 = 0$ has

(i) a unique solution ?(ii) no solution

Q.10 Determine the values of m and n so that the following system of linear equations have infinite number of solutions :

$(2m - 1)x + 3y - 5 = 0$

$3x + (n - 1)y - 2 = 0$

Q.11 Determine the values of k so that the following linear equations have no solution :

$(3k + 1)x + 3y - 2 = 0$

$(k^2 + 1)x + (k - 2)y - 5 = 0$

Q.12 Find the value of k for which each of the following system infinite

$2x - 3y = 7$; $(k + 2)x - (2k + 1)y = 3(2k - 1)$

Q.13 Find the value of k for which each of the following system infinite

$2x + 3y = 2$; $(k + 2)x - (2k + 1)y = 2(k - 1)$

Q.14 Find the value of k for which each of the following system infinite

$x + (k + 1)y = 4$; $(k + 1)x + 9y = 5k + 2$

Q.15 Find the value of k for which each of the following system infinite

$kx + 3y = 2k + 1$; $2(k + 1)x + 9y = 7k + 1$

PRACTICE EXERCISE 3.8

Q.1 Find the value of k for which each of the following system has infinite no. of solution:

$2x + (k - 2)y = k$

$6x + (2k - 1)y = 2k + 5$

Q.2 Find the value of k for which each of the following system has infinite no. of solution:

$2x + 3y = 7$

$(k + 1)x + (2k - 1)y = 4k + 1$

Q.3 Find the value of k for which each of the following system has no solution :

$2x + 3y = k$

$(k - 1)x + (k + 2)y = 3k$

Q.4 Find the value of k for which each of the following system has no soluton :

$3x - 4y + 7 = 0$

$kx + 3y - 5 = 0$

Q.5 Find the value of k for which each of the following system no solution :

$2n - ky + 3 = 0$

$3x + 2y - 1 = 0$

Q.6 Find the value of k for which each of the following system no soluton :

$2x + ky = 11$

$5x - 7y = 5$

Q.7 Find the value of k for which each of the following system unique

$cx + 3y = 3$

$12x + cy = 6$

Q.8 Find the value of k for which each of the following system no solution :

$\alpha x + 3y = \alpha - 3$

$12x + \alpha y = \alpha$

Q.9 Proe that there is a value of c $(\neq 6)$ for which the system infinite solution :

$6x + 3y = c - 3$

$12x + cy = c$

Q.10 Obtain the condition for the following system of linear equations to have a unique solution :

$ax + by = c$; $lx + my = n$

Q.11 Determine the values of a and b so that the following system of linear equations have infinitely many solutions :

$(2a - 1)x + 3y - 5 = 0$; $3x + (b - 1)y - 2 = 0$

Q.12 Find the values of a and b for which the following system of linear equations has infinite number of solutions :

$2x - 3y = 7$

$(a + b)x - (a + b - 3)y = 4a + b$

Q.13 Find the values of p and q for which the following system of linear equations has infinite number of solutions :

$2x + 3y = 9$

$(p + q)x + (2p - q)y = 3(p + q + 1)$

Q.14 Find the values of a and b for which the following system of linear equations has infinite number of solutions :

$(2a - 1)x - 3y = 5$; $3x + (b - 2)y = 3$

PRACTICE EXERCISE 3.9

Solve each of the following system of the equations by any method.

Q1. $\sqrt{2}x - \sqrt{3}y = 0$

$\sqrt{5}x + \sqrt{2}y = 0$

Q2. $0.5x + 0.7y = 0.7y$

$0.3x + 0.5y = 0.50$

Q3. $ax + by = a^2$

$bx + ay = b^2$

Q4. $\frac{x}{7} + \frac{y}{3} = 5$

$\frac{x}{2} - \frac{y}{9} = 6$

Q5. $\frac{7-4x}{3} = y$

$2x + 3y = -1$

Q6. $x + \frac{y}{3} = 0.9$

$\frac{11}{x + \frac{y}{2}} = 10$

Q7. $\frac{x+y}{2} - \frac{x-y}{3} = 8$

$\frac{x+y}{3} + \frac{x-y}{3} = 11$

Q8. $\frac{11x-5y}{11} = \frac{3x+y}{3}$

$8x - 5y = 1$

Q9. $\frac{x+1}{2} - 8 = -\frac{(y-1)}{2}$

$\frac{x-1}{3} + \frac{y+1}{2} = 9$

Q10. $37x + 41y = 70$

$41x + 37y = 86$

Q11. $31x + 43y = 117$

$43x + 31y = 105$

Q12. $1.25x + 1.10y = 1246$

$1.10x + 1.25y = 133.9$

Q13. $99x + 101y = 499$

$101x + 99y = 501$

Q14. $(\sqrt{3}+\sqrt{2})x - (\sqrt{2}-\sqrt{5})y = 0$

$(\sqrt{2}-\sqrt{5})x + (\sqrt{3}+\sqrt{2})y = 0$

Q15. $\frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2$

$\frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1$

Q16. $152x - 378y = -74$

$-378x + 152y = -604$

Q17. $x + y = 5xy$

$3x + 2y = 13xy$

Q18. $x + 2y = \frac{3}{2}$

$2x + y = \frac{3}{2}$

Q19. $3x - \frac{y+7}{11} + 2 = 10$

$2y + \frac{x+11}{7} = 10$

Q20. $\sqrt{2}x + \sqrt{3}y = 0$

$\sqrt{3}x - \sqrt{8}y = 0$

Q21. $\frac{x}{10} + \frac{y}{5} + 1 = 15$

$\frac{x}{8} + \frac{y}{6} = 15$

Q22. $\frac{3x}{2} - \frac{5y}{3} = -2$

$\frac{x}{3} + \frac{y}{2} = \frac{13}{6}$

Q23. $\frac{x}{2} + \frac{2y}{3} = -1$

$X - \frac{Y}{3} = 3$

Q24. $x + y = a - b$

$ax - by = a^2 + b^2$

Q25. $0.4x + 0.3y = 1.7$

$0.7x - 0.2y = 0.8$

Q26. $31x + 23y = 39$

$23x + 31y = 15$

Q27. $0.8x + 0.3y = 3.8$

$0.4x - 0.5y = 0.6$

Q28. $mx - ny = m^2 + n^2$

$x - y = 2n$

Q29. $62x + 37y = 13$

$37x + 62y = -112$

Q30. $\frac{x+y}{xy} = 2$

$\frac{x-y}{xy} = 6$

Q31. $ax + by = a - b$

$bx - ay = a + b$

Q32. $x + ay = b$

$ax - by = c$

Q33. $\frac{x}{a} = \frac{y}{b}$

$ax + by = a^2 + b^2$

Q34. $2ax + 3by = a + 2b$

$3ax + 2by = 2a + b$

Q35. $5ax + 6by = 28$

$3ax + 4by = 18$

Q36. $\frac{2}{x} + \frac{3}{y} = 13$

$\frac{5}{x} - \frac{4}{y} = -2$

Q37. $ax + by = \frac{a+b}{2}$

$3x + 5y = 4$

Q38. $x + y = a - b$

$ax - by = a^2 + b^2$

Q39. $x + y = a + b$

$ax - by = a^2 - b^2$

Q40. $\frac{x}{a} + \frac{y}{b} = a + b$

$ax - by = a^2 - b^2$

PRACTICE EXERCISE 3.10 (HOT QUESTIONS)

Q1. Solve following system of equations by cross multiplication method $bn + cy = a + b$.

$$ax\left(\frac{1}{a-b}-\frac{1}{a+b}\right)+cy\left(\frac{1}{b-a}-\frac{1}{b+a}\right)$$

$$=\frac{2a}{a+b}$$

Q2. Solve the follwing system of equations by cross multiplication method.

$$x\left(a-b+\frac{ab}{a-b}\right)=y\left(a+b-\frac{ab}{a+b}\right)$$

Q3. Solve the following system of equations by cross multiplication method.

$$\frac{a^2}{x}-\frac{b^2}{y}=0\ \ \frac{a^2b}{x}+\frac{b^2a}{y}=a+b$$

Q4. Solve the following system equations by cross multiplication method.

$$(a-b)x+(a+b)y=2a^2-2b^2$$

$$(a+b)(x+y)=4ab$$

Q5. Solve the following system of equations by cross multiplication method.

$$a(x+y)+b(x-y)=a^2-ab+b^2$$

$$a(x+y)-b(x-y)=a^2+ab+b^2$$

Q6. Solve the following system of equations by cross multiplication method.

$$ax+by=1,\ bx+ay=\frac{(a+b)^2}{a^2+b^2}-1$$

Q7. Solve the following system of equations by cross multiplication method.

$$x-y+z=4,\ x-2y-2z=9$$

$$2x+y+3z=1$$

Q8. Solve the following system of equations.

$$x-y+z=4$$

$$x+y+z=2$$

$$2x+y-3z=0$$

Q9. It takes 12 hours to fill a swimming pool. Using two pipes if the pipe of larger diameter is used for 4 hours and the pipe of smaller diameter is used for 9 hours, only half of the pool is filled. How long would it takes for each pipe to fill the pool seperately.

Hints : $12\left(\frac{v}{x}\right)+12\left(\frac{v}{y}\right)=v$

and $4\left(\frac{v}{x}\right)+9\left(\frac{v}{y}\right)=\frac{v}{2}$

Q10. Solve for a and b

$$2^a+3^b=17$$

$$2^{a+b}3^{b+1}=5$$

Q11. The fraction $\frac{5x-11}{2x^2+x-6}=\frac{A}{x-2}+\frac{B}{2x+3}$ find the value of A and B.

Q12. Solve for x and y :

$$\frac{7}{3^x}-\frac{6}{2^y}=15$$

$$\frac{8}{3^x}=\frac{9}{2^y}$$

Q13. Solve the x and y :

$$(x+2y)^2+(x+5y)=665$$

Q14. Solve for x and y.

$$\sqrt{x}+y=11$$

$$\sqrt{y}+x=7$$

Q15. An selling a tea set of 5% loss and a lemon set at 15% gain, a shopkeeper gains Rs.84. How ever, if he sells the Tea-set at 5% gain and the lemon-set at 10% gain, he gains Rs.104. Find the price of the Tea-set and that of the leomn-set paid by the shop keeper.

Q16. A Jeweller has bars of 18-carat gold and 12 carat gold. How much of each must be melted together to obtain a bar of 16-carat gold weighing 120 gm (given pure gold is 24 carat).

Hint : $x+y=120: 75\%x+50\%y=200/3\%120$

Q17. It three times the larger of two numbers is divided by the smaller one, we get 4 as the quotient and 3 as the remainder. Also, if seven times the smaller number is divided by the larger one, we get 5 as the quotient and 1 as the remainder. Find the numbers.

PRACTICE EXERCISE 3.11

Q1. 2 auido cassettes and 3 video cassettes cost Rs. 340 and 3 audio cassettes and 2 video cassettes cost Rs. 260. What are the price of an audio cassette and of a video cassette.

Q2. From Delhi station if we buy 2 tickets to station A and 3 tickets to station B, the total cost is Rs. 77, but if we buy 3 tickets to station A and 5 tickets to station B, the total cost is Rs 124. What are the fares from Delhi to station A and to station B.

Q3. A and B each have certain number of oranges. A says to B "if you give me 10 of your oranges left with you, B replies. If you give me 10 of your oranges. I will have twice the number of oranges, I will have the same number of oranges as left with you" find the number of oranges with A and B seperately.

Ans: 70 and 50

Q4. 2 chairs and 2 tables cost Rs 700 and 5 chairs and 3 tables cost Rs. 1100. What is the total cost of one chair and one table ?

Q5. The sum of the prices of an almirah and a table is Rs 2340 and the difference of their prices is Rs. 140. Find the price of each.

Q6. One says, "give me a hundered, friend ! I shall then become twice as rich as you." The other replies, "If you give me ten, I shall be six times as rich as you." Tell me what is the amount of their respective capital.

Ans. Rs.40, Rs.170

Q7. A bag contains 94 coins of 50-P and 25-P denominations. If the total worth of these coins be Rs. 29.75, find the number of coins of each kind.

Q8. A leading library has a fixed charge for the first three days and an additional charge for each day thereafter. Shruti paid Rs.27 for a book kept for seven days, while Susy paid Rs.21 for the book she kept for 5 days. Find the fixed charge and the charge for each extra day. **Ans.**Rs.15, Rs.3

Q9. 5 kg sugar and 7 kg rice together cost Rs. 258, while 7 kg sugar and 5 kg rice together cost Rs. 246, how much 8 kg sugar and 10 kg rice cost together.

Q10. The Taxy charges in a city comprise for a fixed charge together with the charge for the distance covered for a journey of 10 km the charge paid is Rs.75 and for a journey of 15 km the charge paid is Rs.110. What will be person have to pay for travelling a distance of 25 km. **Ans.** Rs.180

Q11. From New Delhi, if we buy 2 tickets to Jaipur and 3 tickets to Jhansi, the total cost is Rs. 725. But, if we buy 3 tickets to Jaipur and 5 tickets to Jhansi, the total cost is the Rs. 1170. What are the fares from New Delhi to Jaipur and to Jhansi.

Q12. A railway half - ticket costs half the full fare but the reservation charges are the same on a half - tickets as on a full tickets. One reserved first class ticket from station A to B costs Rs. 2125. Also, one reserved first class ticket and one reserved half first class ticket from A to B costs Rs. 3200. Find the full fare station A to B and also the reservation charges for a ticket.

Q13. A part of monthly hostel charges in a college are fixed and the remaining depend on the number of days one has taken food in the mess. When a student A takes food for 20 days, he has to pay Rs.1000 as hostal charges whereas a student B, who takes food for 26 days, pays Rs.1180 as hostel charges. Find the fixed charge and the cost of food per day.

Ans. Rs.400, Rs.30

Q14. A man starts his job with a certain monthly salary and earns a fixed increment every year. If his salary was Rs. 4500 after 4 years of service and Rs. 5400 after 10 years of services, what was his starting salary and what is the annual increment.

Q15. A lady has 25-P and 50-P coins in her purse. If in all she has 40 coins totalling Rs. 12.50, find the number of coins of each type she has.

Q16. A man has only 20-P and 25-P coins in his purse. If he has 50 coins in all totalling Rs. 11.25, how many coins of each kind does he has.

Q17. A farmer sold a calf and a cow for Rs. 760, thereby, making a profit of 25% on the calf and 10% on the cow. By selling them for Rs 767.50, he would have realised a profit of 10% on the calf and 25% on the cow. Find the cost of each.

PRACTICE EXERCISE 3.12

Q1. Five years ago, A was thrice as old as B and 10 years later A shall be twice as old as B. What are the present ages of A and B.

Q2. One year ago a man was four times as old as his son. After 6 years, his age exceeds twice his son's age by 9 years. Find their present ages.

Q3. I am three times as old as my son. Five years later I shall be two and-a half times as old as my son. How old am I and how old my son.

Q4. A man has 5 sons, the sum of the ages of the 5 sons being equal to the age of the father. In 12 years time the sum of ages of the sons will be double that of their father. What is the father's age now.

Q5. The age of the father is 3 years more than three times the age of the son. Three years hence, father's age will be 10 years more than twice the age of the son. Determine their present ages. **CBSE 1994**

Q6. 10 years ago the age of a father was four times that of his son. 5 years ago the age of father was three times that of the sun. Find the present ages of father and the son. **CBSE 1994**

Q7. The age of father is 4 times the age of his son. 5 years hence the age of father will be three times the age of his son. Find their present ages.

Q8. A year ago, the father was 8 times as old as his son. Now his age is the square of his son's age. Find their present ages.

Q9. Six years hence a man's age will be three times his son's age and three years ago he was nine times as old as his son. Find their present ages. **CBSE 1993**

Q10. 10 years ago father was 12 times as old as his son and 10 years hence he will be twice as old as his son. Find their present ages.

Q11. Five years hence a man's age will be three times his son's age and five years ago he was seven times as old as his son. Find their present ages. **CBSE 1996**

Q12. One year ago a man was four times as old as his son. After 6 years his age exceeds twice his son's age by 9 years. Find their present ages.

Q13. A father is three times as old as his son. After 12 years, he will be twice as old as his son. Find their present ages.

Q14. If twice the son's age in years is added to the age of his father, the sum is 90. if twice the Father's age in years is added to the age of the son. The sum is 120. Find their ages.

Q15. Ram is three times as old as Rahim. Five years later, Ram will be two - and - a - half times as old as Rahim. Find their present ages.

Q16. Five years ago Neeta was thrice as old as Geeta. Ten years later, Neeta will be twice as old as Geeta. Find their present ages.

Q17. Three times the age of my father added to seven times the age of my sister is 183 years. Six times the difference between their ages added to 9 years is three times the sum of their ages. Determine their present age.

Q18. The present age at a father is 3 years more than three times the age of his son. Three years later father's age will be 10 years more than twice the age of mission. Find their present ages.

Q19. The sum of the present ages of father and his daughter is 60 years and difference of twice the ages of father before 5 years and the age of daughter after 5 years is 60 years. Find their present ages.

PRACTICE EXERCISE 3.13

Q1. A fraction becomes 4/5 if 1 is added to both numerator and denominator. If however 5 is subtracted from both numerator and denominator, the fraction becomes 1/2. Whatis the fraction.

CBSE 1993

Q2. If we add 1 to the numerator and subtract 1 from the denominator a fraction becomes 1. It also becomes 1/2 if we only add 1 to the denominator. What is the fraction.

Q3. A fraction is such that if the numerator is multiplied by 2 and the denominator is increased by 2, we get 5/4 but if the numerator is increased by 1 and the denominator is doubled, we get 1/2. Find the fraction.

Q4. A fraction is such that if the numerator is multiplied by 3 and the denominator is reduced by 3, we get $\frac{8}{2}$; but if the numerator is increased by 8 and the denominator is doubled, we get $\frac{2}{5}$, Find the fraction.

Q5. A fraction becomes 1/3 if 1 is subtracted from its numerator as well as from its denominator. If 1 is added to both the numerator and the denominator it becomes 1/2. Find the fraction.

Q6. The denominator of a fraction is greater than its numerator by 11. If 8 is added to both its numerator and denominator it becomes 3/4. Find the fraction.

Q7. If the numerator of the fraction is multiplied by 2 and its denominator is increased by 2, it becomes 6/7 if instead we multiply the denominator by 2 and increases the numberator by 2 it reduces to 1/2 what is fraction.

Q8. The denominator of a fraction is 4 more than twice the numerator. When both the numerator an enominator are decreased by 6, then the denominator become 12 times the numerator, determine the fraction.

Q9. The numerator of a fraction is 4 less than the denominator. If the numerator is decreased by 2 and denominator is increased by 1, then the denominator is eight times the numerator. Find the fraction.

Q10. A fraction become $\frac{9}{11}$ if 2 is added to both numerator and the denominator. If 3 is added to both the numerator and the deonominator is becomes $\frac{5}{6}$. Find the fraction.

Q11. If the numerator of a fraction is multiplied by 2 and the denominator is reduced by 5. The fraction becomes $\frac{6}{5}$. And, if the denominator is doubled and the numerator is increased by 8, the fraction becomes $\frac{2}{5}$. Find the fraction.

Q12. When 3 is added to the denominator and 2 is subtract from the numerator a fraction becomes $\frac{1}{4}$. And, when 6 is added to numerator and the denominator is multiplied by 3, it becomes $\frac{2}{3}$. Find the fraction.

Q13. The sum of a numerator and denominator of a fraction is 18. If the denominator is increased by 2, the fraction reduces to $\frac{1}{3}$. Find the fraction .

Q14. If 2 is added to the numerator of a fraction, it reduces to $\frac{1}{2}$ and if 1 is subtracted from the denominator, it reduces to $\frac{1}{3}$. Find the fraction.

Q15. The sum of the numerator and denominator of a fraction is 4 more than twice the numerator. If the numerator and denominator are increased by 3, they are in the ratio 2 : 3. Determinator the fraction.

Q16. The sum of the numerator and denominator of a fraction is 3 less than twice the denominator. If the numerator and denominator are decreased by 1, the numerator becomes half the denominator. Determine the fraction.

Q17. The sum of the numerator and denominator of a fraction is 12. If the denominator is increased by 3, the fraction becomes $\frac{1}{2}$. Find the fraction.

PRACTICE EXERCISE 3.14

Q1. Seven times a two-digit number is equal to four times the number obtained by reversing the order of digits. If the difference between the digits is 3, find the number.

Q2. The sum of a two digit number and the number obtained by reversing the order of its digits is 121, and two digits differ by 3. Find the number.

Q3. The sum of the digits of a two digit number is 8. The number obtained by interchanging the two digits exceeds the given number by 36. Find the number.

Q4. A two-digit number is obtained by either multiplying sum of the digits by 8 and adding 1 or by multiplying the difference of the digits by 13 and adding 2. Find the no.

Q5. The sum of a two - digit number and the number obtained by interchaning the digits of the number is 110. The digits of the number differ by 6. How many such numbers are there ? Find them.

Q6. The sum of the digits of a two digit number is 9. The number obtained by reversing the order of digits of the given number exceeds the given number by 27. Find the given number.

Q7. The sum of a two digit number and the number formed by interchaning the digits is 132. If 2 is added to the number, the new number becomes 5 times the sum of the digits. Find the number.

Q8. The sum of two numbers is 8. If their sum is four times their difference, find the numbers.

Q9. There are two numbers. Four times of the first exceeds by 2 from seven times the second. Sum of two times of the first and three times of the second is 92. Find the numbers.

Q10. Sum of two numbers is 35 and their difference is 13. Find the numbers.

Q11. If three times the larger of the two numbers is divided by the smaller one, we get 4 as quotient and 3 as the remainder. Also, if seven times the smaller number is divided by the larger one, we get 5 as quotient and 1 as remainder. Find the numbers.

Q12. The sum of two numbers is 1000 and the difference between their squares is 256000. Find the numbers.

Q13. The sum of two numbers is 8 and the sum of their reciprocals is $8/15$. Find the numbers.

Q14. The difference of two numbers is 4 and the difference of their reciprocals is $4/21$. Find the numbers.

Q15. Find two numbers such that the sum of twice the first and thrice the second is 92, and four times the first exceeds seven times the second by 2.

Q16. If 45 subtacted from the twice the greater of two numbers, it results in the other numbers. If 21 is subtracted from twice the smaller number, it results in the greater number. Find the numbers.

Q17. If 2 is aded to each of two given numbers, their ratio becomes 1 : 2. However, if 4 is subtracted from each of the given numbers, the ratio becomes 5 : 11. Find the numbers.

Q18. In a two digit number, the unit's digit is twice the then's digit. If 27 is added to the number, the digits interchange their places. Find the number.

Q19. In a two digit number, the Ten's digit is three times the unit's digit. When the numerator is decreased by 54, the digits are reversed. Find the number.

Q20. The sum of a two digit number and the number formed by interchanging its digits is 110. If 10 is subtracted from the first number, the new number is 4 more than 5 times the sum of the digits in the first number. Find the first number.

Q21. A two digit number is 4 times the sum of its digits and twice the product of the digits. Find the number.

PRACTICE EXERCISE 3.15

Q1. The largest angle of a triangle is twice the sum of the other two, the smallest is one-forth of the largest. Find the angles in degrees.

Q2. In a ΔABC, $\angle A = x^o$, $\angle B = (3x - 2)^o$, $\angle C = y^o$. Also $\angle C - \angle B = 9^o$. Find the three angles.

Q3. In ΔABC, $\angle C = 3\angle B = 2(A + B)$, find the three angles.

Q4. In a cyclic quadrilateral ABCD $\angle A = (2x + 4)^o$, $\angle B = (y + 3)^o$, $\angle C = (2y + 10)^o$, $\angle D = (4x - 5)^o$, find the four angles.

Q5. Find the angle of a cyclic quadrilateral ABCD in which $\angle A = (2x - 1)^o$, $\angle B = (y + 5)^o$, $\angle C = (2y + 15)^o$ and $\angle D = (4x - 7)^o$.

Q6. The area of a rectangle gets reduced 9 square units, if its length is reduced by 5 units and the breath is increased by 3 units. If we increase the length by 3 units and the breath by 2 units, then the area is increased by 67 square units. Find the length and the breath of the rectangle.

Q7. In a rectangle the length is increased and the breath is reduced by 2 units each, the area is reduced by 28 square units, if the length is reduced by 1 units, and breath increased by 2 units, the area increases by 33 square units. Find the dimensions of the rectangle.

Q8. Find the four angles of a cyclic quadrilateral. ABCD in which $(A = (2x-1)^0$, $B = (y+5)^0$, $\angle C = (2y+10)^0$ and $\angle D = (4x-7)^0$.

Q9. In a triangle, the sum of the two angles is equal to the third, if the difference between them is 50, determine the angles.

Q10. An obtuse angle of a parallelogram is twice its actue angle. Find the measure of each angle of the parallelogram.

Q11. The area of a rectangle remains the same. If the length is increased by 7m and the bradth is decreased by 3m. The area remains unaffected if the length is decreased by 7 m and breadth is increased by 5m. Find the dimensions of the rectangle.

Q12. In a rectangle, if the length is increased by 3m and breadth is decreased by 4m, the area of a rectangle is reduced by 67 m^2. If the length is reduced by 1m and breadth is increased by 4m, the area is increased by 89 m^2. Find the dimensions of the rectangle.

Q13. Halt the perimeter of a garden, whose length is 4 more than its width is 36m. Find the dimensions of the garden.

Q14. The larger of two supplementary angles exceeds the smaller by 18^0, find them.

Q15. In ΔABC, $\angle A = x^0$, $\angle B = 3x^0$ and $\angle C = y^0$. If $3y - 5x = 30$, prove that the triangle is right angles.

Q16. The area of a rectangle gets reduced by $8m^2$, when its length is reduced by 5 m and its breadth is increased by 2m. If we increase the length by 3 m and breadth by 2m, the area is increased by $74m^2$. Find the length and breadth of the rectangle.

Q17. Find the four angles of a cyclic quadrilateral ABCD n which $\angle A = (x + y + 10)^0$, $\angle B = (y + 20)^0$, $\angle C = (x + y - 30)^0$ and $\angle D = (x + y)^0$.

Q18. The length of a room exceeds its breadth by 3m. If the length is increased by 3m and breadth is decreased by 2m, the area remains the same. Find the length and the breadth of the room.

Q19. If the length of a rectangle is reduced by 5 units and its breadth is increased by 2 units. The queral rectangle is reduced by 80 square units. How ever, if we increase its length by 10 units and decrease be breadth by 5 units, its area is increased by 50 square units. Find the length and breadth of the rectangle.

Q20. The area of a rectangle gets reduced by 6 square units, if the length of the rectangle is reduced by 2 units and its breadth is increased by 1 unit. However, if we increase the length by 3 units and reduce the breadth by 1 unit, the area is increased by 9 square units. Find the perimeter of the given rectangle.

PRACTICE EXERCISE 3.16

Q1. A boat goes 30km upstream and 44km downstream in 10 hours. In 13 hours, it can go 40 km upstream and 55 km downstream. Find the speed of the stream and that of the boat in still water.

Q2. Anuj travels 600 km to his home, partly by train and partly by car. He takes 8 hours when he travels 120 km by train and the rest by car. He takes 20 minutes longer if he travels 200 km by train and rest by car. Find the speed of the train and the car.

Q3. A boat goes 12 km upstream and 40 km down stream in 8 hours. It can go 16 km upstream and 32 km down stream in the same times, find the speed of the boat in still water and the speed of the stream.

Q4. A boat covers 32 km upstream and 36 km dwonstream in 7 hours. Also, it covers 40 km upstream and 48 km downstream in 9 hours. Find the speed of the boat in still water and that of the stream.

Q5. A man walks a certain distance at a certain rate. Had he walked 1/2 km per hour faster, he would have taken 1 hours less. But, if he had gone 1 km an hour slower, he would have taken 3 hours longer. Find the distance coverred by the man and his original rate of walking.

Q6. A person can row down stream 20 km in 2 hours and up stream 4 km in 2 hours. Find man's speed of rowing in still water and the speed of the current.

Q7. A person can row 8km upstream and 24 km down stream in 4 hours. He can row 12 km down stream and 12 km upstream in 4 hours. Find the speed of the person in still water as also the speed of the current.

Q8. A sailor goes 8 km downstream in 40 minutes and returns back to the straling point in 1 hours. Find the speed of the sailor in still water and the speed of the current.

Q9. Points A and B are 90 km apart from each other on a highway. A car starts from A and another from B at the same time. If they go in the same direction they meet in 9 hours and if they go in opposite direction they meet in $9/7$ hurs. Find their speeds.

Q10. A man travels 370 km partly by train and partly by car. If he covers 250 km by train and the rest by car, it takes 4 hours. But, if he travels 130 km by train and the rest by car, he takes 18 minutes longer. Find the speed of the train and that of the car.

Q11. X takes 3 hours more than y to walk 30 km. But, if x double his pace, he is ahead of y by $3/2$ hours. Find their speed of walking.

Q12. A train covered a certain distance at a uniform speed. If the train would have been 6km/hr faster, it would have taken 4 hours less than the scheduled time. And, if the train were slower by 6 km/hr, it would have taken 6 hours more than the scheduled time. Find the length of the journey.

Q13. Places A and B are 80 km apart from eachother on a highway. A car starts from A and other from B at the same time. If they more in the same direction, they meet in 8 hours and if they move in opposite direction, they meet in 1 hours and 20 minutes. Find the speeds of the cars.

Q14. Places P_1 and P_2 are 250km apart from each other on a national highway. A car starts from P_1 and another from P_2 at the same time. If they go in the same direction they they meet in 5 hours and if they go in opposite directions they meet in $25/13$ hours. Find their speeds.

Q15. A person can row 18 km down stream and 12 km upstream in 3 hours. Also he can row 36 km down stream and 40 km upstream in 8 hours. Find the speed of the person in still water and also the speed of the water current by making a pair of equations for the problems.

Q16. A boat goes 24 km upstream and 28 km down stream in 6 hr. It goes 30 km upstream and 21 km downstream in 6.5 hrs. Find the speed of the boat in still water and also speed of the stream.

PRACTICE EXERCISE 3.17 (MISCELLANEOUS)

Q1. The average score of boys in an examination of a school is 71 and that of the girls in 73. The average score of the school in that examination is 71.8. Find the ratio of the number of boys to the number of girls appeared in the examination.

Q2. A dealer sold a VCR and a TV for Rs. 25820 making a profit of 10% on VCR and 15% on TV. By sellling them for Rs. 25930, he would have realised a profit of 15% on VCR and 10% on TV. Find the cost price of each.

Q3. Divide 50 into two parts so that the sum of their reciprocals is 1/12.

Q4. Reena has pens and pencils which together are 40 in number. If she had 5 more pencils and 5 less pens, the number of pencils would have become 4 times the number of pens. Find the number of pens and pencils with Reena.

Q5. A man when asked how many hens and buffaloes, he has told that his animals have 120 eyes and 180 legs. How many hens and buffaloes he has.

Q6. 2 men and 5 boys together can finish a piece of work in 4 days, while 3 men and 6 boys can finished it in 3 days. Find the time taken by one man alone to finish the work and that taken by one boy alone to finish the work.

Q7. The ages of A and B are in the ratio 9:4. Seven Years hence, the ratio of their ages will be 5:3. Find their ages.

Q8. A says to B, " I am three times as old as you were, when I was as old as you are". The sum of their Present ages is 64 years. Find their ages.

Q9. A man gave Rs.1200 on loan. Some amount is given at a simple interest of 4% per annum and remaining at 5% per annum Interest. If after two years he got Rs.110 as interest, then find the amounts given at 4% and 5% Interest seperately.

Q10. Students of a class are made to stand in row. If 4 students are extra in a row, there would be 2 rows less. If 4 students are less in a row, there would be 4 more rows. Find the number of students in the class.

Q11. A man want to the Reserve Bank of India with Rs. 1000. He asked the cashier to give him Rs. 5 and Rs. 10 notes only in return. The man get 175 notes in all. Find how many notes of Rs. 5 and Rs. 10 did he receive.

Q12. 90% and 97% pure acid solutions are mixed to obtain 21 litres of 95% pure acid solution. Find the amount of each type of acid to be mixed to form the mixture.

Q13. Ratio of present age of Prakash and his daughter is 3 : 1. After 5 years this ratio will change to 7 : 3, find their present ages.

Q14. In an auditorium, the number of rows of seats is the same as number of seats in a row. If the number of rows is doubled and the number of seats in a raw is reduced by 10, the total number of seats in the auditorium increases by 300. Find the number of rows in the auditorium.

Q15. A taxi charges in a city comprise of a fixed charge together with the charge for the distance covered. For a journey of 10 km, charges paid is Rs. 75 and for a journey of 15 km, the charge paid is Rs. 110. What will a person have to pay for travelling a distance of 25 km.

Q16. The combined distance from sun to Jupiter and for sun to saturn is 1396 million km. 59 turn is 423 million km father for the sun that jupiter. Find the distance from the sun to each planet.

SELF EVALUATION TEST SERIES

M.M : 30 **M.T: 60 min.**

T E S T - 1

Q1. Solve the following system of equations :
$23x + 31y = 7$; $31x + 23y = 47$ **1**

Q2. For what value of 'k' the following system of equations will have infinite number of solutions : **1**
$(k - 1)x + ky = k + 1$; $2kx + (k + 6)y = 4k$

Q3. A man's age is three times the sum of the ages of his two sons. After 5 years, his age will be twice the sum of the ages of his two sons. Find the age of the man. **2**

Q4. Solve graphically $2x + 3y = 12$, $x - y = 1$ shade the region between two lines and x - axis. **3**

Q5. Solve the following system of equations by cross multiplication method : **3**
$ax + by = (a - b)$; $bx - ay = (a + b)$

Q6. Solve the following system of equations :
$0.5x + 0.8y = 0.4$; $0.8x + 0.6y = 0.5$ **3**

Q7. Show that the system of equations : **6**
$x - 8y = 70$; $3x - 7y = 57$, has a unique solution and hence solve the given system.

Q8. The sum of a two digit number and the number obtained by reversing the order of its digit is 99. if the digits differ by 3, find the number. **6**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

M.M : 30 **M.T: 60 min.**

T E S T - 2

Q1. If $3x + 7y = 14$, express y in terms of x check whether (3, -2) is a point on the given line. **1**

Q2. Draw the graph of $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. calculate the area bounded by these lines and x-axis. **1**

Q3. A and B are friends and their ages differ by 2 years. A's father D is twice as old as A and B is twice as old as his sister C. The age of D and C differ by 40 years. Find the ages of A and B. **2**

Q4. Solve the following equations by :
$ax + by = a - b$; $bx - ay = a + b$ **3**

Q5. Draw the graphs of the following equations on the same graph paper : $2x + 3y = 12$; $x - y = 1$. Find the co-ordinates of the vertices of the traingle formed by the two straight lines and the y-axis. **3**

Q6. Solve the following system of equation :

$$4x + \frac{6}{y} = 15 \; ; \; 3x - \frac{4}{y} = 7, y \neq 0$$ **3**

Q7. The present age of a father is three years more than three times the age of the son. Three years hence father's age will be 10 years more than twice the age of the son. Determine their present age. **6**

Q8. Points A and B 90 km apart from each other on a highway. A car starts from A and another from B at the same time. If they go in the same direction they meet in 9 hours and if they go in opposited direction they meet in 9/7 hours. Find their speeds. **6**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

SELF EVALUATION TEST SERIES

M.M : 30 **M.T: 60 min.**

T E S T - 3

Q1. Solve the following system of equation in x and y : $\sqrt{2}x - \sqrt{3}y = 0$; $\sqrt{5}x + \sqrt{2}y = 0$ **1**

Q2. In a two digit number, the unit's digit is twice the ten's digit. If 27 is added to the number, the digits interchange their places. Find the number. **1**

Q3. Solve for u and v : 3 (2u + v) = 7uv ; 3 (u + 3v) = 11 uv. **2**

Q4. Solve the following system of linear equations graphically : 3x + y - 11 = 0 ; x - y - 1 = 0, shade the region bounded by these lines and y axis. Also, find the area of the region bounded by these lines and y-axis. **3**

Q5. Ved travels 600 km to his home partely by train and partly by car. He takes 8 hours if he travels 120 km by train and rest by car. He takes 20 minuts longer if he travels 200 km by train and the rest by car. Find the speed of the train and the car. **3**

Q6. Determine graphically the coordinates of the vertices of a Δ, the equations of whose sides are : y = x ; y = 2x and y + x = 6. **3**

Q7. The sum of the numerator and denominator of a fraction is 3 less than twice the denominator. If the numerator and denominator are decreased by 1, the numerator becomes half the denominator. Determine the fraction. **6**

Q8. A person distributes a sum of money among some beggars. If there had been 6 beggars more, each would have received a rupees less, but if there had been 4 beggars less each would have received Rs. 1 more. Find the number of beggars. **6**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.(%)	Grade
Marks											

M.M : 30 **M.T: 60 min.**

T E S T - 4

Q1. Solve $\frac{6}{x+y} = \frac{7}{x-y} + 3, \frac{1}{2(x+y)} = \frac{1}{3(x-y)}$ **1**

Q.2 Solve : 9x + 101y = 499 ; 101x + 99y = 501. **1**

Q.3 Solve by the method of cross multiplication

$ax + by = \frac{a+b}{2}$, 3x + 5y = 4 **2**

Q.4 Daw the graphs of the equations :
2x - 3y + 6 = 0, 2x + 3y - 18 = 0, y - 2 = 0 **3**

Q.5 The sum of a two digit number and the number obtained by reversing the order of its digits is 121 and 2 digits differ by 3. Find the number. **3**

Q.6 If twice the son's age is added to the father's age, the sum is 70 years. But if twice the father's age added to the son's age, the sum is 95. Find the ages of father and son. **3**

Q.7 8 men and 12 boys can finish a piece of work in 10 days while 6 men and 8 boys can finish it in 14 days. Find the time taken by one man alone and that by one boy alone to finish the work. **6**

Q.8 2 men and 7 boys can do a piece of work in 4 days. It is done by 4 men and 4 boys in 3 days. How long would it take one man or one boy to do it ? **6**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.(%)	Grade
Marks											

ANSWERS

Exercise - 3.1

1. $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ **2.** $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

3. $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

4. $(a_1x + b_1y + c_1 = 0)$ &
$(a_2x + b_2y + c_2 = 0)$

5. Inconsistent System **6.** 1

7. Infinite solution **10.** A pair of parallel lines.

13. (i) Intersecting lines (ii) Coincident lines
(iii) Parallel lines

14. (i) $x + 2y - 4 = 0$ (ii) $4x + 6y - 12 = 0$
(iii) $4x + 6y - 16 = 0$

15. $2x + y = 160,\ 4x + 2y = 300$

16. (i) Girls = 7, Boys = 3 (ii) Pencils Rs.3, Pen Rs.5

17. (i) $3x + 2y - 6 = 0$ (ii) $4x + 6y = 15$
(iii) $4x + 4y = 16$

Exercise - 3.2

1. y = 2x + 7, NO **2.** $x = \frac{5y - 11}{3}; \left(\frac{-11}{3}, 0\right)$

3. p = 5 **4.** (1,5); (2,3) infinitely

5. i. y = -4 ii. x = 3 iii. y = -3/2 iv. x = 7 **6.** No

7. Unique solution **10.** Consistent

11. Consistent **12.** A(1,3): B(2,5): C(-4,2)

13. (0,0), (2,2), (5,0) **14.** A(0,0), B(-6,6), C(1.2,1.2)

15. (4,3), (2,0), (5,0) **18.** $(-4, 2)(1, 3)(2, 5)$

19. n = 6, y = 0, a = 24 **20.** $x = 11,\ y = -2\ \ (0, -4)(0, -1)$

21. 85 square unit.

Exercise - 3.3

1. $x = \frac{32}{5}, y = \frac{3}{5}$ **2.** x = -4, y = 1 **3.** x = -2, y = 1

4. x = 3, y = -2 **5.** $x = \frac{57}{17}, y = \frac{13}{17}$ **6.** x =21, y = 17

7. $x = \frac{97}{31}, y = \frac{52}{31}$ **8.** $x = 5, y = -2$ **9.** $x = 5, y = -2$

10. $x = 2, y = -1$ **11.** $x = 5, y = 7$ **12.** $x = 2, y = 1$

13. $x = 5, y = 7$ **14.** $x = 5, y = 2$ **15.** $x = 11, y = -4$

16. $x = 1, y = 3$ **17.** $x = 2, y = -3$ **18.** $x = -1, y = 1$

19. $x = \frac{335}{22}, y = \frac{-45}{22}$ **20.** $x = 1, y = -2$ **21.** $x = 1, y = -2$

22. $x = \frac{3}{2}, y = \frac{-2}{3}$ **23.** $x = \frac{-7}{5}, y = \frac{13}{5}$ **24.** $x = \frac{68}{47}, y = \frac{25}{47}$

25. $x = \frac{-7}{87}, y = \frac{170}{87}$ **26.** $x = \frac{45}{13}, y = \frac{-53}{13}$ **27.** $x = 3, y = 4$

28. $x = \frac{407}{199}, y = \frac{336}{199}$ **29.** $x = 15, y = -10$ **30.** $x = 1, y = 2$

31. $x = 11, y = -4$ **32.** $x = 4, y = 3$ **33.** $x = 1, y = -1$

34. $x = 15, y = 3$ **35.** $x = 1, y = -1$ **36.** $x = a, y = b$

37. $x = 3, y = -2$ **38.** $x = 4, y = 2$ **39.** $x = 1, y = -1$

40. $u = \frac{ac + b^2}{a^2 + b}, y = \frac{ab - c}{a^2 + b}$ **41.** $x = \frac{a^2 + ab + b^2}{a + b}, y = \frac{-ab}{a + b}$

42. $x = a, y = b$ **43.** $x = a^2, y = b^2$ **44.** $x = m + n, y = m - 1$

Exercise - 3.4

1. $x = \frac{32}{5}, y = \frac{3}{5}$ **2.** $x = -4, y = 1$ **3.** $x = -2, y = 1$

4. $x = 3, y = -2$ **5.** $x = \frac{57}{17}, y = \frac{13}{17}$ **6.** $x = 21, y = 17$

7. $x = \frac{97}{31}, y = \frac{52}{31}$ **8.** $x = 5, y = -2$ **9.** $x = 5, y = -2$

10. $x = 2, y = -1$ **11.** $x = 5, y = 7$ **12.** $x = 2, y = 1$

13. $x = 5, y = 7$ **14.** $x = 5, y = 2$ **15.** $x = 11, y = -4$

16. $x = 1, y = 3$ **17.** $x = 2, y = -3$ **18.** $x = -1, y = 1$

19. $x = \frac{335}{22}, y = \frac{-45}{22}$ **20.** $x = 1, y = -2$ **21.** $x = 1, y = -2$

22. $x = \frac{3}{2}, y = \frac{-2}{3}$ **23.** $x = \frac{-7}{5}, y = \frac{13}{5}$ **24.** $x = \frac{68}{47}, y = \frac{25}{47}$

25. $x = \frac{-7}{87}, y = \frac{170}{87}$ **26.** $x = \frac{45}{13}, y = \frac{-53}{13}$ **27.** $x = 3, y = 4$

28. $x = \frac{407}{199}, y = \frac{336}{199}$ **29.** $x = 15, y = -10$ **30.** $x = 1, y = 2$

31. $x = 11, y = -4$ **32.** $x = 4, y = 3$ **33.** $x = 1, y = -1$

34. $x = 15, y = 3$ **35.** $x = 1, y = -1$ **36.** $x = a, y = b$

37. $x = 3, y = -2$ **38.** $x = 4, y = 2$ **39.** $x = 1, y = -1$

40. $u = \frac{ac + b^2}{a^2 + b}, y = \frac{ab - c}{a^2 + b}$ **41.** $x = \frac{a^2 + ab + b^2}{a + b}, y = \frac{-ab}{a + b}$

42. $x = a, y = b$ **43.** $x = a^2, y = b^2$ **44.** $x = m + n, y = m - 1$

Exercise - 3.5

1. $x = \frac{17}{7}, y = \frac{5}{7}$ **2.** $x = \frac{125}{41}, y = \frac{-89}{41}$ **3.** $x = 1, y = 2$

4. $x = \frac{1}{3}, y = \frac{9}{5}$ **5.** $x = \frac{5}{2}, y = 0$

6. $x = -\frac{1}{24}, y = \frac{7}{4}$ **7.** $x = \frac{105}{706}, y = \frac{885}{706}$ **8.** $x = 1, y = -1$

9. $x = a, y = b$ **10.** $x = a^2, y = b^2$ **11.** $x = a, y = b$

12. $x = a^2, y = b^2$ **13.** $x = a, y = b$

14. $x = a + b, y = \frac{-2ab}{a + b}$ **15.** $x = \frac{bc - ac + b}{b^2 - a^2}, y = \frac{bc - ac - a}{b^2 - a^2}$

16. $x = \frac{ac + b^2}{a^2 + b}, y = \frac{ab - c}{a^2 + b}$ **17.** $x = \frac{a^2 + ab + b^2}{a + b}, y = \frac{ab}{a + b}$

18. $x = a, y = b$ **19.** $x = a, y = b$

20. $x = \frac{4ab - b}{5a}, y = \frac{-a + 4b}{5b}$ **21.** $x = \frac{1}{2}, y = \frac{1}{2}$

22. $x = \frac{2}{a}, y = \frac{3}{b}$ **23.** $x = \frac{5b - 2a}{10ab}, y = \frac{a + 10b}{10ab}$

24. $x = \frac{2ab - a^2 + b^2}{b}, y = \frac{(a - b)^3}{b(a + b)}$ **25.** $x = \frac{a^2c^2 - b^2d^2}{a^4 - b^4}, y = \frac{a^2d^2 - b^2c^2}{a^4 - b^4}$

26. $x = 1, y = 2$ **27.** $x = 5, y = 0$

28. $x = -1, y = 2$ **29.** $x = 2, y = -1$ **30.** $x = 4, s = 2$

31. No solution **32.** $x = 3, y = 1$ **33.** $x = -1, y = 2$

34. $x = -2, y = 3$ **35.** $x = 2, y = -3$

36. Infinite many solution. **37.** Infinite many solution **38.** $x = \frac{31}{4}, y = \frac{5}{2}$

39. $x = 8/3, y = 17/3$ **40.**

Exercise - 3.6

1. k = 4 **2.** k = 2 **3.** k = -1

4. k = 2 **5.** a = 5, b = 1 **6.** a = -5, b = -1

7. a = 5, b = 1 **8.** m = 5, n = 1 **9.** a = 3, b = 2

10. $\alpha = 2$ **11.** k = 2 **12.** k = -1

13. k = -6 **14.** $k = \frac{-9}{4}$ **15.** (i) $k \neq 3$ (ii) k = 3

16. k = 4 **17.** $k = 2$ **18.** p = 15 and q = 1

19. (i) k + 6 (ii) No value of k

Exercise - 3.7

1. (i) k = 6 (ii) k = 6 ***2.*** (i) k = –9/4

(ii) k = –4/3 **3.** $k \neq 3$ **;** k = 3 **4.** k = 4

5. k = 2 **6.** k = 2 **7.** k = 2

8. p = 5 ; q = 1 **9.** $k \neq 6$; no value of k **10.** m = 17/4 ; n = 11/5

11. k = – 1 **12.** k = 4 **13.** k = 4

14. k = 2 **15.** k = 2

Exercise - 3.8

1. $k = 5$

2. $k = 5$

3. $k = 7$

4. $k = -\frac{9}{4}$

5. $k = -\frac{4}{3}$

6. $k = \frac{-14}{5}$

7. $c \neq \pm 6$

8. $\alpha = -6$

9. $c = 6$

10. $am \neq bl$

11. $a = \frac{17}{4}, b = \frac{11}{5}$

12. $a = -5, b = -1$

13. $q = \frac{1}{3}, p = \frac{5}{3}$

14. $a = 3, b = \frac{1}{5}$

Exercise - 3.9

1. 0, 0

2. $x = \frac{1}{2}, y = \frac{1}{3}$

3. $x = \frac{a^2 + b^2 + ab}{a + b}$

4. $x = 14, y = 9$

5. $x = 4, y = -3$

6. $x = 0.5, y = 0.2$

7. $x = 18, y = 6$

8. $x = \frac{1}{8}, y = 0$

9. $x = -5, y = 21$

10. $x = 3,\ y = 21$ **11.** $x = 1,\ y = 2$ **12.** $x = 0.4,\ y = 0.6$

13. $x = 3,\ y = 2$ **14.** $x = 3,\ y = 2$ **15.** $x = 4,\ y = 9$

16. $x = 2,\ y = 1$ **17.** $x = \frac{1}{2},\ y = \frac{1}{3}$ **18.** $x = \frac{1}{2},\ y = \frac{1}{2}$

19. $x = 3,\ y = 4$ **20.** $x = 0,\ y = 0$ **21.** $x = 80,\ y = 30$

22. $x = 2,\ y = 3$ **23.** $x = 2,\ y = -3$ **24.** $x = a,\ y = -b$

25. $x = 2,\ y = 3$ **26.** $x = 2,\ y = -1$ **27.** $x = 4,\ y = 2$

28. $x = m + n,\ y = m - n$ **29.** $x = 2,\ y = -3$ **30.** $x = \frac{1}{2},\ y = \frac{1}{4}$

31. $x = 1,\ y = -1$ **32.** $x = \frac{ac + b^2}{a^2 + b}$ **33.** $x = a,\ y = b$

34. $x = \frac{4a - b}{5a},\ y = \frac{-a + 4b}{5b}$ **35.** $x = \frac{2}{a},\ y = \frac{a}{b}$, **36.** $x = \frac{1}{2},\ y = \frac{1}{3}$

37. $x = \frac{1}{2},\ y = \frac{1}{2}$ **38.** $x = a,\ y = -b$ **39.** $x = a, y = b$

40. $x = a,\ y = b$

Exercise - 3.10

1. $x = \frac{a}{b},\ y = \frac{b}{c}$ **2.** $x = \frac{a^3 - b^3}{a},\ y = \frac{a^3 + b^3}{q}\ x + y = 2a^2$

3. $x = a^2,\ y = b^2$ **4.** $n = \frac{2ab - a^2 + b^2}{b},\ y = \frac{(a-b)(a^2+b^2)}{b(a+b)}$

5. $x = \frac{b^2}{2a},\ y = \frac{2a^2 + b^2}{2a}$ **6.** $x = \frac{a}{a^2 + b^2},\ y = \frac{b}{a^2 + b^2}$ **7.** $x = 3,\ y = -2,\ z = -1$

8. $x = 2,\ y = -1,\ z = 1$ **9.** $x = 20, 30$ **10.** $a = 3,\ b = 3$

11. $A = 2,\ B = -3$ **12.** $x = -2,\ y = 3$ **13.** $x = 15, y = 5$

14. $x = 4,\ y = 9$ **15.** Rs.576 and Rs.752 **16.** 10 g and 40

17. 25 and 18

Exercise - 3.11

. Rs. 20, Rs 100 **2.** Rs. 13, Rs. 17 **3.** Rs. 120, Rs. 75

4. Rs. 350 **5.** Rs. 1240, Rs. 1100 **6.** Rs. 6.50, Rs. 1.50

7. 25, 69 **8.** Rs. 640, Rs. 327 **9.** Rs. 384

10. Rs. 1700 **11.** Rs. 115, Rs. 165 **12.** Rs. 2100, Rs. 25

13. Rs. 75, Rs. 215 **14.** Rs. 3900, Rs. 250 **15.** 30; 10

16. 25 ; 25 **17.** Rs. 250, Rs. 300

Exercise - 3.12

1. 50 ; 20 **2.** 33 ; 20 **3.** 45 ; 15

4. 36 years **5.** 33 ; 10 **6.** 50 ; 20

7. 40 ; 10 **8.** 49 ; 7 **9.** 30 ; 6

10. 34 ; 12 **11.** 40 ; 10 **12.** 33 ; 9

13. 36 ; 12 **14.** 20 ; 5 **15.** 45; 15

16. 56 ; 20 **17.** 33, 12 **18.** 33, 10

19. 50, 10

Exercise - 3.13

1. $\frac{7}{9}$ **2.** $\frac{3}{5}$ **3.** $\frac{5}{6}$ **4.** $\frac{12}{25}$

5. $\frac{3}{7}$ **6.** $\frac{25}{36}$ **7.** $\frac{3}{5}$ **8.** $\frac{7}{18}$

9. $\frac{3}{7}$ **10.** $\frac{7}{9}$ **11.** $\frac{12}{25}$ **12.** $\frac{4}{5}$

13. $\frac{5}{13}$ **14.** $\frac{3}{10}$ **15.** $\frac{5}{9}$ **16.** $\frac{4}{7}$

17. $\frac{5}{7}$

Exercise - 3.14

1. 36 **2.** 74 or 47 **3.** 12

4. 41 **5.** 82 and 28 **6.** 36

7. 48 **8.** 5 and 3 **9.** 24 and 14

10. 24 and 11 **11.** 25 and 18 **12.** 628 and 375

13. 5 and 3 **14.** 7, 3 or $-7, -3$ **15.** 24 and 14

16. 37, 29 **17.** 34, 70 **18.** 36

19. 93 **20.** 64 **21.** 36

Exercise - 3.15

1. 30^o,30^o and 120^o **2.** 25^o ; 73^o ; 82^o. **3.** 20^o, 40^o, 120^o.

4. 70^o, 53^o, 110^o, 127^o. **5.** 65^o, 55^o, 115^o , 125^o. **6.** l = 17, b = 9

7. l = 23, b = 11 **8.** s = 12, b = 8 **9.** 70^o, 20^o, 90^o

10. 60^o, 120^o, 60^o, 120^o **11.** 28 m, 15 m **12.** 28 m, 19 m

13. 20 m, 16 m **14.** 99^0, 81^0 **16.** 19 m, 10 m

17. 110^0, 80^0, 70^0, 100^0 **18.** 15 m, 12 m **19.** 40, 30

20. 40 units

Exercise - 3.16

1. 8 km/hr; 3 km/hr **2.** 60 km/hr; 80 km/hr **3.** $2\frac{1}{2}$ km/hr

4. 10 km/hr; 2km/hr **5.** 36 km, 4 km/hr **6.** 6km/hr, 4km/hr

7. 8km/hr, 4km/hr **8.** 10km/hr, 2km/hr

9. 40 km/hr and 30 km/hr **10.** 100 km/hr and 80km/hr

11. $\frac{10}{3}$ km / hr and 5 km/hr **12.** 720 km

13. 35 km/hr, 25 km/hr **14.** 90 km/hr, 40 km/hr

15. 10 km/hr, 2 km/hr **16.** 4 km/hr, 10 km/hr

Exercise - 3.17

1. 3 : 2 **2.** Rs. 12600, Rs 10400 **3.** 30, 20

4. 13, 27 **5.** 30, 30 **6.** 18 days ; 36 days

7. 18 years, 8 years **8.** 40 years, 24 years **9.** Rs. 500, Rs. 700

10. 96 **11.** Rs. 130, 25

12. 90% acid = 6 litres and 97% acid = 15 litre **13.** 30 years and 10 years.

14. 30 **15.** Rs. 180 **16.** 483, 886

TEST – 1

1. X = 3, Y = – 2 **2.** K = 3 **3.** 45 **4.** x = 3, y = 2

5. x = 1, y = –1 **6.** x = 16 / 34 ; y = 7/34 **7.** x = –2, y = –9

8. 63

TEST – 2

1. $y = \frac{14-3x}{7}$, No **2.** 7.5 sq unit **3.** 26, 24

4. x = 1, y = – 1 **5.** (3, 2) (0, 4) (0, –1) **6.** x = 3 ; y = 2

7. x = 3, y = 10 **8.** 40, 30

TEST – 3

1. x = 0, y = 0 **2.** 36 **3.** $v = \frac{3}{2}; u = 1$

4. x = 3, y = 2 **5.** 60, 40 **6.** (0,0) (2, 4) (3, 3)

7. $\frac{2}{5}$ **8.** 24

TEST – 4

1. $x = \frac{1}{4}; \frac{5}{4}$ **2.** x = 3, y = 2 **3.** $x = \frac{1}{2}; y = \frac{1}{2}$

5. 74 **6.** 40, 15 **7.** 320, 160

8. 15, 16

CH – 4 – QUADRATIC EQUATIONS

Definition : Let P(x) be a polynomial if P(x) = 0 then it is called quadratic equation. The standard form of quadratic equation is $ax^2 + bx + c = 0$, where a,b and c are real numbers and $a \neq 0$, is called a quadratic equation in variable *x*.

Roots of a Quadratic Equation : Let P(x) = 0, be a Quadratic Equation, then the zeros of a Polynomial P(x) are called the roots of the Quadratic Equation

Note : 1 : If α is a root of quadratic equation, $ax^2 + bx + c = 0$, then we say that $x = \propto$ satisfies the equation $ax^2 + bx + c = 0$ or $x = \alpha$ is a solution of the equation $ax^2 + bx + c = 0$

Derivation of Quadratic Formula : Consider the Quadratic Equation $ax^2 + bx + c = 0$

Derivation of Formula :

Step 1 Constant term shifted towards R.H.S

$ax^2 + bx = -c$

Step 2 Whole equation divided by coeff. of x^2

$$x^2 + \frac{b}{a}x = -\frac{c}{a} \; ; \; \left(\frac{1}{2} \times \frac{b}{a} = \frac{b}{2a}\right)$$

$$\left(\frac{b}{2a}\right)^2 = \frac{b^2}{4a^2}$$

Step 3 Adding Both side by square of the half of the coefficient of *x*.

$$\Rightarrow \quad x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} = -\frac{c}{a} + \frac{b^2}{4a^2}$$

$$\Rightarrow \quad x + \frac{b}{2a}\Big]^2 = \frac{-4ca + b^2}{4a^2}$$

Taking square root on both the side, we get

$$\Rightarrow \quad \sqrt{\left[x + \frac{b}{2a}\right]^2} \quad \sqrt{\frac{b^2 - 4ac}{4a^2}}$$

$$\Rightarrow \quad x + \frac{b}{2a} = \pm\frac{\sqrt{b^2 - 4ac}}{2a}$$

$$\Rightarrow \quad x = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

$$\Rightarrow \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Either,

$$\Rightarrow \quad x = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \Rightarrow x = \frac{-b + \sqrt{D}}{2a} \text{ or}$$

$$\Rightarrow \quad x = \frac{-b - \sqrt{b^2 - 4ac}}{2a} \Rightarrow x = \frac{-b - \sqrt{D}}{2a}$$

Discriminant : If $ax^2 + bx + c = 0$, is a quadratic equation and $a \neq 0$, then the expression; $b^2 - 4ac$ is known as its discriminant and is denoted by letter D.i.e., $D = b^2 - 4ac$. where a, b and c are real numbers.

Nature of the Roots of a quadratic equation :

Nature of the roots of the quadratic equation decided by 'D'.

1. If D > 0, then equation has real and unequal roots and both roots can be calculated by using the following formulae.

$$x(\text{or } \alpha) = \frac{-b + \sqrt{b^2 - 4ac}}{2a} = \frac{-b + \sqrt{D}}{2a}$$

and $$x(\text{or } \beta) = \frac{-b - \sqrt{b^2 - 4ac}}{2a} = \frac{-b - \sqrt{D}}{2a}$$

2. If D = 0 then equation has real and equal roots, then both roots can be calculated by using following formulae.

x or $\frac{-b}{2a}$ and x or $\frac{-b}{2a}$

3. If D < 0 then equation has no real roots.

Important result :

On determining the value of an unknown variable in the given equation when the nature of root is given. Apply the following conditions

a. If equation has real roots then apply $D \geq 0$

b. If equation has real and different roots then apply D > 0.

c. If equation has real and equal roots then apply D = 0.

d. If equation has no real roots than apply D < 0.

PRACTICE EXERCISE 4.1

Select quadratic equation from the following equation :

Q1. $x^2 - 6x - 4 = 2x^2 + 2 + 7$

Q2. $3x^2 - 7x - 2 = 0 + 2x^2$

Q3. $x^3 - 6x^2 + 2x - 1 = 0$

Q4. $7x = 2x^2 + 8x^2 + 3 + 5x$

Q5. $x^2 + \frac{1}{x^2} = 0 + 3x + 5$

Q6. $3x^2 - 4 = 6(x^2 + 3) + 2$

Q7. $(x + 1)(x + 3) = 0 + 5x^2$

Q8. $(2x + 1)(3x + 2) = 6$

Q9. $x + \frac{1}{x} = x + 5x + 9 + 3x$

Q10. $16x^2 - 3 = (2x + 5) + 6$

Q11. $x^2 - 5x + 3 = 0 + 8x^2$

Q12. $3x^2 - 2 = 0 + (x-1) + 7x$

Q13. $x + \frac{7}{x} = x + 3x^{-1} + 6x + 3$

Q14. $x^3 + \frac{1}{x^3} = 2 + x + 2x$

Q15. $x^2 + 4x - 7\sqrt{x} + 4 = 0$

Q16. $2x^2 - 5 = 0 + 3x + 12x$

Q17. $x^2 - 5x + 6 = 0 + 3(x-1)$

Q18. $x^2 + \frac{3}{x} = 0 + 6x + 8x + 2$

Q19. $x^2 - 6\sqrt{x^2} + 8 = 0 + \sqrt{x^2}$

Q20. $2\sqrt{3x^2} + 6x + \sqrt{3} = 0$

Q21. $2x^2 - 5x = x^2 - 2x + 3 + 5$

Q22. $x^2 + 2x - 3 = x(x+1) + 5$

Q23. $x^2 - x + 3 = 0 + 5(x^2 - 3)$

Q24. $2x^2 + \frac{5}{2}x - \sqrt{3} = 0 + 3 + 7$

Q25. $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0 + 2x$

Q26. $\frac{1}{3}x^2 + \frac{1}{5}x - 2 = 0 + 6x$

Q27. $ax^2 + bx + 3 = 0 - 2 + dx$

Q28. $(x - a)(x + b) = ab + 3ab$

Q29. $(x+2)(x+1)(x-3) = 0$

Q30. $x^2(x-2) - 2(x^3 + 3) = 0$

Q31. $ax^2 + (a + b)x + ab = 0$

Q32. $\frac{x}{a} + \frac{b}{x} = 3(x + 3) + 7x$

Q33. $\frac{x}{\sqrt{3}} + \frac{2}{x} = \sqrt{3} - 3x + 3x$

Q34. $x^2(x + a) + a(x^2 + 1) = 0$

Q35. $(x-1)(x-2) = 3x^2 + 2$

Q36. $3x^2 = 7x(x-1) + 8x + 7$

Q37. $a^2x^2 + (a^2 + b^2)x + b^2 = 0$

Q38. $\frac{9}{x^2} + \frac{4}{x} = \frac{3}{x^2} + \frac{6}{7} + \frac{1}{2}$

Q39. $\sqrt{3}x^2 = 6x + 2x^3 + 5 + 5x$

Q40. $2x^2 + 6x = (2x-1)(x+3)$

Q41. $\frac{2}{x^2} + \frac{3}{x} = \frac{2}{x} + \frac{1}{3} + \frac{5}{x}$

Q42. $2^{x^2} - 3x + 8 = 0 + x^2 + 3$

Q43. $(x^2)^3 - 3x^2 + 6x = 0 + 2x^2$

Q44. $\frac{2x}{x^{-1}} + 3x = 11x + 5 + 7$

Q45. $6x - \frac{1}{x} = 3 + 8(x-2) + 1$

Q46. $\frac{x}{x^{-1}} + 3x = 11x + 5 + 2x^2$

Q47. $\frac{2x}{x^{-2}} + 3x^2 + 6 = 2x^3 + 5$

Q48. $\frac{1}{x^{-2}} + \frac{6}{x} = 8 + (3x+2) + 2$

Q49. $x^{-2} + 6x^2 = 6x^4 + 3 + 5x$

Q50. $(x-2)(x-3) = 3x + 5$

Q51. $x^{-2} + 3x + x = 5 + 3x + 1$

Q52. $x^2(x-3) = x^2 + 2x^2 + 7$

Q53. $(x^2 - 1)(x-2) = x^3 + 6$

Q54. $x^2(x^2 + 3) = 6x^2 + 3 + 5$

Q55. $(x^2 - 1)(x+2) = 3x^2 + 6x$

Q56. $x(x+2) + 3(x+1) = x^2$

Q57. $x^2 + (x-1) = 3x^2 + 2 - 2$

Q58. $9(x^2 - 2) + 3 = (x-1)^2 + 8$

Q59. $(x+1)^2(x-3)^2 = 6x + 3$

Q60. $x^3 + x^{-1} = 5x + 3 + 2x$

Q61. $(3x+1)(x-3) = 6x + 5 + 2$

Q62. $6x^2(x-1) = 6x^3 + 11x^2$

Q63. $2x^2 - 9x(x-1) = x^3 - 1$

Q64. $(6x+8)(x-8) = 6x^2 + 3x$

Q65. $(x-1)(x-2)(x+3) = 0$

Q66. $x^2 - (x-1)(x+1) = 8 + 3x$

Q67. $(x^2 + 2)(x^2 - 2) = 4x + 3$

Q67. $(x^2 + 2)(x^2 - 2) = 4x + 3$

Q68. $(x-2)(x^2 + 2x + 9) = 0 + 7$

Q69. $(x-3)(x+3) = 9x - 5$

Q70. $(x-3)^2 + (x-2)^2 = 5 + 3$

Q71. $(x-8)^2 + (x-3)^2 = 11x + 5$

Q72. $(x-6) + 3x = 2x - 8 + 9$

Q73. $\frac{1}{x-3} + \frac{1}{x-4} = \frac{1}{2} + x + 5$

Q74. $\sqrt{x} + \frac{3}{\sqrt{x}} = x^{3/2}$

PRACTICE EXERCISE 4.2

In each of the following, determine whether the given value of x is a solution of the given equation or not :

Q1. $3x^2 - 2x - 1 = 0$: $x = 1$

Q2. $2x^2 - 6x + 3 = 0$: $x = 1/2$

Q3. $(2x + 3)(3x - 2) = 0$: $x = 2/3$

Q4. $2x^2 + x + 1 = 0$: $x = -1$

Q5. $x^2 + 6x + 5 = 0$: $x = -1$

Q6. $6x^2 - x - 2 = 0$: $x = -1/2$

Q7. $x^2 + \sqrt{2}x - 4 = 0$: $x = \sqrt{2}$

Q8. $9x^2 - 3x - 2 = 0$: $x = -1/3$

Q9. $(x + 4)(x - 5) = 0$: $x = -4$

Q10. $(3x + 8)(2x + 5) = 0$: $x = 8/3$

Q11. $x^2 - 6x + 5 = 0$: $x = 5$

Q12. $ax^2 - a^2x + 5 = 0$: $x = a$

Q13. $2\sqrt{3}x^2 + \sqrt{3}x + 5$: $x = \sqrt{3}$

Q14. $x^2 - 9kx + 8k^2$: $x = k$

Q15. $x^2 + x + 1 = 0$: $x = 1$

Q16. $\sqrt{7}x^2 - 6x - 13\sqrt{7}$: $x = -\sqrt{7}$

Q17. $a(x^2 + 1) = x(a^2 + 1)$: $x = a$

Q18. $px^2 - 3\sqrt{2}x + 2p^2$: $x = p$

Q19. $x^2 + 11x + 30 = 0$: $x = -6$

Q20. $x^2 + 18x + 32 = 0$: $x = -2$

Q21. $x^2 + 7x - 18 = 0$: $x = 2$

Q22. $x^2 + 5x - 6 = 0$: $x = 1$

Q23. $x^2 - 4x + 3 = 0$: $x = 1$

Q24. $x^2 - 21x + 108 = 0$: $x = 9$

Q25. $x^2 - 11x - 80 = 0$: $x = 16$

Q26. $x^2 - x - 156 = 0$: $x = 12$

Q27. $x^2 - 32x - 105 = 0$: $x = -3$

Q28. $40 + 3x - x^2 = 0$: $x = -5$

Q29. $15x^2 - x - 28 = 0$: $x = 7/5$

Q30. $8x^2 - 24x + 9 = 0$: $x = 3$

Q31. $5x^2 + 33xy - 14y^2 = 0$: $x = -7y$

Q32. $x^2 - 6x + 5 = 0$: $x = 5$

Q33. $a^2x^2 - 3abx + 2b^2 = 0$: $x = 2b$

Q34. $2x^2 - \sqrt{3}x + 5 = 0$: $x = -1$

Q35. $(x - 2)(x + 3) = 0$: $x = -3$

Q36. $12abx^2 - (9a^2 - 8b^2)x - 6ab = 0$: $x = 3$

Q37. $ax^2 + (a + b)x + b = 0$: $x = -a$

Q38. $2x^2 + (2 + \sqrt{3})x + \sqrt{3} = 0$: $x = \sqrt{3}$

Q39. $x^2 - 5x + 6 = 0$: $x = -3$

Q40. $6\sqrt{3}x^2 - 9x - \sqrt{3} = 0$: $x = -\sqrt{3}$

Q41. $2x^2 + (2 + \sqrt{7})x + \sqrt{7} = 0$: $x = -1$

Q42. $3^{x+2} - 3^{-x} - 10 = 0$: $x = -2$

Q43. $(a + 2)x^2 + 3x - (a - 1) = 0$: $x = -1$

Q44. $2^{2x} - 3.2^{(x+2)} + 32 = 0$: $x = 2$

Q45. $3a^2x^2 + 8abx + 4b^2 = 0$: $x = -b$

Q46. $x^2 - 2ax + (a^2 - b^2) = 0$: $x = -b$

Q47. $abx^2 + (b^2 - 2ac)x - bc = 0$: $x = -b$

Q48. $2x^2 - 2\sqrt{6}x + 3 = 0$: $x = -\sqrt{3}$

Q49. $p^2x^2 + (p^2 - q^2)x - q^2 = 0$: $x = -1$

Q50. $\sqrt{7}x^2 + (\sqrt{7} + \sqrt{2})x + \sqrt{2} = 0$: $x = -1$

Q51. $2a^2x^2 - 5abx + 3b^2 = 0$: $x = b/a$

Q52. $2^{2x} - 3^x - 6 = 0$: $x = 1$

Q53. $x^2 - 7x - 30 = 0$: $x = -3$

Q54. $x^2 - 21x + 68 = 0$: $x = 17$

Q55. $a^2x^2 + 3abx + 2b^2 = 0$: $x = -2b$

Q56. $x^2 - 11x + 30 = 0$: $x = 6$

PRACTICE EXERCISE 4.3

In the following, find the value of k for which the given value is a solution of the given equations.

Q1. $7x^2 + kx - 3 = 0$: $x = 2/3$

Q2. $x^2 - x(a + b) + k = 0$: $x = a$

Q3. $kx^2 + \sqrt{2}x - 4 = 0$: $x = \sqrt{2}$

Q4. $x^2 + 3ax + k = 0$: $x = -a$

Q5. $kx^2 + 2x - 3 = 0$: $x = 2$

Q6. $3x^2 + 2kx - 3 = 0$: $x = -1/2$

Q7. $x^2 + 2ax - k = 0$: $x = -a$

Q8. $2x^2 + kx - 6 = 0$: $x = 2$

Q9. $2x^2 - 6kax - 2a^2 = 0$: $x = a$

Q10. $3x^2 - 5kx + 11 = 0$: $x = -3$

Q11. $2kx^2 - 3x + 2 = 0$: $x = 3$

Q12. $3x^2 - 2kx + 5 = 0$: $x = -3$

Q13. $ax^2 + kx + 2a = 0$: $x = -a$

Q14. $x^2 + kx + 3 = 0$: $x = -1$

Q15. $kx^2 + 2x - 3 = 0$: $x = 2$

Q16. $kx^2 - 3kx + 5 = 0$: $x = -3$

Q17. $2ax^2 - 3kx + 2 = 0$: $x = -a$

Q18. $2kx^2 - 6kax + 18 = 0$: $x = -a$

Q19. $3\sqrt{3}x^2 + 2kx - 3\sqrt{3} = 0$: $x = 1$

Q20. $ax^2 + 2\sqrt{3}kx - a^3 = 0$: $x = a$

Q21. $6x^2 + 2\sqrt{3}x + k = 0$: $x = -\sqrt{3}$

Q22. $\frac{2}{3}x^2 + \frac{1}{3}kx + \frac{5}{2} = 0$: $x = 1$

Q23. $6kx^2 - 23x = 2kx - 5$: $x = -1$

Q24. $k(x^2 - 1) = 2k - 3x$: $x = -2$

Q25. $6x^2 + 3x + 2/k$: $x = 1$

Q26. $4x^2 - (2k + 1)x - 8k = 0$: $x = 2$

Q27. $3x^2 + (2k + x)x - 35 = 0$: $x = -2$

Q28. $2x^2 + (6k + 1)k - 32 = 0$: $x = 1$

Q29. $6k^2x^2 - 9kx + 3 = 0$: $x = 1$

Q30. $2kx^2 - \frac{2}{5}kx + 3 = 0$: $x = 5$

Q31. $7x^2 - 3x + k = 0$: $x = 2$

Q32. $2\sqrt{3}x^2 + 6kx = -2\sqrt{3} = 0$: $x = 1$

Q33. $6\sqrt{7}x^2 + 2\sqrt{7}kx + 2\sqrt{7} = 0$: $x = 1$

Q34. $3kx^2 - 6kx + 5k = 0$: $x = -2$

Q35. $(2+\sqrt{3})x^2 + kx - 2 - \sqrt{3} = 0$: $x = 1$

Q36. $abkx^2 + 3abx - 6ab = 0$: $x = 1$

Q37. $2a^3x^2k + 2ka^2x - 6a^2 = 0$: $x = a$

Q38. $2a^2b^2x^2 + 3ka^2b^2x + b^2a^2 = 0$: $x = -1$

Q39. $\frac{7}{3}x^2 - \frac{2}{5}x + k = 0$: $x = -\frac{1}{2}$

Q40. $2x^2 + (2+\sqrt{3})x + k = 0$: $x = 1$

Q41. $3k(x^2 + 2) - 2(k+1)x + 3k = 0$: $x = 2$

Q42. $2kx^2 = -3kx + 17$: $x = -1$

Q43. $6x^2 - \frac{2}{7}kx = \frac{1}{3}$: $x = -\frac{1}{2}$

Q44. $2\sqrt{3}x^2 + 3kx - 2\sqrt{3}$: $x = 1$

Q45. $(6+2k)x^2 + (2+k)x - 5 = 0$: $x = -1$

Q46. $x^2 - 6x + 3k = 0$: $x = -2$

Q47. $3x^2 - 2kx + 5 = 0$: $x = -3$

Q48. $6x^2 - (2k + 1)x = 3k$: $x = -2$

Q49. $2kx^2 - 6x + k = k - 1$: $x = -3$

Q50. $2kx^2 - 3x + 5 = 0$: $x = 1$

PRACTICE EXERCISE 4.4

Find the roots of the following quadratic equations by factorization method :

Q1. $6x^2 - 19x = 0$

Q2. $5x^2 + 20x = 0$

Q3. $x^2 - 15x = 0$

Q4. $x^2 - 5x = 0$

Q5. $5x^2 - \sqrt{5}x = 0$

Q6. $3x^2 - 6x = 0$

Q7. $6x^2 - \sqrt{2}x = 0$

Q8. $ax^2 - bx = 0$

Q9. $9a^2x^2 - 6abx = 0$

Q10. $x^2 - 25 = 0$

Q11. $x^2 - 100 = 0$

Q12. $x^2 - 0.09 = 0$

Q13. $3x^2 - \sqrt{3}x = 0$

Q14. $36x^2 - 25 = 0$

Q15. $3x^2 - 2 = 0$

Q16. $a^2b^2x^2 - c^2d^2 = 0$

Q17. $12x^2 - 125 = 0$

Q18. $x^2 - 2 = 0$

Q19. $2x^2 + 11x - 21 = 0$

Q20. $3x^2 - 14x + 8 = 0$

Q21. $18x^2 + 3x - 10 = 0$

Q22. $15x^2 + 2x - 8 = 0$

Q23. $6x^2 + 11x - 10 = 0$

Q24. $30x^2 + 7x - 15 = 0$

Q25. $24x^2 - 41x + 12 = 0$

Q26. $2x^2 - 7x - 15 = 0$

Q27. $6x^2 - 5x - 21 = 0$

Q28. $10x^2 - 9x - 7 = 0$

Q29. $5x^2 - 16x - 21 = 0$

Q30. $2x^2 - x - 21 = 0$

Q31. $15x^2 - x - 28 = 0$

Q32. $\left(2x + \sqrt{5}\right)^2 - 125 = 0$

Q33. $\left(x + \sqrt{2}\right)^2 - 32 = 0$

Q34. $2.8x^2 + 5.6x + 2 = 0$

Q35. $\frac{1}{3}x^2 - 2x - 9 = 0$

Q36. $x^2 - 2x + \frac{7}{16} = 0$

Q37. $x^2 - 21x + 108 = 0$

Q38. $x^2 - 11x - 80 = 0$

Q39. $x^2 - x - 156 = 0$

Q40. $x^2 - 32x - 105 = 0$

Q41. $40 + 3x - x^2 = 0$

Q42. $6 - x - x^2 = 0$

Q43. $7x^2 + 49x + 84 = 0$

Q44. $13x^2 - 15x + 2 = 0$

Q45. $5x^2 + 16x + 3 = 0$

Q46. $6x^2 + 17x + 12 = 0$

Q47. $9x^2 + 18x + 8 = 0$

Q48. $14x^2 + 9x + 1 = 0$

Q49. $2x^2 + 3x - 90 = 0$

Q50. $2x^2 + 11x - 21 = 0$

Q51. $3x^2 - 14x + 8 = 0$

Q52. $x^2 + 7x + 12 = 0$

Q53. $2x^2 + 5x - 12 = 0$

Q54. $x^2 + 3x - 10 = 0$

Q55. $6x^2 - 7x - 3 = 0$

Q56. $4x^2 - 4x - 3 = 0$

Q57. $5x^2 - 4 - 8x = 0$

Q58. $6x^2 - 3 - 7x = 0$

Q59. $2x^2 - 11x + 15 = 0$

Q60. $x^2 - 2x - 8 = 0$

Q61. $4x^2 - 4x + 1 = 0$

Q62. $75x^2 + 35x - 10 = 0$

Q63. $10x - 20x + 10 = 0$

Q64. $6x^2 - 3 - 7x = 0$

Q65. $x^2 - 3x + 2 = 0$

Q66. $x^2 - 4x + 3 = 0$

Q67. $x^2 + x - 2 = 0$

Q68. $x^2 - 5x + 4 = 0$

Q69. $5x^2 - 9x + 4 = 0$

Q70. $9x^2 - x - 8 = 0$

Q71. $6x^2 - 12x + 6 = 0$

Q72. $7x^2 - x - 6 = 0$

Q73. $13x^2 - 26x + 13 = 0$

Q74. $24x^2 - 14x + 2 = 0$

Q75. $18x^2 - 15x - 3 = 0$

Q76. $19x^2 - 17x - 2 = 0$

Q77. $x^2 - 2x + 1 = 0$

Q78. $1000x^2 - 250x - 750 = 0$

Q79. $100x^2 - 25x + 1 = 0$

Q80. $12x^2 - 8x - 4 = 0$

Q81. $x^2 + 2x - 675 = 0$

Q82. $102x^2 + 55x + 2 = 0$

Q83. $36x^2 + 32x - 4 = 0$

Q84. $56x^2 + 20x - 4 = 0$

Q85. $200x^2 - 10x - 6 = 0$

Q86. $x^2 + 250x - 750000 = 0$

Q87. $x^2 - 20x - 4800 = 0$

Q88. $x^2 + 48x - 324 = 0$

Q89. $5x^2 - 7x - 24 = 0$

Q90. $x^2 + 10x - 3000 = 0$

PRACTICE EXERCISE 4.5

Find the roots of the following quadratic equations by factorization method :

1. $\sqrt{2}x^2 + 3x + \sqrt{2} = 0$
2. $\sqrt{5}x^2 + 2x - 3\sqrt{5} = 0$
3. $2\sqrt{3}x^2 + x - 5\sqrt{3} = 0$
4. $5\sqrt{5}x^2 + 20x + 3\sqrt{5} = 0$
5. $7\sqrt{2}x^2 - 10x - 4\sqrt{2} = 0$
6. $6\sqrt{3}x^2 - 19x + 5\sqrt{3} = 0$
7. $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$
8. $\sqrt{3}x^2 + 11x + 6\sqrt{3} = 0$
9. $2\sqrt{3}x^2 - 7x + \sqrt{3} = 0$
10. $\sqrt{5}x^2 - 6x + \sqrt{5} = 0$
11. $2x^2 + 3\sqrt{3}x + 3 = 0$
12. $7x^2 + 2\sqrt{14}x + 2 = 0$
13. $6x^2 - 3\sqrt{3}x - 5 = 0$
14. $10x^2 + 7\sqrt{3}x + 3 = 0$
15. $8x^2 - 2\sqrt{2}x - 2 = 0$
16. $16x^2 + 6\sqrt{2}x + 1 = 0$
17. $10x^2 + \sqrt{5}x - 3 = 0$
18. $3\sqrt{7}x^2 - 10x + \sqrt{7} = 0$
19. $7x^2 + 4\sqrt{2}x - 6 = 0$
20. $21x^2 + 10\sqrt{2}x + 2 = 0$
21. $6\sqrt{7}x^2 - 25x + 2\sqrt{7} = 0$
22. $\sqrt{5}x^2 - 6x + \sqrt{5} = 0$
23. $3\sqrt{7}x^2 - 10x + \sqrt{7} = 0$
24. $\sqrt{13}x^2 - 10x - 3\sqrt{13} = 0$
25. $3\sqrt{2}x^2 - 10x + 4\sqrt{2} = 0$
26. $\sqrt{3}x^2 + 2x - \sqrt{3} = 0$
27. $2\sqrt{2}x^2 - 3x - \sqrt{2} = 0$
28. $\sqrt{3}x^2 + (\sqrt{3} + 1)x + 1 = 0$
29. $\sqrt{5}x^2 + x - 4\sqrt{5} = 0$
30. $6\sqrt{7}x^2 - x - \sqrt{7} = 0$
31. $5\sqrt{3}x^2 - x - 6\sqrt{3} = 0$
32. $10\sqrt{10}x^2 - 20x + \sqrt{10} = 0$
33. $2\sqrt{21}x^2 + 5x - 3\sqrt{21} = 0$
34. $\sqrt{7}x^2 - 15x + 2\sqrt{7} = 0$
35. $3\sqrt{15}x^2 - 9x - 2\sqrt{15} = 0$
36. $2\sqrt{20}x^2 - 6x - 4\sqrt{20} = 0$
37. $4x^2 + 4\sqrt{2}x - 6 = 0$
38. $9x^2 - 8\sqrt{3}x + 4 = 0$
39. $10x^2 + 2\sqrt{\ }x - 7 = 0$
40. $\sqrt{13}x^2 - 12x - \sqrt{13} = 0$
41. $2\sqrt{13}x^2 - 25x + 6\sqrt{13} = 0$
42. $6\sqrt{7}x^2 + 23x + 3\sqrt{7} = 0$
43. $\sqrt{2}x^2 - 4x + 2\sqrt{2} = 0$
44. $\sqrt{19}x^2 - 16x - 3\sqrt{19} = 0$
45. $\sqrt{50}x^2 - 7x + \sqrt{2} = 0$
46. $\sqrt{8}x^2 - 4x + \sqrt{2} = 0$
47. $10x^2 + 3\sqrt{2}x - 8 = 0$
48. $3\sqrt{13}x^2 + 7x - 2\sqrt{13} = 0$
49. $6x^2 + 7\sqrt{3}x + 5 = 0$
50. $x^2 - 4\sqrt{2}x + 8 = 0$
51. $x^2 - 4\sqrt{2}x + 6 = 0$
52. $10x^2 + \sqrt{2}x - 6 = 0$
53. $10x^2 - \sqrt{15}x - 3 = 0$
54. $2x^2 - 4\sqrt{2}x + 4 = 0$
55. $x^2 - 5\sqrt{2}x - 100 = 0$
56. $24x^2 - 8\sqrt{3}x + 2 = 0$
57. $100x^2 + 23\sqrt{2}x - 1 = 0$
58. $3x^2 - 2\sqrt{3}x + 1 = 0$
59. $2x^2 - 4\sqrt{2}x + 4 = 0$
60. $3x^2 - 14\sqrt{3}x + 49 = 0$
61. $30x^2 + \sqrt{13}x - 13 = 0$
62. $32x^2 + 8\sqrt{2}x + 1 = 0$
63. $49x^2 + 5\sqrt{7}x - 2 = 0$
64. $3x^2 + 4\sqrt{3}x + 4 = 0$
65. $5x^2 - 2\sqrt{5}x + 1 = 0$
66. $13x^2 + 2\sqrt{13}x + 1 = 0$
67. $108x^2 + 84\sqrt{3}x + 49 = 0$
68. $10x^2 + 3\sqrt{7}x - 7 = 0$
69. $30x^2 - 8\sqrt{2}x + 1 = 0$
70. $\sqrt{7}x^2 + 8x + \sqrt{7} = 0$
71. $12x^2 - 4\sqrt{6}x + 2 = 0$
72. $16x^2 + 6\sqrt{2}x - 2 = 0$
73. $12x^2 + 2\sqrt{3}x - 12 = 0$
74. $10x^2 + 21\sqrt{5}x + 10 = 0$
75. $78x^2 + 4\sqrt{3}x - 2 = 0$
76. $12x^2 + 11\sqrt{5}x + 10 = 0$
77. $72x^2 - \sqrt{3}x - 3 = 0$
78. $17x^2 + 3\sqrt{17}x + 2 = 0$
79. $15x^2 - 2\sqrt{7}x - 7 = 0$
80. $3x^2 + 4\sqrt{3}x + 4 = 0$
81. $7x^2 - 10\sqrt{7}x + 25 = 0$
82. $52x^2 - 32\sqrt{13}x + 64 = 0$
83. $108x^2 - 132\sqrt{3}x + 121 = 0$
84. $2x^2 - 20\sqrt{7}x + 25 = 0$
85. $20x^2 - 32\sqrt{5}x + 64 = 0$
86. $147x^2 - 70\sqrt{3}x + 25 = 0$
87. $192x^2 - 80\sqrt{3}x + 25 = 0$
88. $52x^2 - 44\sqrt{13}x + 121 = 0$
89. $252x^2 + 60\sqrt{7}x + 25 = 0$
90. $162x^2 + 18\sqrt{2}x + 1 = 0$
91. $13x^2 + 10\sqrt{3}x + 25 = 0$
92. $7x^2 - 4\sqrt{7}x + 4 = 0$
93. $11x^2 + 6\sqrt{2}x - 10 = 0$

PRACTICE EXERCISE 4.6

Find the roots of the following quadratic equations by factorization method :

Q1. $\frac{1}{x-3}-\frac{1}{x-5}=\frac{1}{6}$

Q2. $\frac{x-3}{x+3}-\frac{x+3}{x-3}=6\frac{6}{7}$

Q3. $\frac{2x}{x-4}+\frac{2x-5}{x-3}=\frac{25}{3}$

Q4. $\frac{x+3}{x-2}-\frac{1-x}{x}=\frac{17}{4}$

Q5. $\frac{1}{x-2}+\frac{1}{x}=\frac{8}{2x+5}$

Q6. $\frac{1}{x-2}+\frac{2}{x-1}=\frac{6}{x}$

Q7. $2\left(\frac{x-1}{x+3}\right)-7\left(\frac{x+3}{x-1}\right)=5$

Q8. $2\left(\frac{2x-1}{x+3}\right)-3\left(\frac{x+3}{2x-1}\right)=5$

Q9. $\left(\frac{4x-3}{2x+1}\right)-10\left(\frac{2x+1}{4x-3}\right)=3$

Q10. $\frac{x-1}{x-2}+\frac{x-3}{x-4}=3\frac{1}{3}$

Q11. $\frac{x+2}{x-1}+\frac{8}{3}=\frac{x+3}{x-2}$

Q12. $\frac{1}{x+3}+\frac{1}{2x-1}=\frac{11}{7x+9}$

Q13. $\frac{1}{x}+\frac{1}{x-10}=\frac{8}{75}$

Q14. $\frac{1}{x}-\frac{1}{x+3}=\frac{1}{6}$

Q15. $\frac{1}{x+1}+\frac{2}{x+2}=\frac{4}{x+4}$

Q16. $\frac{5.25}{5-x}-\frac{5.25}{5+x}=1$

Q17. $\frac{12000}{x-200}-\frac{12000}{x}=3$

Q18. $\frac{x-3}{x+3}-\frac{x+3}{x-3}=\frac{48}{7}$

Q19. $\frac{x+1}{x-1}-\frac{x-1}{x+1}=\frac{5}{6}$

Q20. $\frac{x-1}{x+1}-\frac{x+5}{3x-5}=7\frac{1}{4}$

Q21. $\frac{1}{x}+\frac{1}{15-x}=\frac{3}{10}$

Q22. $\frac{x}{2x+1}+\frac{2x+1}{x}=\frac{58}{21}$

Q23. $\frac{288}{x}-\frac{288}{x+4}=-1$

Q24. $\left(\frac{x}{x+1}\right)^2-5\left(\frac{x}{x+1}\right)+6=0$

Q25. $2\left(\frac{x-1}{x+3}\right)-7\left(\frac{x+3}{x-1}\right)=5$

Q26. $\left(\frac{4x-3}{2x+1}\right)-10\left(\frac{2x+1}{4x-3}\right)=3$

Q27. $\frac{1}{x-1}-\frac{1}{x+5}=\frac{6}{7}$

Q28. $\frac{x-1}{x-2}+\frac{x-3}{x-4}=3\frac{1}{3}$

Q29. $\frac{1}{x-3}-\frac{1}{x+5}=\frac{1}{6}$

Q30. $\frac{x+1}{x-1}+\frac{x-2}{x+2}=3$

Q31. $2x-1-\frac{2}{x-2}=3$

Q32. $\frac{x}{x+1}+\frac{x+1}{x}=\frac{34}{15}$

Q33. $\frac{x+2}{x+3}=\frac{2x-3}{3x-7}$

Q34. $\frac{1}{x}-\frac{1}{x+250}=\frac{1}{3000}$

Q35. $\frac{3x-4}{2x+4}+\frac{x+5}{3x-5}=7\frac{1}{4}$

Q36. $\left(\frac{x+3}{x-2}\right)-\left(\frac{1-x}{x}\right)=\frac{17}{4}$

Q37. $2\left(\frac{2x+3}{x-3}\right)^2-5\left(\frac{2x+3}{x-3}\right)-7=0$

Q38. $\frac{1}{x-400}-\frac{1}{x}=\frac{1}{12000}$

Q39. $\frac{2x+3}{4x+3}+\frac{3x+5}{4x-2}=2$

Q40. $\frac{2x-3}{x-2}+\frac{2x-7}{x-4}=5\frac{1}{3}$

Q41. $40\left(\frac{4x-3}{2x+1}\right)-10\left(\frac{2x+1}{4x-3}\right)=3$

Q42. $\frac{1}{x}+\frac{1}{x-6}-\frac{1}{4}=0$

Q43. $\frac{1}{x}+\frac{1}{x-16}=\frac{1}{15}$

Q44. $\frac{4}{x}-3=\frac{5}{2x+3}$

Q45. $\frac{1}{4-x}-\frac{1}{4-x}=\frac{1}{3}$

Q46. $\left(\frac{2x-1}{x-1}\right)^4-10\left(\frac{2x+1}{x-1}\right)^2+9=0$

Q47. $\frac{1}{x+4}-\frac{1}{x-7}=\frac{11}{30}$

Q48. $\frac{12}{5-x}+\frac{12}{5+x}=1$

PRACTICE EXERCISE 4.7

Find the roots of the following quadratic equations by factroizaiton method:

Q1*. $9a^2x^2+5abx-4b^2=0$

Q2*. $3a^4x^2-6a^2x-9=0$

Q3*. $2a^2x^2+3ax+1=0$

Q4. $p^2x^2+4px+4=0$

Q5. $6x^2-8ax+2a^2=0$

Q6. $p^4x^2+2p^2x-24=0$

Q7. $6a^2x^2-ax-7=0$

Q8. $3a^2x^2+12abx+9b^2=0$

Q9. $x^2-(a+b)x+ab=0$

Q10. $7p^2x^2-4pqx-3q^2=0$

Q11. $64x^2+12p^2x-p^4=0$

Q12. $5p^2x^2-2pq-3q^2=0$

Q13. $3a^2x^2+5ax-8=0$

Q14. $36a^2x^2+abx-2b^2=0$

Q15. $12p^2x^2-8pqx-4q^2=0$

Q16. $13x^2+15bx+2b^2=0$

Q17. $p^2x^2+2pqx+q^2=0$

Q18. $25x^2+23qx-2q^2=0$

Q19. $a^2x^2+5abx+6b^2=0$

Q20. $4a^4x^2-4a^2bx-8b^2=0$

Q21. $3a^2x^2-10abx+7b^2=0$

Q22*. $2x^2+(2+\sqrt{5})x+\sqrt{5}=0$

Q23. $\sqrt{2}x^2+(\sqrt{2}+1)x+1=0$

Q24*. $\sqrt{3}x^2+(2+\sqrt{3})x+2=0$

Q25. $6x^2+(6+\sqrt{2})x+\sqrt{2}=0$

Q26. $\sqrt{7}x^2+(\sqrt{7}+2)x+2=0$

Q27. $5x^2+(\sqrt{2}+5)x+\sqrt{2}=0$

Q28. $3x^2+(3+\sqrt{3})x+\sqrt{3}=0$

Q29. $5x^2+(5+\sqrt{3})x+\sqrt{3}=0$

Q30. $3x^2+(3+\sqrt{7})x+\sqrt{7}=0$

Q31. $6x^2+(6+\sqrt{2})x+\sqrt{2}=0$

Q32. $7x^2+(7+\sqrt{5})x+\sqrt{5}=0$

Q33. $13x^2+(\sqrt{2}+13)x+\sqrt{2}=0$

Q34. $2x^2+(2-\sqrt{5})x-\sqrt{5}=0$

Q35. $3x^2-(3-\sqrt{7})x-\sqrt{7}=0$

Q36. $2x^2-(2+\sqrt{3})x+\sqrt{3}=0$

Q37. $\sqrt{2}x^2+(\sqrt{2}+\sqrt{5})x+\sqrt{5}=0$

Q38. $p^2x^2+(p^2-q^2)x-q^2=0$

Q39. $ax^2+(a+b)x+b=0$

Q40*. $abx^2+(b^2-ac)x-bc=0$

Q41. $12abx^2-(9a^2-8b^2)x-6ab=0$

Q42. $x^2-(a+b)x+ab=0$

Q43. $a(x^2+4)=x(a^2+4)$

Q44. $ax^2+(4a^2-3b)x-12ab=0$

Q45. $x^2+2ab=(2a+b)x$

Q46. $3abx^2-3abx-6ab=0$

Q47. $x^2+\left(a+\frac{1}{a}\right)x+1=0$

Q48*. $x^2+\left(\frac{a}{a+b}+\frac{a+b}{a}\right)x+1=0$

Q49. $4x^2-2(a^2+b^2)x+a^2b^2=0$

Q50. $ad^2x\left(\frac{a}{b}x+\frac{2c}{d}\right)+cb=0$

Q51. $a^2b^2x^2-(4b^4-3a^4)x-12a^2b^2=0$

Q52. $a^2b^2x^2+b^2x-a^2x-1=0$

Q53. $9x^2-3(a+b)x+ab=0$

Q54. $a^2x^2+(a^2-b^2)x-b^2=0$

Q55. $2ax^2+2(a+b)x+2b=0$

Q56. $2(x-a)(x-b)=0$

Q57*. $\frac{1}{x-a-b}+\frac{1}{a}+\frac{1}{b}=\frac{1}{x}$

Q58*. $a^2x^2-(a^2b^2+1)x+b^2=0$

Q59. $x^2-16b^2=0$

Q60. $16x^2-25b^2=0$

Q61. $\sqrt{10x^2}+(\sqrt{5}+\sqrt{2})x+1=0$

Q62. $x^2+(2+\sqrt{5})x+\sqrt{20}=0$

Q63. $\sqrt{10}x^2+(2+\sqrt{5})x+\sqrt{2}=0$

Q64. $\sqrt{5}x^2+(5+\sqrt{2})x+\sqrt{10}=0$

Q65*. $a(x^2+1)-x(a^2+1)=0$

Q66*. $\frac{1}{a+b+x}=\frac{1}{a}+\frac{1}{b}+\frac{1}{x}$

PRACTICE EXERCISE 4.8 (HOTS)

Find the roots of the following quadratic equations by factorization method.

1. $x^2 + 2ax + (a^2 - b^2) = 0$
2. $\frac{m}{n}x^2 + \frac{n}{m} = 1 - 2x$
3. $(5a-3)x^2 + (5a-2)x + 1 = 0$
4. $3a^{100}x^2 - 9a^{50}b^{25} + 6b^{50}$
5. $x^2 - \left(\sqrt{\frac{5}{7}} + \sqrt{\frac{7}{5}}\right)x + 1 = 0$
6. $9x^2 + 6bx + (a^2 - b^2) = 0$
7. $x^2 + (2a-5)x + a^2 - 5a = 0$
8. $25x^2 + 15x - (a^2 - 3a) = 0$
9. $x^2 + 4x + 1 = 0$
10. $x^2 + 4\sqrt{3}x - 24 = 0$
11. $\sqrt{\frac{a}{b}}x^2 + \left(\sqrt{a} - \frac{2}{\sqrt{b}}\right)x - 2 = 0$
12. $(a+\sqrt{b})x^2 + 2ax + (a-\sqrt{b}) = 0$
13. $x^{2/3} - 5x^{1/3} + 4 = 0$
14. $x^{1/3} - x^{1/6} - 2 = 0$
15. $\sqrt{x} - 5\sqrt[4]{x} + 6 = 0$
16. $\sqrt{x+6} + \sqrt{x-2} = 4$
17. $\sqrt{x-6} - \sqrt{x+2} = 4$
18. $\sqrt[3]{x^2} - 2\sqrt[3]{x} - 15 = 0$
19. $x^2 + 2ax + a^2 - 5 = 0$
20. $9x^2 + 24x + 7 = 0$
21. $(2a-5)x^2 + (3a-8)x + (a-3) = 0$
22. $4x^2 - 4ax + (a^2 - b^2) = 0$
23. $4x^2 - 2(a^2 + b^2)x^4 + a^2b^2 = 0$
24. $9x^2 - 6ax + (a^2 - 1) = 0$
25. $x^2 + 5x - 1800 = 0$
26. $x^2 + 3x - (a^2 + a - 2) = 0$
27. $4x + \frac{1}{x} = 25\frac{1}{25}$
28. $(2a-5)x^2 + (3a-4)x + (a+1) = 0$
29. $(a+6)x^2 + 7x - (a-1) = 0$
30. $\frac{x-a}{x-b} + \frac{x-b}{x-a} = \frac{a}{b} + \frac{b}{a}$
31. $\frac{a}{x-a} + \frac{b}{(x-b)} = \frac{2c}{(x-c)}$
32. $x^2 + 11x - (a^2 - a - 30) = 0$
33. $(6a^2 - 5a - 6)x^2 + (a+5)x - 1 = 0$
34. $(x-5)(x-6) = \frac{25}{(24)^2}$
35. $4x^2 + 4bx - (a^2 - b^2) = 0$
36. $(4a^2 - 16)x^2 - (2a+20) - 6 = 0$
37. $x^2 - 4ax + 4a^2 - b^2 = 0$
38. $(a^2 - 3)x^2 + 2\sqrt{3}x - 1 = 0$
39. $x^2 + x - (a^2 + 3a + 2) = 0$
40. $5^{2x} - 5^{x+3} + 125 = 5^x$
41. $3^{x+2} + 3^{-x} = 10$
42. $4^{x+1} + 4^{1-x} = 10$
43. $2^{2x} - 3.2^{x+2} + 32 = 0$
44. $\sqrt{x+3} = 2x$
45. $x^2 - 12x + (36a^2 - 25) = 0$
46. $20x^2 + (18a-5)x + (4a^2 - 4a - 15) = 0$
47. $6x^2 + (22a-1)x + (12a^2 - 24a - 15) = 0$
48. $2(a-\sqrt{3})x^2 + (a - 3\sqrt{3})x - (a+\sqrt{3}) = 0$
49. $6x^2 + (11a-10)x + (3a^2 - a - 4) = 0$
50. $6(a+b)x^2 + (a-7b)x - 2(a-b) = 0$
51. $2\sqrt{3}x^2 + (10a-26)x + 4\sqrt{3}(a^2 - 4a - 5) = 0$
52. $2(x+1)(3x+1) + (2x+1)(x+3) = 7$
53. $13x^2 + 9(x+1) - (2x+3)(x+2) = 6$
54. $a^2b^2x^2 - (4b^4 - 3a^4)x = 12a^2b^2 = 0,\ ab \neq 0$
55. $12abx^2 - (9a^2 - 8b^2)x - 6ab = 0,\ ab = 0$
56. $(2a-3b)x^2 + (4a+2b)x - 10(3a-5b) = 0$
57. $(2\sqrt{a} - \sqrt{3})x^2 + 2\sqrt{3}x - (\sqrt{2}a + \sqrt{3}) = 0$
58. $(a^2 - 3a + 2)x^2 + (5a-9)x + (a^2 - 9) = 0$
59. $(3a-5)x^2 + (10a-12)x + 4(2a-1) = 0$
60. $(a^2 - 9)x^2 + (2a^2 - 6)x + (a^2 + 3) = 0$
61. $9x^2 - 9(a+b)x + (2a^2 + 5ab + 2b^2) = 0$

PRACTICE EXERCISE 4.9

Find the roots of the following quadratic equation by completing the perfect square.

Q1. $(3x-5)(2x+3)=0$

Q2. $4x^2-12x+9$

Q3. $5x^2+4x=0$

Q4. $x^2+12x+35=0$

Q5. $x^2=18x-77$

Q6. $6x^2+11x+3$

Q7. $3a^2x^2+2abx+4b^2=0$

Q8. $3x^2-2x-1=0$

Q9. $6x^2-x-2=0$

Q10. $48x^2-13x-1=0$

Q11. $3x^2+11x+10=0$

Q12. $a^2x^2-3abx+2b^2=0$

Q13. $9x^2-22x-8=0$

Q14. $15x^2-28=x$

Q15. $9x^2-\sqrt{3}x-2=0$

Q16. $3x^2+2x-1=0$

Q17. $4-11x=3x^2$

Q18. $x^2+4x+4=0$

Q19. $x^2-\left(1+\sqrt{2}\right)x+\sqrt{2}=0$

Q20. $\sqrt{3}x^2+11x+6\sqrt{3}=0$

Q21. $x^2+6x+9=0$

Q22. $4\sqrt{3}x^2+5x-2\sqrt{3}=0$

Q23. $3\sqrt{7}x^2-4x-\sqrt{7}=0$

Q24. $8x^2-8\sqrt{2}x+3=0$

Q25. $16y^2-40y+25=0$

Q26. $\frac{2}{x^2}-\frac{5}{x}+2=0$

Q27. $y^2-4y-1=0$

Q28. $6x^2-3x-3=0$

Q29. $y^2+8y+4=0$

Q30. $y^2+\frac{1}{2}y-1=0$

Q31. $2y^2+5y-3=0$

Q32. $-2y^2+y+1=0$

Q33. $3y^2+9y+4=0$

Q34. $5y^2-2y-2=0$

Q35. $7z^2+8z+2=0$

Q36. $z^2+\frac{1}{2}z-3=0$

Q37. $z^2+2z-8=0$

Q38. $\left(\frac{x+3}{x-2}\right)-\left(\frac{1-x}{x}\right)=\frac{17}{4}$

Q39. $\frac{1}{x-2}+\frac{2}{(x-1)}=\frac{6}{x}$

Q40. $9a^2x^2-13abx+4b^2=0$

Q41. $2a^2x^2-8abx+6b^2=0$

Q42. $ax^2+(a+b)x+b=0$

Q43. $2x^2+11x-21=0$

Q44. $3x^2-14x+8=0$

Q45. $18x^2+3x-10=0$

Q46. $15x^2+2x-8=0$

Q47. $6x^2+11x-10=0$

Q48. $30x^2+7x-15=0$

Q49. $24x^2-41x+12=0$

Q50. $2x^2-7x-15=0$

Q51. $6x^2-5x-21=0$

Q52. $\sqrt{2}x^2+3x+\sqrt{2}=0$

Q53. $\sqrt{5}x^2+2x-3\sqrt{5}=0$

Q54. $2\sqrt{3}x^2+x-5\sqrt{3}=0$

Q55. $5\sqrt{5}x^2+20x+3\sqrt{5}=0$

Q56. $7\sqrt{2}x^2-10x-4\sqrt{2}=0$

Q57. $6\sqrt{3}x^2-4x+5\sqrt{3}=0$

Q58. $2x^2+3\sqrt{3}x+3=0$

Q59. $7x^2+2\sqrt{14}x+2=0$

Q60. $6x^2-3\sqrt{3}x-5=0$

Q61. $10x^2+7\sqrt{3}x+3=0$

Q62. $8x^2-2\sqrt{2}x-2=0$

Q63. $16x^2+6\sqrt{2}x+1=0$

Q64. $\frac{1}{x-3}-\frac{1}{x+5}=\frac{1}{6}$

Q65. $\frac{x-3}{x+3}-\frac{x+3}{(x-3)}=\frac{48}{7}$

Q66. $\frac{2x}{x-4}+\frac{2x-5}{x-3}=\frac{25}{3}$

Q67. $\frac{x+3}{x-2}-\frac{1-x}{x}=\frac{17}{4}$

Q68. $\frac{1}{x-2}+\frac{1}{x}=\frac{8}{2x+5}$

Q69. $\frac{1}{x-2}+\frac{2}{x-1}=\frac{6}{x}$

Q70. $9a^2x^2+5abx-4b^2=0$

Q71. $3a^4x^2-6a^2x-9=0$

Q72. $2a^2x^2+3ax+1=0$

Q73. $p^2x^2+4px+4=0$

Q74. $6x^2-8ax+2a^2=0$

Q75. $p^4x^2+2p^2x-24=0$

Q76. $6a^2x^2-ax-7=0$

Q77. $3a^2x^2+12abx+9b^2=0$

Q78. $x^2-(a+b)x+ab=0$

Q79. $2x^2+\left(2+\sqrt{5}\right)x+\sqrt{5}=0$

Q80. $\sqrt{2}x^2+\left(\sqrt{2}+1\right)x+1=0$

Q81. $\sqrt{3}x^2+\left(2+\sqrt{3}\right)x+2=0$

PRACTICE EXERCISE 4.10

Solve the following quadratic equations by using quadratic formula :

Q1. $2x^2-7x-15=0$ Q2. $6x^2-5x-21=0$ Q3. $10x^2-9x-7=0$

Q4. $5x^2-16x-21=0$ Q5. $2x^2-x-21=0$ Q6. $6x^2-7x-3=0$

Q7. $4x^2-4x-3=0$ Q8. $5x^2-4-8x=0$ Q9. $6x^2-3-7x=0$

Q10. $2x^2-11x+15=0$ Q11. $x^2+250x-750000=0$ Q12. $x^2-20x-4800=0$

Q13. $x^2+48x-324=0$ Q14. $5x^2-7x-24=0$ Q15. $x^2+10x-3000=0$

Q16. $20x^2-32\sqrt{5}x+64=0$ Q17. $147x^2-70\sqrt{3}x+25=0$ Q18. $192x^2-80\sqrt{3}x+25=0$

Q19. $52x^2-44\sqrt{13}x+121=0$ Q20. $252x^2+60\sqrt{7}x+25=0$ Q21. $162x^2+18\sqrt{2}x+1=0$

Q22. $3x^2+10\sqrt{3}x+25=0$ Q23. $7x^2-4\sqrt{7}x+4=0$ Q24. $11x^2+6\sqrt{2}x-10=0$

Q25. $\left(\frac{x}{x+1}\right)^2-5\left(\frac{x}{x+1}\right)+6=0$ Q26. $2\left(\frac{x-1}{x+3}\right)-7\left(\frac{x+3}{x-1}\right)=5$ Q27. $\left(\frac{4x-3}{2x+1}\right)-10\left(\frac{2x+1}{4x-3}\right)=3$

Q28. $\frac{1}{x-1}-\frac{1}{x+5}=\frac{6}{7}$ Q29. $\frac{x-1}{x-2}+\frac{x-3}{x-4}=3\frac{1}{3}$ Q30. $\frac{1}{x-3}-\frac{1}{x+5}=\frac{1}{6}$

Q31. $\frac{x+1}{x-1}+\frac{x-2}{x+2}=3$ Q32. $2x-1-\frac{2}{x-2}=3$ Q33. $\frac{x}{x+1}+\frac{x+1}{x}=\frac{34}{15}$

Q34. $9a^2x^2+5abx-4b^2=0$ Q35. $3a^4x^2-6a^2x-9=0$ Q36. $2a^2x^2+3ax+1=0$

Q37. $p^2x^2+4px+4=0$ Q38. $6x^2-8ax+2a^2=0$ Q39. $p^4x^2+2p^2x-24=0$

Q40. $6a^2x^2-ax-7=0$ Q41. $3a^2x^2+12abx+9b^2=0$ Q42. $x^2-(a+b)x+ab=0$

Q43. $7p^2x^2-4pq-3q^2=0$ Q44. $64x^2+12p^2x-p^4=0$ Q45. $5p^2x^2-2pq-3q^2=0$

Q46. $3a^2x^2+5ax-8=0$ Q47. $36a^2x^2+abx-2b^2=0$ Q48. $12p^2x^2-8pqx-4q^2=0$

Q49. $13x^2+15bx+2b^2=0$ Q50. $p^2x^2+2pqx+q^2=0$ Q51. $25x^2+23qx-2q^2=0$

Q52. $a^2x^2+5abx+6b^2=0$ Q53. $4a^4x^2-4a^2bx-8b^2=0$ Q54. $3a^2x^2-10abx+7b^2=0$

Q55. $2x^2+(2+\sqrt{5})x+\sqrt{5}=0$ Q56. $\sqrt{2}x^2+(\sqrt{2}+1)x+1=0$ Q57. $\sqrt{3}x^2+(2+\sqrt{3})x+2=0$

Q58. $6x^2+(6+\sqrt{2})x+\sqrt{2}=0$ Q59. $\sqrt{7}x^2+(\sqrt{7}+2)x+2=0$ Q60. $5x^2+(\sqrt{2}+5)x+\sqrt{2}=0$

Q61. $3x^2+(3+\sqrt{3})x+\sqrt{3}=0$ Q62. $5x^2+(5+\sqrt{3})x+\sqrt{3}=0$ Q63. $3x^2+(3+\sqrt{7})x+\sqrt{7}=0$

Q64. $6x^2+(6+\sqrt{2})x+\sqrt{2}=0$ Q65. $7x^2+(7+\sqrt{5})x+\sqrt{5}=0$ Q66. $13x^2+(\sqrt{2}+13)x+\sqrt{2}=0$

Q67. $2x^2+(2-\sqrt{5})x-\sqrt{5}=0$ Q68. $3x^2-(3-\sqrt{7})x-\sqrt{7}=0$ Q69. $2x^2-(2+\sqrt{3})x+\sqrt{3}=0$

Q70. $\sqrt{2}x^2+(\sqrt{2}+\sqrt{5})x+\sqrt{5}=0$ Q71. $p^2x^2+(p^2-q^2)x-q^2=0$ Q72. $ax^2+(a+b)x+b=0$

PRACTICE EXERCISE 4.11 (HOTS)

Solve the following quadratic equation by using quadratic formula :

Q1. $a^2x^2+4abx+4b^2=0$

Q2. $abx^2-\left(a^2+b^2\right)x+ab=0$

Q3. $ax^2+(a+b)x+b=0$

Q4. $(6a-9)x^2+2ax+1=0$

Q5. $10ax^2-6x+15ax=9$

Q6. $abx^2-\left(a^2-b^2\right)x-ab=0$

Q7. $x^2-x=p(2x-1)$

Q8. $a\left(x^2-1\right)=x\left(a^2-1\right)$

Q9. $2qx^2-\left(2q-p^2\right)x-p^2=0$

Q10. $0.3x^2-0.1x-0.4=0$

Q11. $ax^2+3x-(a-3)=0$

Q12. $ax^2+(2a-4)x+(a-4)=0$

Q13. $9x^2-3\left(a^2+b^2\right)x+a^2b^2=0$

Q14. $9x^2-3(a+b)x+ab=0$

Q15. $x^2-4ax+4a^2-b^2=0$

Q16. $x^2-2ax+\left(a^2-b^2\right)=0$

Q17. $p^2x^2+\left(p^2-q^2\right)x-q^2=0$

Q18. $4x^2-4a^2x+\left(a^4-b^4\right)=0$

Q19. $x^2-12x+\left(36a^2-25\right)=0$

Q20. $3a^2x^2+2abx+4b^2=0$

Q21. $x^2-2ax+\left(a^2-b^2\right)=0$

Q22. $x^2-4ax+4a^2-b^2=0$

Q23. $4x^2-4ax+\left(a^2-b^2\right)=0$

Q24. $x^2+x-(a+1)(a+2)=0$

Q25. $x^2+3ax-\left(2a^2-\sqrt{5}a-5\right)=0$

Q26. $36x^2-12ax+\left(a^2-b^2\right)=0$

Q27. $a\left(x^2+1\right)-x\left(a^2+1\right)=0$

Q28. $\left(a^2-b^2\right)x^2+4bx-4=0$

Q29. $4x^2+4bx-\left(a^2-b^2\right)=0$

Q30. $a^2x^2-3abx+2b^2=0$

Q31. $abx^2-\left(4b^4-3a^4\right)x-12a^2b^2=0$

Q32. $\dfrac{1}{a+b+x}=\dfrac{1}{a}+\dfrac{1}{b}+\dfrac{1}{x}$

Q33. $(a+b)x^2-2ax+(a-b)=0$

Q34. $(2a+5)x^2+6x-(2a-1)=0$

Q35. $a^8x^2+2a^4b^2x+b^4=0$

Q36. $x^2+2ax+\left(a^2-3\right)=0$

Q37. $\left(4a^4-9\right)x^2+4a^2x+1=0$

Q38. $3a^4x^2-8a^2b^2x+4b^4=0$

Q39. $2a^2x^2-6a^2b^2x+4b^2=0$

Q40. $2\sqrt{7}a^4x^2+9a^2b^2x+\sqrt{7}b^4=0$

Q41. $\sqrt{5}a^2x^2+3abx-2\sqrt{5}b^2=0$

Q42. $(a+b)x^2-2bx-(a-b)=0$

Q43. $\left(a+\sqrt{5}\right)x^2+2\sqrt{5}x-\left(a-\sqrt{5}\right)=0$

Q44. $2\sqrt{2}a^2x^2+4ax+\sqrt{2}=0$

Q45. $\sqrt{2}a^4x^2-2a^2x-2a^2x+2\sqrt{2}=0$

Q46. $20x^2+(18a-5)x+\left(4a^2-4a-15\right)=0$

Q47. $6x^2+(22a-1)x+\left(12a^2-24a-15\right)=0$

Q48. $2\left(a-\sqrt{3}\right)x^2+\left(a-3\sqrt{3}\right)x-\left(a+\sqrt{3}\right)=0$

Q49. $6x^2+(11a-10)x+\left(3a^2-a-4\right)=0$

Q50. $6(a+b)x^2+(a-7b)x-2(a-b)=0$

Q51. $2\sqrt{3}x^2+(10a-26)x+4\sqrt{3}\left(a^2-4a-5\right)=0$

Q52. $2(x+1)(3x+1)+(2x+1)(x+3)=7$

Q53. $13x^2+9(x+1)-(2x+3)(x+2)=6$

Q54. $a^2b^2x^2-\left(4b^4-3a^4\right)x=12a^2b^2=0,\ ab\neq 0$

Q55. $12abx^2-\left(9a^2-8b^2\right)x-6ab=0,\ ab=0$

Q56. $(2a-3b)x^2+(4a+2b)x-10(3a-5b)=0$

Q57. $\left(2\sqrt{a}-\sqrt{3}\right)x^2+2\sqrt{3}x-\left(\sqrt{2}a+\sqrt{3}\right)=0$

Q58. $\left(a^2-3a+2\right)x^2+(5a-9)x+\left(a^2-9\right)=0$

Q59. $(3a-5)x^2+(10a-12)x+4(2a-1)=0$

Q60. $\left(a^2-9\right)x^2+\left(2a^2-6\right)x+\left(a^2+3\right)=0$

Q61. $9x^2-9(a+b)x+\left(2a^2+5ab+2b^2\right)=0$

PRACTICE EXERCISE 4.12

QI. **Find the value of k for each of the following quadratic equation, so that they have two equal roots or coincident roots or perfect square.**

1. $kx^2+5x-3=0$
2. $2x^2+kx+3=0$
3. $kx(x-2)+6=0$
4. $2kx^2+6x+5=0$
5. $2x^2-kx+k=0$
6. $kx^2-18x+1=0$
7. $kx(x-3)+9=0$
8. $4x^2-3kx+1=0$
9. $k^2x^2-2(k-1)x+4=0$
10. $9x^2+8kx+16=0$
11. $3x^2+2kx+27=0$
12. $2x^2-10x+k=0$
13. $9x^2+3kx+4=0$
14. $12x^2+4kx+3$
15. $2x^2+3x+k=0$
16. $2x^2-kx+1=0$
17. $kx^2-5x+k=0$
18. $9x^2-24x+k=0$
19. $2kx^2-40x+25=0$
20. $kx^2+4x+1=0$
21. $kx^2-2\sqrt{5}x+4=0$
22. $3x^2-5x+2k=0$
23. $4x^2+kx+9=0$
24. $x^2+kx+4=9$
25. $x^2+kx+6=0$
26. $x^2-2(5+2k)x+3(7+10k)=0$
27. $(k+1)x^2+2(k+3)x+(k+8)=0$
28. $(2k+1)x^2+2(k+3)x+(k+5)=0$
29. $(k+1)x^2-2(3k+1)x+8k+1=0$
30. $(4-k)x^2+(2k+4)x+(8k+1)=0$
31. $4x^2-2(k+1)x+(k+4)=0$
32. $5x^2-4x+2+k(4x^2-2x-1)=0$
33. $(3k+1)x^2+2(k+1)x+k=0$
34. $(k+4)x^2+(k+1)x+1=0$
35. $x^2-2x(1+3k)+7(3+2k)=0$
36. $kx^2+kx+1=-4x^2-x$
37. $(k-12)x^2+2(k-12)x+2=0$

QII. **Find the value of K for which the following equation has real roots.**

1. $kx^2+4x+1=0$
2. $5kx^2-8x+2=0$
3. $4x^2+8x-k=0$
4. $x^2+kx+1=0$
5. $4x^2-3kx+9=0$
6. $2x^2+3x+k=0$
7. $2x^2+kx+3=0$
8. $2x^2-5x-k=0$
9. $kx^2+6x+1=0$
10. $x^2-kx+9=0$
11. $2x^2+kx+2=0$
12. $3x^2+2x+k=0$
13. $4x^2-3kx+1=0$
14. $2x^2+kx-4=0$
15. $kx^2+6x-2=0$
16. $9x^2+3kx+4=0$
17. $5x^2-kx+1=0$
18. $2x^2-kx-4=0$

QIII. **Find the value of K for which the following equation has real and distinct roots.**

1. $x^2-4x+k=0$
2. $kx^2+2x+1=0$
3. $2x^2+kx+3=0$
4. $2x^2-5x-k=0$
5. $kx^2+6x+1=0$
6. $2x^2+kx+2=0$
7. $3x^2+2x+k=0$
8. $x^2-kx+9=0$
9. $4x^2-3kx+1=0$
10. $9x^2+3kx+4=0$
11. $2kx^2-5x+2=0$
12. $2x^2-3x+k=0$

QIV. **Find the value of K for which the following equation has no real roots.**

1. $x^2-4x+k=0$
2. $kx^2+2x+1=0$
3. $x^2+5kx+16=0$
4. $2x^2+kx+3=0$
5. $5x^2-kx+1=0$
6. $9x^2+3kx+4=0$
7. $kx^2-6x-2=0$
8. $3x^2+2x+k=0$
9. $2x^2+kx+2=0$
10. $4x^2-3kx+1=0$
11. $x^2-kx+9=0$
12. $2x^2-5x-k=0$
13. $2x^2-4x+k=0$
14. $3x^2-2kx+4=0$

PRACTICE EXERCISE 4.13

Q1. Find the value of k for which the equation $9x^2 - 24x + k = 0$ has equal roots. Also find the roots.

Q2. If -4 is a root of the quadratic equation $x^2 + px - 4 = 0$ and the quadratic equation $x^2 + px + k = 0$ has equal roots, find the value of k.

Q3. Show that the equation, $x^2 + ax - 4 = 0$ has real and distinct roots for all real values of a.

Q4. If -5 is a root of the quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, find the value of k.

Q5. Find the least positive value of k for which the equation $x^2 + kx + 4$ has real roots.

Q6. Find the positive value of k for which the equation $x^2 + kx + 64 = 0$ and $x^2 + 8x + k = 0$ will have real roots.

Q7. If the equation $(1+m^2)x^2 + 2mcx + (c^2 - a^2) = 0$ has equal roots, prove that $c^2 = a^2(1+m^2)$

Q8. Show that the equation $2(a^2 + b^2)x^2 + 2(a+b)x + 1 = 0$ has no real roots.

Q9. Show that the equation $3x^2 + 7x + 8 = 0$ is not true for any real value of *x*.

Q10. Find the value of k for which the following equation has real and equal roots

$kx^2 + kx + 1 = -4x^2 - x$

Q11. If one root of the quadratic equation $2x^2 + kx - 6 = 0$ is 2, find the value of k. Also, find the other root.

Q12. If x = 2 and x = 3 are the rots of the equation $3x^2 - 2kx + 2m = 0$, find the value of k and m.

Q13. If the equation $ax^2 + 2x + a = 0$ has two distinct root then find the value of a.

Q14. If –2 is a root of the equation $x^2 + px + 12 = 0$ and the equation $x^2 + kx + p = 0$ has equal roots, then find the value of k. **Ans.** $\pm 4\sqrt{2}$

Q15. If the equation $x^2 - bx + 1 = 0$ does not posses real roots then find the value of p.

Q16. If p and q are the roots of equation $x^2 - px + q = 0$ then find the value of p and q.

Q17. If the sum of the roots of the equation $x^2 - x = \lambda(2x - 1)$ is zero, then find the value of λ.

Q18. If $x = 1$ is a common roots of $ax^2 + ax + 2 = 0$ and $x^2 + x + b = 0$, then find the value of ab.

Q19. Find the value of c for which the equation $ax^2 + 2bx + c = 0$ has equal roots.

Q20. If the sum and product of the roots of the equation $kx^2 + 6x + 4k = 0$ are equal, then find the value of k.

Q21. If $\sin\alpha$ and $\cos\alpha$ are the roots of the equation $ax^2 + bx + c = 0$, then find the value of b^2.

Q22. Solve the following equations by using quadratic formula $\frac{4}{x} - 3 = \frac{5}{2x+3}$.

Q23. Find the value of k for which the following equation has equal roots

$(k-12)x^2 + 2(k-12)x + 2 = 0$

Q24. If one roots of the equation $ax^2 + bx + c = 0$ is three times the other then find the value of $b^2 : ac$.

Q25. If one roots of the equation $4x^2 - 2x + (\lambda - 4) = 0$ be the reciprocal of the other, then find the value of λ.

Q26. Using quadratic formula solve the following equation $abx^2 + (b^2 - ac)x - bc = 0$.

Q27. Find the roots of quadratic equation : $9x^2 - 9(a+b)x + (2a^2 + 5ab + 2b^2) = 0$. By using quadratic formula.

Q28. Find the rots of quadratic equation : $a^2x^2 - 3abx + 2b^2 = 0$ by method of completing the perfect square.

Q29. Solve for $x : \frac{x-1}{x-2} + \frac{x-3}{x-4} = 3\frac{1}{3}$.

Q30. Find the value of k for which the equation $x^2 + 5kx + 16 = 0$ has no real roots.

PRACTICE EXERCISE 4.14

Q1. Divide 12 into two parts such that their product is 32.

Q2. Find two consecutive natural numbers whose squares have the sum of 181.

Q3. Devide 12 into two parts such that the sum of their squares is 74.

Q4. The sum of the squares of four consecutive natural numbers is 30. Determine the numbers.

Q5. The sum of a number and its reciprocal is $\frac{10}{3}$,find the numbers.

Q6. Find two consecutive positive even integers whose squares have the sum 340.

Q7. Find two consecutive positive odd integers whose squares have the sum 290.

Q8. Find two consecutive odd natural numbers, the sum of whose squares is 202.

Q9. The sum of two numbers is 15. If the sum of their reciprocal is 3 / 10, find the two numbers.

Q10. Determine the two consecutive even positive integers the sum of whose squares is 100.

Q11. If the sum of square of three consecutive multiples of 5 is 1250. Find these numbers.

Q12. The sum of two numbers is 8 determine the numbers if the sum of their reciprocals is $\frac{8}{15}$.

Q13. Divide 16 into two parts such that twice the square of the large part exceeds the square of the smaller part by 164.

Q14. There are three consecutive positive integers such that the sum of the squares of the first and the product of the other two is 154. What are the integers.

Q15. The sum of the reciprocals of two consecutive even numbers is 7/24. What are the numbers ?

Q16. The difference of the squares of two numbers is 45. The square of the smaller number is 4 times the larger number. Determine the numbers.

Q17. Find the whole number which when decreased by 20 is equal to 69 times the reciprocal.

Q18. The product of two consecutive integers is 20. Using quadratic equation, find the integers.

Q19. The sum of two numbers is 48 and their product is 432. Find the numbers.

Q20. Divide 29 into two parts so that the sum of the squares of the two parts is 425.

Q21. The sum of a number and its positive square root is 6/25. Find the numbers.

Q22. The two number differ by 4 and their product is 192. Find the numbers.

Q23. Find two consecutive multiples of 5 whose product is 300.

Q24. A certain number is formed by the product of 3 consecutive positive number and if it is divided by each of them, then the sum of three quotient is 146. Find the numbers.

PRACTICE EXERCISE 4.15

Q1. A two digit number is such that the product of its digit is 6 and when 9 is added to the number, the digits get interchaged. Find the number.

Q2. A number consists of two digits. Units digit is greater than tenth place digit by 8. If the number is more than the product of its digit by 10, find the number.

Q3. A two digit number is such that the product of its digit is 12. When 36 is added to this number. The digits inter change their places. Find the numbers.

Q4. A two digit number is such that the product of its digit is 12. When 9 is added to the number the digits interchange their places. Determine the number.

Q5. A number consists of two digits . The product of its digit is 15. If 18 is added to the number, the digits change their places find the numbers.

Q6. Two digit number is such the product of its digits is 18. When 63 is subtracted from the number, the digits interchange their places find the number.

Q7. A two digit number is such that the product of the digits is 14 when 45 is added to the number, then digits are reversed. Find the number.

Q8. A two digit number is such that the product of the digits is 16. When 54 is subtracted from the number, the digits are interchanged. Find the number.

Q9. A two digit number is 4 times the sum of its digit and twice the product of its digits. Find the number.

Q10. A two digit number is such that the product of digit is 18. When number divided by the sum of digits. The quotent is 7. Find number.

Q11. A two digits number is 5 times the sum of its digits and is also equal to 5 more than twice the product of its digit. Find the number.

Q12. The sum of the digits of a two digit number is 9 and the product of digits is 20. Find the number.

Q13. A two digit number such that the tenth digit is 2 more than one's digit if the product of digits is 63. Find the number.

Q14. A two digit number is divided by sum of the digit quotient is 5 and remainder is 10 and the product of digit is 30. Find the number.

Q15. The sum of two digit number and number obtaining by reversing the digits is 33. If the product of digit is 2. Then find the two digit number.

Q16. The product of the digits of a two digit number is 8, when Ten's digit divided by the once's digit. The quotient is 2 find the two digit number.

Q17. The product of the digit of a two digit number is 18. If number divided by the sum of the digits the quotient is 4 find the number.

Q18. The product of the digits of a two digit number is 18. If number is added with the number obtaining by interchanging the digits result is 99. Find the number.

Q19. The product of the digits of a two digit number is 14. If number divided by 3, we get quotient is 9. Find the number.

Q20. The product of the digits of a two digit number is 30. If two digit number is divided by 7. We get quotient is 8 find the number.

Q21. A two digit number is equal to seven time the sum of the digits. If the products of digit is 18 then find the number.

PRACTICE EXERCISE 4.16

Q1. The length of a rectangle exceeds its width by 8cm and the area of the rectangle is 240 cm^2. Find the dimensions of the rectangle.

Q2. A farmer wishes to start 100 sq.m rectangular vegetable garden. Since he has only 30 m barbed wire he fences three sides of the rectangular garden letting his house compound wall act as fourth side fence. Find the dimensions of his garden.

Q3. The area of a right angled triangle is 600 sq.m. If the base of the triangle excced the altitude by 10cm, find the dimensions of the triangle.

Q4. The hypotenue of a right angled triangle is 6 cm more than twice the shorted side. If the third side is 2 cm less than the hypotenuse, find the sides of the triangle.

Q5. The perimeter of a right angled triangle is 70 units and its hypotenuse is 29 units. Find the length of the other sides.

Q6. The length of hypotenuse of a right triangle is one unit more than twice the length of the shortest side and the other side is one unit less than twic the length of the shortest side. Find the length of the other two sides.

Q7. The length of a hall is 5m more than its breath, if the area of the floor of the hall is $84m^2$, what are the length and the brath of the hall.

Q8. The length of the hypotenuse of a right triangle exceeds the length of the base by 2cm and exceed twice of the length of the Altitude by 1 cm. Find the sides of the triangle.

Q9. One side of a rectangle exceeds its other side by 2cm. If its area is 195 cm^2, determine the sides of the rectangle.

Q10. Vikarm, wisheds to fit three rods together in the shape of a right triangle. The hypotenuse is to be 2cm longer than the base and 4cm longer than the altitude. What should be the length of the rods.

Q11. The hypotenuse of a right -angled triangle is 1 m less than twice the shortest side. If the third side is 1m more than the shortest side, find the sides of the triangle.

Q12. A rectangular field is 20m long and 14m wide. There is a path of equal width all around it, having an area of $111m^2$. Find the width of path.

Q13. The diagonal of a rectangular field is 60m more than the shortest side. If the longer side is 30m more than the shorter side, find the sides of the field.

Q14. A chess board contains 64 equal squares and the area of. Each square is 6.25 cm^2. A border around the board is 2cm. Wide find the length of the side of the chess board.

Q15. The area of a right angled triangle is $165m^2$. Determine its base and altitude. If the latter exceeds the former by 7m.

Q16. The hypotenuse of a right angled triangle is 20m. If the difference between the length of the other side be 4m, find the other sides.

Q17. The length of the hypotenuse of a right triangle is 25cm. The difference of the lengths of the other two sides of the triangle is 5 cm. Find the lengths of these sides.

PRACTICE EXERCISE 4.17

Q1. A person on tour has Rs.360 for his expenses. If he extends his tour programme by 4 days, he must cut down his daily expenses by Rs.3 per day. Find the number of days of his tour programme.

Q2. Some students planned a picnic. The budget for food was Rs.500. Because five of the student failed to go the cost of food to each member got increased by Re.5. How many students attended the picnic?

Q3. Rs.250 were divided equally among a certain number of children. If there were 25 children more, each would have received 50 paise less. Find the number of children.

Q4. Rs.6500 were divided equally among a certain number of persons. had there been 15 more persons, each would have got Rs.30 less. Find the original number of persons.

Q5. Rs.9000 were divided equally among a certain number of persons. Had there been 20 more persons, each would have got Rs.160 less. Find the original number of persons.

Q6. A shopkeeper buy a number of books for Rs.80. If he had bought 4 more books for the same amount, each book would have cost him Rs.1 less. How many books did he buy?

Q7. A piece of cloth cost Rs.200. If the piece were 5 meter longer and the cost of each meter were Rs.2 less, the cost would have remained unchanged. How long is the piece and what its origianl rate per meter.

Q8. By a reduction of Re.1 per kg in the price of sugar Mohan can buy one kg sugar more for Rs 56. Find the original price of sugar per kilogram.

Q9. A person on tour has Rs.4200 for his expenses. If the extends his tour for 3 days, he has to cut down his daily expenses by Rs.70. Find the original duration of the year.

Q10. 300 apples are distributed equally among a certain number of students. Had there been 10 more students, each would have received one apple less. Find the number of students.

Q11. A man buys a number of pens for Rs.80. If he had bought 4 more pens for the same amount, each pen would have cost him Rs.1 less. How many pens did he buy.

Q12. If the price of a book is reduced by Rs.5, a person can buy 5 more books for Rs.300. Find the original list price of the book.

Q13. If the list price of a toy is reduced by Rs.2, a person can buy 2 toys more for Rs.360. Find the original price of the toy.

Q14. A piece of cloth costs Rs.35. If the piece were 4m longer and each meter costs Rs. one less the cost would remain unchanged. How long is the piece.

PRACTICE EXERCISE 4.18

Q1. An express train makes a run of 240 km at a certain speed. Another train whose speed is 12km/hr less then express train takes an hour longer to cover the same distance. Find the speed of the express train in km/hr.

Q2. A train covers a distance of 90 km at a uniform speed. Had the speed been 15km / hr more, it would have taken half an hour less for the journey. Find the original speed of the train.

Q3. A train travels a distance of 300 km at a constant speed. If the speed of the train is increased by 5 km/hr, the journey would have taken 2 hours less. Find the original speed.

Q4. The distance between Mumbai and Pune is 192 km. Travelling by Deccan Queen, it takes 48 minutes less than another train. Calculate the speed of the Deccan Queen if the speed of the two trains differ by 20 km/hr.

Q5. A passenger train takes 3 hours less for a journey of 360 km if its speed is increase by 10 km/hr from its usual speed. What is its usual speed.

Q6. If I had walked 1 km/hr faster, I would have taken 10 minutes less to walk 12 km. Find the rate of my walking.

Q7. A fast train takes 3 hours less than a slow train for a journey of 600 km. If the speed of the slow train is 10 km/hr less than that of the fast train, find the speed of the two trains.

Q8. Ram can row a boat 8 km downstream and return in 1 hour 40 minutes. If the speed of the stream is 2 km/hr. Find the speed of the boat in still water.

Q9. The speed of a boat in still water is 15 km/hr. it can go 30 km upstream and return downstream to the original point in 4 hours 30 minutes. Find the speed of the stream.

Q10. The speed of a boat in still water is 11 km/hr. It can go 12km upstream and return downstream to the original point in 2 hours 45 minutes. Find the speed of stream.

Q11. The speed of a boat in still water is 8 km/hr. It can go 15 km upstream and 22 km downstream in 5 hours. Find the speed of the stream.

Q12. A motor Boat, whose speed is 9km/hr insstill water goes 12km down stream and come back in a total time of 3 hr, find the speed of the stream.

Q13. In a flight of 600 km, an aircraft was slowed down due to bad wheather. The average speed for the trip was reduced by 40 km/hr and the time of flight increased by 30 minutes. Find the original duration of flight.

Q14. An Aeroplane left 50 minutes later than its shedule time, and in order to reach the destination, 1250 km away in time, it has to increase its speed by 250 km/hr from its usual speed. Find the usual speed of aeroplane.

Q15. A plane left 40 minutes late due to bad wheather and in order to reach its destination 1600 km away in time, it has to increase its speed by 400 km/hr from its usual speed. Find the usual speed of the plane.

Q16. The time taken by a person to cover 150 km was 2.5 hrs. more than the time taken in return journey. If he return at a speed of 10 km/hr more than the speed of going. What was the speed in each direction.

PRACTICE EXERCISE 4.19

Q1. The age of father is equal to the square of the age of his son. The sum of the age of the father and five times the age of the son is 66 year. Find their ages.

Q2. The difference of a mother's age and her daugther's age is 21years and the twelveth part of product of their ages is less than the mother's age by 18 year. Find the ages.

Q3. If a boy's age and his father's amount together its 24 years and the fourth part of the product of their ages, exceeds the boy's age by 9 years. Find how old they are.

Q4. 36 year hence, the age of a man will be square of what he was 36 years ago. Find the present age.

Q6. The product of Ramu's age five years ago and his age nine years later is 15. Determine Ramu's present age.

Q7. The sum of the ages of a father and his son is 45 years. Five years ago, the product of their ages was 124 years. Determine their present ages.

Q8. One year ago, a man was 8 times as old as his son. Now his age is equal to the square of his son's age. Find their present ages.

Q9. Ashu is x years old while his mother Veena is x^2 years old. Five years hence Mrs. Veena will be three time old as Ashu. Find their present ages.

Q10. The sum of the ages of man and his son 45 years. Five years ago, the product of their ages was four times the man's age at the time. Find their present ages.

Q11. The product of Shikha's age five year ago and her age 8 years later is 30, her age at both time being given in years. Find her present age.

Q12. The sum of the ages of a father and his son 54 years. Two years ago, the product of their ages was 400. Find their present ages.

Q13. Is the given situation is possible if so, determine their present ages. The sum of the ages of two friends is 20 years. Four years ago, the product of their ages in years is 120.

Q14. A girl is twice as old as her sister. Four years hence, the product of their ages will be 160. Find their present age.

Q15. The product of Meeta's age (in years) five years ago with her age (in years) 10 years later is 450. Find the present age of Meeta.

Q16. The sum of the reciprocals of Rehman's age 3 years ago and 5 years from now is 1/3. Find their present age.

Q17. Seven years ago Varun's age was five times the square of Swati age. Three years hence Swati's age will be two fifth of Varun's age. Find their present ages.

Q18. Rohan's mother age 26 years older then him. The product of their ages 3 years from now will is 360 years. Find the Rohan age.

PRACTICE EXERCISE 4.20 Miscellenious

Q1. The number of straight lines that can connect 'X' points is given by the formula : $y = 1/2\,0x(x-1)$. How many points are there, if only 15 lines can be drawn, connecting them?

Q2. In a group of children, each child gives a gift to every other child. If the number of gifts is 132. Find the number of children.

Q3. B is a point in the line segment AC such that it lies between A and C. If AB = 9cm and $AB \times AC = 12(BC)^2$, find BC.

Q4. A segment AB of 2 metre length is divided at C point two parts such that $AC^2 = AB \times BC$. Find the length of AC.

Q5. Two cyclist start at same time from a particular place, one cyclist has speed 1 km/hr faster than the second cyclist. The faster cyclist goes in the North direction and the slow cyclist goes in the East direction. If after one hour, they are $\sqrt{221}$ km apart. Find the speed of the faster cyclist.

Q6. If Tripti were younger by 5 years than what she really is, then the square of her age would have been 11 more than five times her actual age. Find the present age of Tripti.

Q7. A present Asha's age is 2 more than the square of her daughter Nisha's age. When Nisha grows to her mother's present age, Asha's age would be one year less than 10 times the present age of Nisha. Find the present age of both Asha and Nisha.

Q8. The sum of n successive odd natural numbers starting from 3 is given by the relation $s = n(n+2)$. Determine n, if the sum is 168.

Q9. The denominator of a fraction exceeds its numerator by 3, if one added to both numerator and denominator, the difference between the new and the original fraction is 1/24. Find the original fraction.

Q10. The sums of first even natural numbers is given by the relation $s = n(n+1)$, find n, if the sum is 420.

Q11. In a cricket match Kumnle took one wicket less than twice the number of wickets taken by Srinath. It the product of the number of wicket taken by these two is 15, find the number of wickets taken by each.

Q12. Two pipes running together can fill a cistern in $3\frac{1}{13}$ minutes if one pipe taken 3 minutes more than the other to fill. It find the time in which each pipe would fill the cistern.

Q13. A sum of Rs.1200 becomes Rs.1323 in 2 years at compound interest compound annually find the rate of interest.

Q14. In a class test, the sum of the marks obtained by Prem in mathematics and Science is 28. Had he got 3 marks more in Mathematics and 4 marks less in Science. The product of marks obtained in the two subjects, would have been 180. Find the marks obtained by him in the two subjects seperately.

Q15. A takes 10 days less than the time taken by B to finish a piece of work. If both A and B together can finish the work in 12 days. Find the time taken by B to finish work.

Q16. A factory kept increasing its output by the same percentage every year.

Q17. A dealer sells a toy for Rs.24 and gains as much per cent as the cost price of the toy. Find the cost price of the toy.

Q18. The angry Arjun carried some arrows for fighting with Bheeshm. With half the arrows, he cut down the arrows thrown by Bheeshm on him and with six other arrows he killed the rath driver of Bheeshm. With one arrow each he knocked down respectively the rath, flag and the bow of Bheeshm. Finally, with one more than four times the square root of arrows he laid Bheeshm unconscious on an arrow bed. Find the total number of arrows Arjun had.

Q19. One-fourth of a herd of camels was seen in the forest. Twice the square root of the herd had gone to mountains and the remaining 15 camels were seen on the bank of a river. Find the total number of camels.

Q20. A peacock is sitting on the top of a pillar, which is 9m high. From a point 27 m away from the bottom of the pillar, a snake is coming to its hole at the base of the pillar. Seeing the snake the peacock pounces on it. If their speeds are equal, at what distance from the whole is the snake caught?

Q21. If the list price of a toy is reduced by Rs.2, a person can buy 2 toys more for Rs.360. Find the original price of the toy.

Q22. A pole has to be erected at a point on the boundary of a circular park of diameter 13 meters in such a way that the difference of its distances from two diametrically opposite fixed gates A and B on the boundary is 7 meters. It is the possible to do so? If yes, at what distances from the two gates should the pole be erected?

Q23. In a class test, the sum of the marks obtained by P in Mathematics and science is 28. Had he hot 3 marks more in Mathematics and 4 marks less in Science. The product of his marks, would have been 180. Find his marks in the two subjects.

Q24. In a class test, the sum of Shefali's marks in Mathematics and English is 30. Had she got 2 marks more in Mathematics and 3 marks less in English, the product of her marks would have been 210. Find her marks in two subjects.

Q25. A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of production of each article (in rupees) was 3 more that twice the number of articles produces on that day. If the total cost of production on that day was Rs.90, find the number of articles produced and the cost of each article.

Q26. A chess board contains 64 equal squares and the area of each square is $12.25cm^2$. Aborder around the board is 3cm wide. Find the length of each side of the board.

Q27. In the centre of a rectangular lawn of dimensions 50 m x 40 m a rectangular pond has to be constructed so that the area of the grass border of uniform width surrounding the pond would be $1184m^2$. Find the length and breadth of the pond.

Q28. There is a square field whose side is 40m. A square flower bed is prepared in its centre leaving a gravel path around the flower bed. The total cost of laying the flower bed and gravelling the path at the rate of Rs. 2 per m respectively is Rs.4224. Find the width of the gravel path.

PRACTICE EXERCISE 4.21 Miscellenious (HOTS)

Q1. If the roots of the quadratic equation $(a-b)x^2+(b-c)x+(c-a)=0$ are equal. Prove that $b+c=2a$.

Q2. Prove that both the roots of the quadratic equation $(x-a)(x-b)+(x-b)(x-c)+(x-c)(x-a)=0$ are real but they are equal only when $a=b=c$.

Q3. If the roots of the equation $(c^2-ab)x^2-2(a^2-bc)\ x+(b^2-ac)=0$ are real and equal, show that either $a=0$ or $a^3+b^3+c^3=3abc$.

Q4. Solve for x : $\frac{x-a}{x-b}+\frac{x-b}{x-a}=\frac{a}{b}+\frac{b}{a}$

Q5. Solve for x : $\frac{a}{x-a}+\frac{b}{x-b}=\frac{2c}{(x-c)}$.

Q6. Solve for x : $x=\dfrac{1}{2-\dfrac{1}{2-\dfrac{1}{2-x}}}$

Q7. Solve for x : $\sqrt{6+\sqrt{6+\sqrt{6.....}}}$

Q8. If p, q r and s are real numbers such that $pr=2(q+s)$, then show that at least one value of the equation $x^2+px+q=0$ and $x^2+rx+s=0$ has real roots.

Q9. If the roots of the equation $x^2+2cx+bx=0$ are real and in equal, prove that the equation $x^2-2(a+b)x+a^2+b^2+2c=0$ has no real roots.

Q10. Prove that the equation $x^2(a^2+b^2)+2x(ac+bd)+(c^2+d^2)=0$ has no real roots.

Q11. If the roots of the equation $(a^2+b^2)x^2-2(ac+bd)x+(c^2+d^2)=0$ are equal. Prove that ad = bc or a : b : : c : d.

Q12. If the roots of the equation $ax^2+bx+c=0$ and $bx^2-2\sqrt{a}cx+b=0$ are simultaneously real, prove that $b^2=ac$.

Q13. If p and q are real and $p\neq q$, then show that the roots of the equation $(p-q)x^2+5(p+q)x-2(p-q)=0$ are real and unequal.

Q14. Solve : $\frac{1}{x+a}+\frac{1}{x+2a}+\frac{1}{x+2a}=\frac{3}{x}$

Q15. The angry arjun carried some arrows for fighting with Bheesm with half the arrows, he cut down the thrown by Bheesm on him and with six arrows he killed the rath driver of Bheesm with one arrow. Each he knocked down respectivity the rath, flag and the bow of Bheesm. Finally, with one more than four times the square roots of arrows he laid Bheesm unconscious on an arrow bed. Find the total number of arrows arjun had.

Q16. Out of a certain number of Saravs birds, one fourth the number are moving in Lotus plants, $\frac{1}{9}$th coupled with $\frac{1}{4}$th as well as 7 times the square root of the number move on a hill, 56 birds remain in Vakula Tree, what is the total number of birds.

Q17. A Peacock is sitting on the top of a pillar, which is 9m high from a point 27m away from the bottom of the pillar a snake is coming to its hole at the base of the pillar seeing the snake the Peacock pounces on it. If their speeds are equal, at what distance from the whole is the snake caught.

Q18. A man bought a certain number of Toys for Rs.180, he kept one for his use and sold the Rest for one for his use and sold the rest for one rupees each more than he gave for them, besides getting his own toy for nothing he made a profit of Rs.10. Find the number of toys.

Q19. X and Y are centres of circle of radius 9 cm and 2 cm. xy = 17 cm. Z is the centre of a circle of radius r cm. Which Touches the above circles externally. Given that $x+y=90^0$. Write an equation in 'r'.

Q20. Solve the following quadratic equation: $\frac{a}{x-b}+\frac{b}{(x-a)}=2$.

PRACTICE EXERCISE 4.22 (MIQ)

Q1. If x = 2 and x = 3, are the roots of the equation $3x^2 - 2kx + 2m = 0$ find the value of k and m.

Q2. The side of a square. Exceeds the side of another square by 4 cm and the sum of the areas of the two squares 400 cm^2. Find the dimensions of the square.

Q3. Find the value of k if the quadratic equation $4x^2 + 8x - k = 0$ has real roots.

Q4. Divide 29 into two parts. So that the sum of the squares of the parts is 425.

Q5. Find the value of pWhich will make the product of 2p – 5 and p – 4 equal in value to p + 8.

Q6. The sum of two number a and b is 15 and the sum of their reciprocals $\frac{1}{a}$ and $\frac{1}{b}$ is $\frac{3}{10}$. Find the number a and b.

Q7. Solve for x : $ax^2 (4a^2 - 3b)x - 12ab = 0$.

Q8. Show that the equation $x^2 + ax - 4 = 0$ has real and distinct roots for all real values of a.

Q9. The sum of two numbers is 15. If the sum of their reciprocal is $\frac{3}{10}$, find the number.

Q10. Show that the equation $2\left(a^2 + b^2\right)x^2 + 2\left(a + b\right)x + 1 = 0$ has no real roots, when $a \neq b$.

Q11. If one root of the equation $x^2 - 5x + k = 0$ is equal to 4, find the value of k and other root.

Q12. The sum of a number and its reciprocal is $2\frac{1}{30}$. Find the number.

Q13. Solve for x : $a^2b^2x^2 + b^2x - a^2x - 1 = 0$.

Q14. Seven years ago Varun's age was five times the square of Swati's age. Three years hence Swati's age will be two fifth of Varun's age. Find their present ages.

Q15. Find the value of k for which the given equation has real and equal roots :

$x^2 + k(4x + k - 1) + 2 = 0$

Q16. The area of a right angles triangle is 600 cm^2. If the base of the triangle exceeds the Actitude by 10cm, find the dimensions of triangle.

Q17. If –4 is root of the quadratic equation $x^2 + px - 4 = 0$ and the quadratic equation $x^2 + px + k = 0$ has equal roots, find the value of k.

Q18. A takes 10 days less than the time taken by B to finish a piece of work. If both A and B together can finish the work in 12 days, find the time taken by B to finish the work.

Q19. Solve for x : $2\left(\frac{x+2}{2x-3}\right) - 9\left(\frac{2x-3}{x+2}\right) = 3$.

Q20. Solve the following quadratic equation by compeleting the perfect square $6\sqrt{2}x^2 - 5x - 3\sqrt{2} = 0$.

Q21. A person on tour has Rs. 360 for his daily expenses. If he exceeds his tour programme by 4 days, he must cut down his daily

expenses by Rs. 3 per day. Find the number of days of his tour programme.

Q22. Solve the following quadratic equation by using quadratic formula $12abx^2-\left(9a^2-8b^2\right)x-6ab=0$.

Q23. In a flight of 600 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km / hour and the time increased by 30 minutes. Find the duration of the flight.

Q24. Solve the following quadratic equation by factorization $\frac{1}{a+b+x}=\frac{1}{a}+\frac{1}{b}+\frac{1}{x}$.

Q25. A piece of cloth costs Rs. 200. If the piece were 5 m longer and each meter of cloth costed Rs. 2 less, the cost of the piece would have remained unchanged. How long is the piece and what is its original rate per metre ?

Q26. Show that the quadratic equation $2x^2+4bx+4b^2$ has no real roots.

Q27. Rs. 6,500 were divided equally among a certain number of persons. Had there been 15 more persons, each would have got Rs. 30 less. Find the original number of persons.

Q28. Find the roots of quadratic equation : $4x^2+4\sqrt{3}x+3=0$.

Q29. An express train makes a run of 240 km at a certain speed. Another train whose speed is 12km / hr less takes an hour longer to cover the same distance. Find the speed of the express train in km/hr.

Q30. Find the roots of the quadratic equation : $4^{x+1}+4^{1-x}=0$.

Q31. A Teacher an attempting to arrange the students for mass drill inthe form of a solid square found 24 students were let 1. When he increased the size of square by one student he found that he was short of 25 students. Find the number of students.

Q32. Find the roots of quadratic equation:

$$\frac{x-1}{x-2}+\frac{x-3}{x-4}=3\frac{1}{3}.$$

Q33. Two pipes running together can fill a cistern in $2\frac{8}{11}$ minutes. If one pipe takes 1 minute more than the other to fill the cistern, find the time in which pipe would fill the cistern.

Q34. Find the value of k for which the quadratic equation $x^2-kx+9=0$ has real roots.

Q35. A two digit number is 4 times the sum of its digits and twice the product of its digits. Find the number.

Q36. Find the roots of the following quadratic equation by using quadratic formula $10ax^2-6x+15ax=9$.

Q37. If the price of a toy is reduced by Rs. 2, a person can buy 2 toys more for Rs.360. Find theoriginal price of the toy.

Q38. Find the roots of quadratic equation $\sqrt{10}x^2-\left(\sqrt{5}+\sqrt{2}\right)x+1=0$ by using quadratic formula.

Q39. Two numbers differ by 3 and their product is 504, find the numbers.

Q40. Find the value of k if the following quadratic equation has real and equal roots $5x^2 - 4x + 2 + k\left(4x^2 - 2x - 1\right) = 0$.

Q41. A two digit number is such that the product of its digits is 15. If 18 is added to the number, the digits interchange theie places. Find the number.

Q42. Write the nature of the roots of the following quadratic equaiton $3x^2 + 2\sqrt{6}x + 2$ real equation.

Q43. A passenger train takes 2 hours less for a journey of 300 km if its speed is increased by 5 km/hour from its usual speed. Find the usual speed of the train.

Q44. If one root of the quadratic equation $2x^2 + kx - 6 = 0$ is 2, find the value of k. Also find the other root.

Q45. Aeroplane left 30 minutes later than its schedule time and in order to reach destination 1500 km away in time, it has to increase its speed by 250 km/h from its usual speed. Determine its usual speed.

Q46. If the quadratic equation $x^2 - bx + 1 = 0$ has no real roots for all real values of a and b.

Q47. A speed of a boat in still water is 11 km/hr. It can go 12 km upstream and return downstream to the original point in 2 hours 45 minutes. Find the speed of the stream.

Q48. Show that the equation $x^2 + ax - 4 = 0$ has real and distinct roots for all real values of a and b.

Q49. Seven years ago Varun's age was five times the square of Swati's age. Three years hence Sawti's age will be two - fifth of Varun's age. Find their present ages.

Q50. Show that the equation $2\left(a^2 + b^2\right)x^2 + 2\left(a + b\right)x + 1 = 0$ has no real roots.

Q51. The numerator of a fraction is one less than its denominator. If three is added to each of the numerator and denominator, the fraction is increased by $\frac{3}{28}$. Find the fraction.

Q52. Find the roots of the following quadratic equation : $a^2b^2x^2 - \left(4b^4 - 3a^4\right)x - 12a^2b^2 = 0$.

Q53. The denominator of a fraction exceeds its numerator by 3. If one is added to both numerator and denominator, the difference between the new and the original fractions is $\frac{1}{24}$. Find the original fraction.

Q54. Find the roots of quadratic equation $a\left(x^2 + 4\right) = x\left(a^2 + 4\right)$ by using quadratic formula.

Q55. A person goes a distance of 30 km on his bicycle. The number of hours taken by him is one less than his average speed in km / hr. Find the time taken by him to complete the journey.

Q56. Solve the following quadratic equation : $\left(\frac{x}{x+1}\right)^2 - 5\left(\frac{x}{x+1}\right) + 6 = 0$. By factorization method.

Q57. If the equation $\left(1 + m^2\right)x^2 + 2mcx + c^2a^2 = 0$ has equal roots. Show that $c^2 = a^2\left(1 + m^2\right)$

Q58. For what value of k, $(4-k)x^2+(2k+4)x+(8k+1)=0$ is a perfect square.

Q59. A factory kept increasing the output by the same percentage. If it is known that output is double in the last two years. Find the rate of interest.

Q60. The Hypotenuse of a right angled triangle is 6m more than twice the shortest side. If the third side is 2m less than the hypotenuse, find the side of the triangle.

Q61. A pole has to be irrected at a point on the boundary of a circular park of diameter 13m, in such a way that the difference of its distances from the diametrically opposite distances from the two gates. Showed the pole to be errected.

Q62. Solve the following quadratic equation by using quadratic formula :

$$a(x^2+1)-x(a^2+1)=0$$

Q63. A dealer sells a toy for Rs.24 and gain as much percent as the cotst price of the toy. Find the cost price of the toy.

Q64. The difference of squares of two numbers is 88. If the larger number is 5 less than twice the smaller number, then find two numbers.

Q65. Find the roots of the following quadratic equation by factorization method :

$$\frac{2}{x^2}-\frac{5}{x}+2=0$$

Q66. One year ago, a man was 8 times as old as his son. Now his age is equal to the square of his son's age. Find their present ages.

Q67. Find the value of k if the following quadratic equation has real and equal roots.

$$kx^2+kx+1=0-4x^2-x$$

Q68. If the price of a book is reduced by Rs.5, a person can buy 5 more book for Rs.300. Find the original list price of the book.

Q69. Find the roots of the following quadratic equaiton by factorization method :

$$x^2+x-(a+1)(a+2)=0$$

Q70. Divide 16 into two parts such that twice the square of the larger part exceeds the square of the smaller part by 164.

Q71. Find the roots of the following quadatic equation by using quadratic formula.

$$\frac{x}{x+1}+\frac{x+1}{x}=\frac{34}{15}$$

Q72. One fourth of a heard of camels was seen in the forest twice the square root of the heard had gone to mountains and the remaining 15 camels were seen on the bank of a river. Find the total number of camels.

Q73. If $x=2$ and $-\frac{1}{3}$ are the solution of following quadratic equation then find the values of a and b $2x^2-3ax+2b=0$.

Q74. The sum of the squares of two positive integer is 208 if the square of the larger number is 18 times the smaller number, find the number.

Q75. Solve the following quadratic equation by completing the perfect square

$$\frac{x+3}{x-3}-\frac{1-x}{x}=\frac{17}{4}$$

Q76. The denominator of a fraction is one more than twice the numerator if the sum of the fraction and its reciprocal is $2\frac{16}{21}$. Find the fraction.

SELF EVALUATION TEST SERIES

M.M : 25 **M.T: 60 min.**

T E S T - 1

Q1. If x = 2 and x = 3 are roots of the equation $3x^2 - 2kx + 2m = 0$, find the value of k and m. **2**

Q2. If one root of the quadratic equation $2x^2 + kx - 6 = 0$ is 2, find the value of k also find the other root. **2**

Q3. Solve the following quadratic equation by factorisation method. **2**

$$y^2 + 2\sqrt{3}y + 3 = 0$$

Q4. Solve the following quadratic equation by factorization method. **3**

$$ad^2x\left(\frac{a}{b}x + \frac{2c}{d}\right) + c^2b = 0$$

Q5. Solve the following quadratic equation by using quadratic formula. **4**

$$3y^2 + (6 + 4a)y + 8a = 0$$

Q6. Solve the following quadratic equation by using quadratic formula. **4**

$abx^2 - (a^2 - b^2)x - ab = 0$

Q7. Determine weather the quadratic equation $2x^2 + 5\sqrt{3}x + 6 = 0$ has a real root and if so find those roots. **4**

Q8. Some students planned a picnic. The budget for food was Rs. 24. Because four of the group failed to go, the cost of food to each member got increased by Re. 1. How many students attended picnic. **4**

Q9. Find the roots of quadratic equations by using quadratic formula :

$4x^2 - 2(a^2 + b^2)x + a^2b^2 = 0$ **4**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

M.M : 25 **M.T: 60 min.**

T E S T - 2

Q1. Find the value of k if x = 2 is the solution of the equation $kx^2 - 3x + 2 = 0$ **2**

Q2. Determine, if 3 is a root of the equation given

$$\sqrt{x^2 - 4x + 3} + \sqrt{x^2 - 9} = \sqrt{4x^2 - 14x + 16}$$

2

Q3. Solve the following quadratic equation by using quadratic formula. $a(x^2 - 1) = x(a^2 - 1)$ **2**

Q4. Solve the following quadratic equation by using quadratic formula. **3**

$$\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x\quad 4}$$

Q5. Solve the following quadratic equation by using factorization method **4**

$$2x^2 + \left(2 + \sqrt{5}\right)x + \sqrt{5} = 0$$

Q6. Find the value of p if the quadratic equation $2x^2 + 3x + p = 0$ has no real root. **4**

Q7. Find the value of p if the quadratic equation $2x^2 - 5x + p = 0$ has no real roots. **4**

Q8. A passenger train takes 2 hours less for a journey of 300 km if its speed is increased by 5 km/hr from its usual speed. What is tits usual speed. **4**

Q9. Find the value of *k* for which the equation $9x^2 - 24x + k = 0$ has equal roots. Also find the roots. **4**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

SELF EVALUATION TEST SERIES

M.M : 25 **M.T: 60 min.**

T E S T - 3

Q1. If -4 is a root of the equation $x^2 + px - 4$ and the equation $x^2 + px + k = 0$ has equal roots find the value of K ? **2**

Q2. Solve the quadratic equations by using quadratic formula : **2**

$x^2 + x - (a + 1)(a + 2) = 0$

Q3. Solve the following equation by reducing to quadratic equation : **2**

$$\left(\frac{2x}{x-5}\right)^2 + 5\left(\frac{2x}{x-5}\right) - 24 = 0$$

Q4. If the equation $(1 + m^2)x^2 + 2mcx + c^2 - a^2 = 0$ has equal roots, show that $c^2 = a^2(1 + m^2)$ **3**

Q5. Find the positive value of k for which the equation $x^2 + kx + 64 = 0$ and $x^2 + 8x + k = 0$ will have real roots. **4**

Q6. Find the nature of the roots of following quadratic equation : **4**

$$2\left(a^2 + b^2\right)x^2 + 2(a + b)x + 1 = 0$$

Q7. Solve for x : $\dfrac{1}{P + q + x} = \dfrac{1}{P} + \dfrac{1}{q} + \dfrac{1}{x}$ **4**

Q8. Out of group of Swans, $\frac{7}{2}$ times the square root of the total number are playing on the shore of a pond. The two remaings once are swinging in water. Find the total number of Swans. **4**

Q9. Solve the following equation by using quadratic formula $4x^2 - 2\left(a^2 + b^2\right)x + ab^2 = 0$. **4**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

M.M : 25 **M.T: 60 min.**

T E S T - 4

Q1. Solve for x : $5^{2x} - 5^{x+3} + 125 = 5^x$ **2**

Q2. Solve for x : $ax^2 + (4a^2 - 3b)x - 12ab = 0$ **2**

Q3. Solve for x : $10ax^2 - 6x + 15ax = 9$ **3**

Q4. Find the value of α such that the quadratic equation has real and equal roots : $(\alpha - 12)x^2 + 2(\alpha - 12)x + 2 = 0$ **2**

Q5. Solve for x : $4x^2 + 4\sqrt{3}x + 3 = 0$ **3**

Q6. Solve for x : $2\left(\dfrac{2x-1}{x+3}\right) - 3\left(\dfrac{x+3}{2x-1}\right) = 5$ **4**

Q7. A two digit number is such that the product of its digit is 12. When 9 is added to the number the digit interchange their places. determine the number. **4**

Q8. In a flight of 600 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km/hr and the time increase by 30 minutes. Find the duration of the flight. **4**

Q9. One fourth of a heard of camels seen in the forest twice the square root of the heard had gone to mountains and the remaining 15 camels were seen on the bank of a river. Find the total number of camels. **4**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

ANSWERS SHEET

EXERCISE - 4.1

1.	Yes	**2.**	Yes	**3.**	No	**4.**	Yes	**5.**	No	**6.**	Yes
7.	Yes	**8.**	Yes	**9.**	No	**10.**	Yes	**11.**	Yes	**12.**	Yes
13.	No	**14.**	No	**15.**	No	**16.**	Yes	**17.**	Yes	**18.**	No
19.	No	**20.**	Yes	**21.**	Yes	**22.**	No	**23.**	Yes	**24.**	Yes
25.	Yes	**26.**	Yes	**27.**	Yes	**28.**	Yes	**29.**	No	**30.**	Yes
31.	Yes	**32.**	Yes	**33.**	Yes	**34.**	No	**35.**	Yes	**36.**	Yes
37.	Yes	**38.**	No	**39.**	No	**40.**	No	**41.**	No	**42.**	No
43.	No	**44.**	Yes	**45.**	Yes	**46.**	Yes	**47.**	Yes	**48.**	No
49.	No	**50.**	Yes	**51.**	No	**52.**	Yes	**53.**	Ys	**54.**	No
55.	No	**56.**	No	**57.**	Yes	**58.**	Yes	**59.**	Yes	**60.**	No
61.	Yes	**62.**	Yes	**63.**	No	**64.**	No	**65.**	Yes	**66.**	No
67.	No	**68.**	No	**69.**	Yes	**70.**	Yes	**71.**	Yes	**72.**	Yes
73.	No	**74.**	Yes								

EXERCISE - 4.2

1.	yes	**2.**	No	**3.**	Yes	**4.**	No	**5.**	Yes	**6.**	Yes
7.	Yes	**8.**	Yes	**9.**	Yes	**10.**	Yes	**11.**	Yes	**12.**	No
13.	Yes	**14.**	No	**15.**	No	**16.**	Yes	**17.**	Yes	**18.**	No
19.	Yes	**20.**	Yes	**21.**	Yes	**22.**	Yes	**23.**	Yes	**24.**	Yes
25.	Yes	**26.**	Yes	**27.**	Yes	**28.**	Yes	**29.**	Yes	**30.**	Yes
31.	Yes	**32.**	Yes	**33.**	Yes	**34.**	No	**35.**	Yes	**36.**	No
37.	Yes	**38.**	No	**39.**	No	**40.**	No	**41.**	Yes	**42.**	Yes
43.	Yes	**44.**	Yes	**45.**	No	**46.**	No	**47.**	No	**48.**	No
49.	Yes	**50.**	Yes	**51.**	Yes	**52.**	No	**53.**	Yes	**54.**	Yes

55. Yes

EXERCISE - 4.3

1.	$k=\frac{1}{6}$	**2.**	$k = ab$	**3.**	$k = 1$	**4.**	$k=2a^2$
5.	$k=-\frac{1}{4}$	**6.**	$k=\frac{-9}{4}$	**7.**	$k=-a^2$	**8.**	$k=-1$
9.	$k=0$	**10.**	$k=\frac{-38}{11}$	**11.**	$\left(k=\frac{7}{8}\right)$	**12.**	$\left(k=-\frac{16}{3}\right)$
12.	$\left(k=a^2+2\right)$	**13.**	$\left(k=-4\right)$	**14.**	$\left(k=-\frac{1}{4}\right)$	**15.**	$\left(k=\frac{-5}{18}\right)$
16.	$\left(k-\frac{\left(2+2a^3\right)}{3a}\right)$	**17.**	$\left(k=\frac{-9}{4a^2}\right)$	**18.**	$\left(k=0\right)$	**19.**	$\left(k=0\right)$

20.	$(k=-12)$	**22.**	$\left(k=\frac{-19}{2}\right)$	**23.**	$\left(k=\frac{9}{2}\right)$	**24.**	$(k=6)$
25.	$(k=-2/9)$	**26.**	$(k=76)$	**27.**	$\left(k=\frac{-9}{4}\right)$	**28.**	$(k=-6,+5)$
29.	$\left(k=1,\frac{1}{2}\right)$	**30.**	$(k=-3/48)$	**31.**	$(k=-22)$	**32.**	$(k=0)$
33.	$(k=-4)$	**34.**	$(k=0)$	**35.**	$(k=0)$	**36.**	$(k=3)$
37.	$\left(k=\frac{3}{2a}\right)$	**38.**	$(k=1)$	**39.**	$\left(k=\frac{-47}{60}\right)$	**40.**	$\left(k=-\left(4+\sqrt{3}\right)\right)$
41.	$\left(k=\frac{4}{17}\right)$	**42.**	$(k=-17)$	**43.**	$\left(k=-\frac{49}{6}\right)$	**44.**	$(k=0)$
45.	$(k=1)$	**46.**	$k=\frac{-16}{3}$	**47.**	$k=\frac{-17}{6}$	**48.**	$k=-26$
49.	$k=\frac{-19}{18}$	**50.**	$k=-1$				

EXERCISE - 4.4

1.	0, 19/6	**2.**	0, –4	**3.**	0, 15	**4.**	x = 0, 5
5.	0, 1	**6.**	0, 2	**7.**	$0,\frac{1}{3\sqrt{2}}$	**8.**	0, b/a
9.	$\frac{2b}{3a}$, 0	**10.**	5, – 5	**11.**	10, – 10	**12.**	0.3, – 0.3
13.	$0,\frac{1}{\sqrt{3}}$	**14.**	$\frac{5}{6},\frac{-5}{6}$	**15.**	$\frac{\sqrt{2}}{\sqrt{3}},\frac{-\sqrt{2}}{\sqrt{3}}$	**16.**	$\frac{cd}{ab},\frac{-cd}{ab}$
17.	$\frac{5\sqrt{5}}{2\sqrt{3}},\frac{-5\sqrt{5}}{2\sqrt{3}}$	**18.**	$-\sqrt{2},\sqrt{2}$	**19.**	$-7,\frac{3}{2}$	**20.**	$4,\frac{2}{3}$
21.	$-\frac{5}{6},\frac{2}{3}$	**22.**	$-\frac{4}{5},\frac{2}{3}$	**23.**	$-\frac{5}{2},\frac{2}{3}$	**24.**	$-\frac{5}{6},\frac{3}{5}$
25.	$\frac{4}{3},\frac{3}{8}$	**26.**	$5,-\frac{3}{2}$	**27.**	$\frac{7}{3},-\frac{3}{2}$	**28.**	$\frac{7}{5},-\frac{4}{3}$
29.	$7,-1$	**30.**	$\frac{7}{2},-3$	**31.**	$\frac{7}{5},-\frac{4}{3}$	**32.**	$-3\sqrt{5},\ 2\sqrt{5}$
33.	$-5\sqrt{2},3\sqrt{2}$	**34.**	$2,-\frac{5}{3}$	**35.**	$9,-3$	**36.**	$\frac{7}{4},\frac{1}{4}$
37.	12, 9	**38.**	16, – 5	**39.**	– 12, 13	**40.**	–3, 35
41.	8, – 5	**42.**	8, – 5	**43.**	$-3,-4$	**44.**	$\frac{2}{\sqrt{3}},1$
45.	$\frac{-1}{5},-3$	**46.**	$\frac{-3}{2},\frac{-4}{3}$	**47.**	$\frac{-2}{3},\frac{-4}{3}$	**48.**	$\frac{-1}{2},-\frac{1}{7}$

49.	$6, \frac{-15}{2}$	**50.**	$-7, \frac{3}{2}$	**51.**	$4, \frac{2}{3}$	**52.**	$-4, -3$
53.	$-4, \frac{3}{2}$	**54.**	$-5, 2$	**55.**	$\frac{3}{2}, \frac{-1}{3}$	**56.**	$\frac{3}{2}, -\frac{1}{2}$
57.	$2, \frac{-2}{5}$	**58.**	$\frac{3}{2}, \frac{-1}{3}$	**59.**	$3, \frac{5}{2}$	**60.**	$4, -2$
61.	$\frac{1}{2}, \frac{1}{2}$	**62.**	$\frac{-2}{3}, \frac{2}{25}$	**63.**	$1, \frac{1}{10}$	**64.**	$\frac{3}{2}, \frac{-1}{3}$
65.	$2, 1$	**66.**	$3, 1$	**67.**	$-2, 1$	**68.**	$4, 1$
69.	$1, \frac{4}{5}$	**70.**	$1, \frac{-8}{9}$	**71.**	$1, 1$	**72.**	$1, \frac{-6}{7}$
73.	$1, 1$	**74.**	$\frac{1}{3}, \frac{1}{4}$	**75.**	$1, \frac{-3}{18}$	**76.**	$1, \frac{-2}{19}$
77.	$1, 1$	**78.**	$-1, \frac{3}{4}$	**79.**	$\frac{1}{5}, \frac{1}{20}$	**80.**	$1, \frac{-1}{3}$
81.	$25, -27$	**82.**	$\frac{-2}{51}, -\frac{1}{2}$	**83.**	$\frac{1}{9}, -1$	**84.**	$\frac{1}{7}, \frac{-1}{2}$
85.	$\frac{-3}{20}, \frac{1}{5}$	**86.**	$-1000, 750$	**87.**	$86, -60$	**88.**	$-54, 6$
89.	$3, -8$	**90.**	$50, -60$				

EXERCISE - 4.5

1.	$-\sqrt{2}, -\frac{1}{\sqrt{2}}$	**2.**	$-\sqrt{5}, \frac{3}{\sqrt{5}}$	**3.**	$\sqrt{3}, \frac{-5}{2\sqrt{3}}$	**4.**	$\frac{-3}{\sqrt{5}}, \frac{-\sqrt{3}}{5}$
5.	$\sqrt{2}, \frac{4}{7\sqrt{2}}$	**6.**	$\frac{5\sqrt{3}}{2}, \frac{1}{3\sqrt{3}}$	**7.**	$\frac{-2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$	**8.**	$-3\sqrt{3}, \frac{-2}{\sqrt{3}}$
9.	$\frac{1}{2\sqrt{3}}, \sqrt{3}$	**10.**	$\sqrt{5}, \frac{1}{\sqrt{5}}$	**11.**	$-\sqrt{3}, \frac{-\sqrt{3}}{2}$	**12.**	$\frac{-2}{\sqrt{7}}, \frac{-2}{\sqrt{7}}$
13.	$\frac{-1}{\sqrt{3}}, \frac{5}{2\sqrt{3}}$	**14.**	$\frac{-\sqrt{3}}{5}, \frac{-\sqrt{3}}{2}$	**15.**	$\frac{-\sqrt{2}}{4}, \frac{\sqrt{2}}{2}$	**16.**	$\frac{-1}{4\sqrt{2}}, \frac{-1}{2\sqrt{2}}$
17.	$\frac{1}{\sqrt{5}}, \frac{-3}{2\sqrt{5}}$	**18.**	$\frac{1}{\sqrt{7}}, \frac{\sqrt{7}}{3}$	**19.**	$\frac{3\sqrt{2}}{7}, -2$	**20.**	$\frac{\sqrt{2}}{7}, \frac{-\sqrt{2}}{3}$
21.	$\frac{\sqrt{7}}{2}, \frac{2}{3\sqrt{7}}$	**22.**	$\sqrt{5}, \frac{1}{\sqrt{5}}$	**23.**	$\frac{\sqrt{7}}{3}, \frac{1}{\sqrt{7}}$	**24.**	$\frac{-3}{\sqrt{13}}, \sqrt{13}$
25.	$\frac{4}{3\sqrt{2}}, \sqrt{2}$	**26.**	$\frac{1}{\sqrt{3}}, -\sqrt{3}$	**27.**	$\frac{-1}{2\sqrt{2}}, \sqrt{2}$	**28.**	$-\sqrt{3}, \frac{-1}{\sqrt{3}}$
29.	$\frac{4}{\sqrt{5}}, -\sqrt{5}$	**30.**	$\frac{-1}{\sqrt{7}}, \frac{\sqrt{7}}{6}$	**31.**	$\frac{-3\sqrt{3}}{5}, \frac{2}{\sqrt{3}}$	**32.**	$\frac{\sqrt{10}}{10}, \frac{1}{\sqrt{10}}$

33. $\frac{3\sqrt{3}}{2\sqrt{7}}, \frac{-\sqrt{7}}{\sqrt{3}}$ **34.** $\frac{1}{\sqrt{7}}, 2\sqrt{7}$ **35.** $\frac{-2}{\sqrt{5}}, \frac{\sqrt{15}}{3}$ **36.** $\frac{4}{\sqrt{5}}, \frac{-2\sqrt{2}}{4}$

37. $\frac{2}{2\sqrt{2}}, \frac{-3}{\sqrt{2}}$ **38.** $\frac{2}{3\sqrt{3}}, \frac{2}{\sqrt{3}}$ **39.** $\frac{1}{\sqrt{2}}, \frac{-7}{5\sqrt{2}}$ **40.** $\frac{-1}{\sqrt{13}}, \sqrt{13}$

41. $\frac{\sqrt{13}}{2}, \frac{6}{\sqrt{13}}$ **42.** $\frac{\sqrt{7}}{3}, \frac{-3\sqrt{7}}{14}$ **43.** $\frac{2}{\sqrt{2}}, \sqrt{2}$ **44.** $-3, \sqrt{19}$

45. $\frac{\sqrt{2}}{5}, \frac{1}{\sqrt{2}}$ **46.** $\frac{\sqrt{2}}{2}, \frac{1}{\sqrt{2}}$ **47.** $\frac{\sqrt{2}}{2}, \frac{-4\sqrt{2}}{5}$ **48.** $\frac{2}{\sqrt{13}}, \frac{-\sqrt{13}}{3}$

49. $-\frac{1}{\sqrt{3}}, \frac{-5}{2\sqrt{3}}$ **50.** $2\sqrt{2}, 2\sqrt{2}$ **51.** $3\sqrt{2}, \sqrt{2}$ **52.** $-6\sqrt{2}, 5\sqrt{2}$

53. $-\frac{\sqrt{3}}{2\sqrt{5}}, \frac{\sqrt{3}}{\sqrt{5}}$ **54.** $\sqrt{2}, \sqrt{2}$ **55.** $10\sqrt{2}, -5\sqrt{2}$ **56.** $\frac{1}{2\sqrt{3}}, \frac{1}{2\sqrt{3}}$

57. $\frac{-1}{2\sqrt{2}}, \frac{1}{25\sqrt{2}}$ **58.** $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$ **59.** $\sqrt{2}, \sqrt{2}$ **60.** $\frac{7}{\sqrt{3}}, \frac{7}{\sqrt{3}}$

61. $\sqrt{13}/6, -\sqrt{13}/6$ **62.** $-\frac{1}{4\sqrt{2}}, \frac{-1}{4\sqrt{2}}$ **63.** $\frac{-1}{\sqrt{7}}, \frac{2}{7\sqrt{7}}$ **64.** $\frac{-2}{\sqrt{3}}, \frac{-2}{\sqrt{3}}$

65. $\frac{1}{\sqrt{5}}, \frac{1}{\sqrt{5}}$ **66.** $\frac{-1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}$ **67.** $\frac{-7}{6\sqrt{3}}, \frac{-7}{6\sqrt{3}}$ **68.** $\frac{\sqrt{7}}{5}, \frac{-\sqrt{7}}{5}$

69. $\frac{1}{5\sqrt{2}}, \frac{1}{3\sqrt{2}}$ **70.** $\frac{-1}{\sqrt{7}}, \sqrt{7}$ **71.** $\frac{1}{\sqrt{6}}, \frac{1}{\sqrt{6}}$ **72.** $\frac{1}{4\sqrt{2}}, \frac{-1}{\sqrt{2}}$

73. $\frac{6}{4\sqrt{3}}, \frac{-2}{\sqrt{3}}$ **74.** $\frac{-\sqrt{5}}{10}, -2\sqrt{5}$ **75.** $\frac{2}{6\sqrt{13}}, \frac{-1}{\sqrt{13}}$ **76.** $\frac{-\sqrt{5}}{4}, \frac{-2\sqrt{5}}{3}$

77. $\frac{-\sqrt{3}}{9}, \frac{\sqrt{3}}{8}$ **78.** $\frac{-1}{\sqrt{17}}, \frac{-2}{\sqrt{17}}$ **79.** $\frac{\sqrt{7}}{3}, \frac{-\sqrt{7}}{5}$ **80.** $\frac{-2}{\sqrt{3}}, \frac{-2}{\sqrt{3}}$

81. $\frac{5}{\sqrt{7}}, \frac{5}{\sqrt{7}}$ **82.** $\frac{8}{2\sqrt{13}}, \frac{8}{2\sqrt{3}}$ **83.** $\frac{11}{6\sqrt{3}}, \frac{11}{6\sqrt{3}}$ **84.** $\frac{5}{2\sqrt{7}}, \frac{5}{2\sqrt{7}}$

85. $\frac{4}{\sqrt{5}}, \frac{4}{\sqrt{5}}$ **86.** $\frac{5}{7\sqrt{3}}, \frac{5}{7\sqrt{3}}$ **87.** $\frac{5}{8\sqrt{3}}, \frac{5}{8\sqrt{3}}$ **88.** $\frac{11}{9\sqrt{13}}, \frac{11}{2\sqrt{13}}$

89. $\frac{-5}{6\sqrt{7}}, \frac{-5}{6\sqrt{7}}$ **90.** $\frac{-1}{9\sqrt{2}}, \frac{-1}{9\sqrt{2}}$ **91.** $\frac{2}{\sqrt{7}}, \frac{2}{\sqrt{7}}$ **92.** $\frac{-1}{2\sqrt{3}}, \frac{-1}{2\sqrt{3}}$

93. $-\sqrt{2}, \frac{5\sqrt{2}}{11}$

EXERCISE - 4.6

1. $-9, 7$ **2.** $-4, \frac{9}{4}$ **3.** $6, \frac{40}{3}$ **4.** $4, \frac{-2}{9}$ **5.** $5, \frac{1}{2}$

6.	$3, \frac{4}{3}$	**7.**	$-1, -\frac{25}{5}$	**8.**	$-10, \frac{-1}{5}$	**9.**	$\frac{-4}{3}, \frac{1}{8}$	**10.**	$5, \frac{5}{2}$
11.	$\frac{13}{4}, \frac{1}{2}$	**12.**	$-17, 3$	**13.**	$25, \frac{15}{4}$	**14.**	$-15, 12$		
15.	$(2+2\sqrt{3})(2-2\sqrt{3})$			**16.**	$\frac{-25}{2}, 2$	**17.**	$1000, -800$		
18.	$-4, \frac{9}{4}$	**19.**	$-\frac{1}{5}, 5$	**20.**	(-1)	**21.**	$10, 5$		
22.	$3, -\frac{7}{11}$	**23.**	$32, -36$	**24.**	$-2, \frac{-3}{2}$	**25.**	$-1, \frac{23}{5}$		
26.	$\frac{-4}{3}, \frac{1}{8}$	**27.**	$(2, -6)$	**28.**	$5, \frac{5}{2}$	**29.**	$-9, 7$		
30.	$2, -5$	**31.**	$1,3$	**32.**	$\frac{-5}{2}, \frac{3}{2}$	**33.**	$5,-1$		
34.	$-1000, 750$	**35.**	$2, -\frac{37}{13}$	**36.**	$-1,5$	**37.**	$0, 9$		
38.	$2400, -2000$	**39.**	$3, \frac{-7}{12}$	**40.**	$5, 5/2$	**41.**	$\frac{-4}{3}, \frac{1}{8}$		
42.	$12, 2$	**43.**	$40, 6$	**44.**	$(1, -2)$	**45.**	$2, -8$		
46.	$-2, 0, 4, \frac{2}{5}$	**47.**	$(2, 1)$	**48.**	$-25, 1$				

EXERCISE - 4.7

1.	$\frac{4b}{9a}, \frac{-b}{a}$	**2.**	$\frac{-1}{a^2}, \frac{3}{a^2}$	**3.**	$-\frac{1}{a}, \frac{-1}{2a}$	**4.**	$\frac{-2}{p}, \frac{-2}{p}$		
5.	$a, \frac{a}{3}$	**6.**	$\frac{-6}{p^2}, \frac{4}{p^2}$	**7.**	$\frac{7}{6a}, \frac{-1}{a}$	**8.**	$\frac{-3b}{a}, \frac{-b}{a}$		
9.	a, b	**10.**	$\frac{q}{p}, \frac{-3q}{7p}$	**11.**	$\frac{p^2}{16}, \frac{-p^2}{4}$	**12.**	$\frac{q}{p}, \frac{-3q}{5p}$		
13.	$\frac{1}{a}, \frac{-8}{3a}$	**14.**	$\frac{-b}{4a}, \frac{2b}{9a}$	**15.**	$\frac{q}{p}, \frac{-q}{3p}$	**16.**	$-b, \frac{-2b}{13}$		
17.	$\frac{-q}{p}, \frac{-q}{p}$	**18.**	$-q, \frac{2q}{25}$	**19.**	$\frac{-3b}{a}, \frac{-2b}{a}$	**20.**	$\frac{2b}{a^2}, \frac{-b}{a^2}$		
21.	$\frac{7b}{3a}, \frac{b}{a}$	**22.**	$-1, \frac{-\sqrt{5}}{2}$	**23.**	$-1, \frac{-1}{\sqrt{2}}$	**24.**	$-1, \frac{-2}{\sqrt{3}}$		
25.	$-1, -\sqrt{2}/6$	**26.**	$-1, -\sqrt{2}/7$	**27.**	$-1, -\sqrt{2}/5$	**28.**	$-1, \frac{-1}{\sqrt{3}}$		

29. $-1, \frac{-\sqrt{5}}{7}$ **30.** $-1, -\sqrt{7}/3$ **31.** $-1, \sqrt{2}/6$ **32.** $-1, \frac{\sqrt{5}}{7}$

33. $-1, \frac{-\sqrt{2}}{13}$ **34.** $-1, \sqrt{5}/2$ **35.** $1, -\sqrt{7}/3$ **36.** $1, \sqrt{3}/2$

37. $-1, -\sqrt{5}/\sqrt{2}$ **38.** $-1, \frac{q^2}{p^2}$ **39.** $-b/a, -1$ **40.** $-b/a, c/b$

41. $\frac{3a}{4b}, \frac{-2b}{3a}$ **42.** a, b **43.** $4/a, a$ **44.** $-4a, \frac{3b}{a}$

45. $2a, b$ **46.** $2, -1$ **47.** $-\frac{1}{a}, -a$ **48.** $\frac{-a}{a+b}, \frac{-(a+b)}{a}$

49. $\frac{a^2}{2}, \frac{b^2}{2}$ **50.** $\frac{-cb}{ad}, \frac{-cb}{ad}$ **51.** $\frac{4b^2}{a^2}, \frac{-3a^2}{b^2}$ **52.** $-1/a^2, \frac{1}{b^2}$

53. $a/3, b/3$ **54.** $\frac{b^2}{a^2}, -1$ **55.** $-1, -b/a$ **56.** a, b

57. a, b **58.** $b^2, \frac{1}{a^2}$ **59.** $4b, -4b$ **60.** $\frac{5b}{4}, \frac{-5b}{4}$

61. $-1/\sqrt{5}, -1/\sqrt{2}$ **62.** $-\sqrt{5}, -2$ **63.** $-1/\sqrt{2}, -\sqrt{2}/\sqrt{5}$ **64.** $-\sqrt{5}, --\sqrt{2}/\sqrt{5}$

65. $\frac{1}{a}, a$ **66.** $-a, -b$

EXERCISE - 4.8

1. $-(a-b), -(a+b)$ **2.** $\frac{-n \pm \sqrt{mn}}{m}$ **3.** $-1, \frac{-1}{5a-3}$

4. $\frac{b^{25}}{a^{50}}, \frac{2b^{50}}{a^{50}}$ **5.** $\sqrt{\frac{5}{7}}, \sqrt{\frac{7}{5}}$ **6.** $\left(\frac{\sqrt{3}}{4}, \frac{-2\sqrt{3}}{3}\right)$

7. $\left(-\frac{\sqrt{7}}{3}, \frac{\sqrt{7}}{7}\right)$ **8.** $\left(\frac{2\sqrt{6}}{3}, \frac{13\sqrt{7}}{7}\right)$ **9.** $\left(-\sqrt{7}, \frac{13\sqrt{7}}{7}\right)$

10. $\left(4, \frac{-2}{9}\right)$ **11.** $\left(3, \frac{4}{3}\right)$ **12.** $\left(-\frac{b}{a}\right)$

13. $1, 64$ **14.** $1, 64$ **15.** $8, 81$

16. 3 **17.** 7 **18.** $125, -27$

19. $-(a-\sqrt{5}), -(a+\sqrt{5})$ **20.** $-7/3, -1/3$ **21.** $-1, \frac{3-a}{2a-5}$

22. $(a+2), (a-2)$ **23.** $\frac{-2b}{3a}, \frac{-2b}{a}$ **24.** $(a+b)(a-b)$

25. $(2a+b)(2a-b)$ **26.** $\left(\frac{a+b}{2}, \frac{a-b}{2}\right)$ **27.** $\frac{a+1}{3}, \frac{a-1}{3}$

28. $\frac{-a}{a+b}, -\frac{a+b}{b}$ **29.** $-(a+2),(a+1)$ **30.** $-(a+2),(a-1)$

31. $\frac{-(a+1)}{2a-5}, -1$ **32.** $-1, \frac{a-1}{a+6}$ **33.** $\frac{98}{33}, \frac{133}{33}$

34. $(0,\ a+b)$ **35.** $a-6, -(a+5)$ **36.** $\frac{-1}{2a-3}, \frac{1}{3a+2}$

37. $-a, \frac{1}{a}$ **38.** $\left(6\frac{1}{24}, 4\frac{23}{24}\right)$ **39.** $\frac{1}{a+2}, \frac{-3}{2a-4}$

40. $\left(\frac{2b}{a}, \frac{b}{a}\right)$ **41.** $\frac{1}{a+\sqrt{3}}, \frac{-1}{a-\sqrt{3}}$ **42.** $(a+2), (a-1)$

43. $0,3$ **44.** $-2,\ 0$ **45.** $\frac{1}{2}, \frac{-1}{2}$

46. $2,\ 3$ **47.** $1, \frac{-3}{4}$ **48.** $(6a+5), (6a-5)$

49. $\frac{5-2a}{5}, \frac{-(2a+3)}{4}$ **50.** $\frac{5-2a}{3}, \frac{-(6a+3)}{2}$ **51.** $\frac{a+\sqrt{3}}{2(a-\sqrt{3})}, \frac{\sqrt{3}-a}{a-\sqrt{3}}$

52. $\frac{-(a+1)}{3}, \frac{-(3a-4)}{3}$ **53.** $\frac{1}{2}, -\frac{2(a-b)}{3(a+b)}$ **54.** $-\sqrt{3}(a-5), \frac{-2(a+1)}{\sqrt{3}}$

55. $-2, \frac{1}{8}$ **56.** $\frac{-1\pm\sqrt{34}}{11}$ **57.** $\frac{4b^2}{a^2}, \frac{3a^2}{b^2}$

58. $\frac{-2b}{3a}, \frac{3a}{4b}$ **59.** $\frac{2(3a-5b)}{2a-3b}, -5$ **60.** $1, \frac{-(\sqrt{2}a+\sqrt{3})}{(\sqrt{2}a-\sqrt{3})}$

61. $\frac{-(a+3)}{a-1}, \frac{a-3}{a-2}$ **62.** $-2, \frac{(2a-1)}{2a-5}$ **63.** $-1, \frac{-(a^2+3)}{a^2-9}$ **64.** $\frac{a^2}{2}, \frac{b^2}{2}$

EXERCISE - 4.9

1. $x=\frac{5}{3}, \frac{-5}{3}$ **2.** $\frac{3}{2}$ **3.** $\left(0, \frac{-4}{5}\right)$ **4.** $(-5, -7)$

5. $11,\ 7$ **6.** $\left(\frac{-3}{2}, \frac{-1}{3}\right)$ **7.** $\frac{-2b}{3a}, \frac{-2b}{a}$ **8.** $\left(1, -\frac{1}{3}\right)$

9. $\left(\frac{2}{3}, \frac{-1}{2}\right)$ **10.** $\left(\frac{1}{3}, \frac{-1}{16}\right)$ **11.** $\left(-2, \frac{-5}{3}\right)$ **11.** $\frac{2b}{a}, \frac{b}{a}$

12. $\left(2, \frac{4}{9}\right)$ **13.** $\left(\frac{7}{5}, \frac{-4}{3}\right)$ **14.** $\frac{-2\sqrt{3}}{a}, \frac{\sqrt{3}}{3}$ **15.** $\left(-1, \frac{1}{3}\right)$

16. $\left(-4, \frac{1}{3}\right)$ **17.** $(x-2)$ **18.** $\left(1, \sqrt{2}\right)$ **19.** $\left(-3\sqrt{3}, -\frac{2\sqrt{3}}{3}\right)$

20. (-3) **21.** $\left(\frac{\sqrt{3}}{4}, \frac{-2\sqrt{3}}{3}\right)$ **22.** $\left(\frac{-\sqrt{7}}{3}, \frac{\sqrt{7}}{7}\right)$ **23.** $\frac{\sqrt{2}}{4}, \frac{3\sqrt{2}}{4}$

24. $\left(\frac{5}{4}\right)$ **25.** $\left(-5, \frac{7}{5}\right)$ **27.** $\left(2+\sqrt{5}, 2-\sqrt{5}\right)$ **28.** $\left(1, -\frac{1}{2}\right)$

29. $-4+2\sqrt{3}, -4-2\sqrt{5}$ **30.** $\left(\frac{-1}{4}+\frac{\sqrt{17}}{4}\right)\left(\frac{-1}{4}-\frac{\sqrt{7}}{4}\right)$

31. $\left(\frac{1}{2}, -3\right)$ **32.** $\left(1, -\frac{1}{2}\right)$ **33.** $\left(\frac{-9+\sqrt{33}}{6}, \frac{-9-\sqrt{33}}{6}\right)$

34. $\left(\frac{1-\sqrt{11}}{5}, \frac{1-\sqrt{11}}{5}\right)$ **35.** $\left(\frac{-4+\sqrt{2}}{7}, \frac{-4-\sqrt{2}}{7}\right)$ **36.** $\left(\frac{3}{2}, -2\right)$

37. $(2, -4)$ **38.** $4, \frac{-2}{9}$ **39.** $\left(3, \frac{4}{3}\right)$ **40.** $\left(\frac{b}{a}, \frac{4b}{9a}\right)$

41. $x=\frac{b}{a} x=\frac{3b}{a}$ **42.** $x=-1, x=-b/a$ **43.** $-7, 3/2$ **44.** $4, 2/3$

45. $-3/6, 2/3$ **46.** $\frac{-4}{5}, 2/3$ **47.** $-5/2, 2/3$ **48.** $-5/6, 3/5$

49. $-4/5, 2/3$ **50.** $-5/2, 2/3$ **51.** $-5/6, 3/5$ **52.** $-\sqrt{2}, -1/\sqrt{2}$

53. $-\sqrt{5}, / 3/\sqrt{5}$ **54.** $-\sqrt{3}, -5/2\sqrt{3}$ **55.** $-\frac{3}{\sqrt{5}}, \frac{-\sqrt{3}}{3}$ **56.** $\frac{-\sqrt{2}}{2}, \frac{4}{7\sqrt{2}}$

57. $\frac{5\sqrt{3}}{2}, \frac{1}{3\sqrt{3}}$ **58.** $-\sqrt{3}, \frac{-\sqrt{3}}{2}$ **59.** $\frac{-2}{\sqrt{7}}, \frac{-2}{\sqrt{7}}$ **60.** $\frac{-1}{\sqrt{3}}, \frac{5}{2\sqrt{3}}$

61. $\frac{-\sqrt{3}}{5}, \frac{-\sqrt{3}}{2}$ **62.** $\frac{-\sqrt{2}}{4}, \frac{\sqrt{2}}{2}$ **63.** $\frac{-1}{4\sqrt{2}}, \frac{-1}{2\sqrt{2}}$ **64.** $-9, 7$

65. $-4, \frac{9}{4}$ **66.** $6, \frac{40}{3}$ **67.** $4, \frac{-2}{9}$ **68.** $5, \frac{1}{2}$

69. $3, \frac{4}{3}$ **70.** $\frac{4b}{9a}, \frac{-b}{a}$ **71.** $\frac{-1}{a^2}, \frac{3}{a^2}$ **72.** $\frac{-1}{a}, \frac{-1}{2a}$

73. $\frac{-2}{p}, \frac{-2}{p}$ **74.** $a, a/3$ **75.** $\frac{4}{p^2}, \frac{6}{p^2}$ **76.** $\frac{7}{6a}, \frac{-1}{a}$

77. $-3b/a, -b/a$ **78.** a, b **79.** $-1, -\sqrt{5}/2$ **80.** $-1, -1/\sqrt{2}$

81. $-1, -2/3$

EXERCISE - 4.10

1. $5, -3/2$ **2.** $7/3, -3/2$ **3.** $7/5, -1/2$ **4.** $7, -1$

5. $7/2, -3$ **6.** $3/2, \frac{-1}{3}$ **7.** $3/2, -\frac{1}{2}$ **8.** $2, -2/5$

9. $3/2, -1/3$ **10.** $3, 5/2$ **11.** $-1000, 750$ **12.** $86, -60$

13. $-54, 6$ **14.** $3, -8$ **15.** $50, -60$ **16.** $\frac{4}{\sqrt{5}}, \frac{4}{\sqrt{5}}$

17. $\frac{5}{7\sqrt{3}}, \frac{5}{7\sqrt{3}}$ **18.** $\frac{5}{8\sqrt{3}}, \frac{5}{8\sqrt{3}}$ **19.** $\frac{11}{9\sqrt{13}}, \frac{11}{2\sqrt{13}}$ **20.** $\frac{-5}{6\sqrt{7}}, \frac{-5}{6\sqrt{7}}$

21. $\frac{-1}{9\sqrt{2}}, \frac{-1}{9\sqrt{2}}$ **22.** $\frac{-5\sqrt{3}}{3}, \frac{-5\sqrt{3}}{3}$ **23.** $\frac{-1}{2\sqrt{3}}, \frac{-1}{2\sqrt{3}}$ **24.** $-\sqrt{2}, \frac{5\sqrt{2}}{11}$

25. $-2, \frac{-3}{2}$ **26.** $-1, \frac{23}{5}$ **27.** $\frac{-4}{3}, \frac{1}{8}$ **28.** $(2, -6)$

29. $5, \frac{5}{2}$ **30.** -9, 7 **31.** 2, -5 **32.** 1,3

33. $\frac{-5}{2}, \frac{3}{2}$ **34** $\frac{4b}{9a}, \frac{-b}{a}$ **35.** $\frac{-1}{a^2}, \frac{3}{a^2}$ **36.** $-\frac{1}{a}, \frac{-1}{2a}$

37. $\frac{-2}{p}, \frac{-2}{p}$ **38.** $a, \frac{a}{3}$ **39.** $\frac{-6}{p^2}, \frac{4}{p^2}$ **40.** $\frac{7}{6a}, \frac{-1}{a}$

41. $\frac{-3b}{a}, \frac{-b}{a}$ **42.** a, b **43.** $\frac{q}{p}, \frac{-3q}{7p}$ **44.** $\frac{p^2}{16}, \frac{-p^2}{4}$

45. $\frac{q}{p}, \frac{-3q}{5p}$ **46.** $\frac{1}{a}, \frac{-8}{3a}$ **47.** $\frac{-b}{4a}, \frac{2b}{9a}$ **48.** $\frac{q}{p}, \frac{-q}{3p}$

49. $-b, \frac{-2b}{13}$ **50.** $\frac{-q}{p}, \frac{-q}{p}$ **51.** $-q, \frac{2q}{25}$ **52.** $\frac{-3b}{a}, \frac{-2b}{a}$

53. $\frac{2b}{a^2}, \frac{-b}{a^2}$ **54.** $\frac{7b}{3a}, \frac{b}{a}$ **55.** $-1, \frac{-\sqrt{5}}{2}$ **56.** $-1, \frac{-1}{\sqrt{2}}$

57. $-1, \frac{-2}{\sqrt{3}}$ **58.** $-1, -\sqrt{2}/6$ **59.** $-1, -\sqrt{2}/7$ **60.** $-1, -\sqrt{2}/5$

61. $-1, \frac{-1}{\sqrt{3}}$ **62.** $-1, \frac{-\sqrt{5}}{7}$ **63.** $-1, -\sqrt{7}/3$ **64.** $-1, \sqrt{2}/6$

65. $-1, \frac{\sqrt{5}}{7}$ **66.** $-1, \frac{-\sqrt{2}}{13}$ **67.** $-1, \sqrt{5}/2$ **68.** $1, -\sqrt{7}/3$

69. $1, \sqrt{3}/2$ **70.** $-1, -\sqrt{5}/\sqrt{2}$ **71.** $-1, \frac{q^2}{p^2}$ **72.** $-b/a, -1$

EXERCISE - 4.11

1. $\frac{-2b}{a}, \frac{-2b}{a}$ **2.** $\frac{a}{b}, \frac{b}{a}$ **3.** $-1, -b/a$ **4.** $\frac{-1}{3}, \frac{-1}{2a-3}$

5. $\frac{-3}{2}, \frac{3}{5a}$ **6.** $\frac{a}{b}, \frac{-b}{a}$ **7.** $\frac{(1+2p) \pm \sqrt{1+4p^2}}{2}$ **8.** $a, -\frac{1}{a}$

9. $\frac{-p^2}{2q}, 1$ **10.** $-1, \frac{4}{3}$ **11.** $-a, (a-3)$ **12.** $-1, \frac{4-a}{a}$

13. $\frac{a^2}{3}, \frac{b^2}{3}$ **14.** $\frac{a}{3}, \frac{b}{3}$ **15.** $2a+b, 2a-b$ **16.** $a+b, a-b$

17. $\frac{q^2}{p^2}, -1$ **18.** $\frac{a^2+b^2}{2}, \frac{a^2-b^2}{2}$ **19.** $(6a+5), (6a-5)$ **20.** $\frac{b}{a}, \frac{-4b}{3a}$

21. $(a+b),(a-b)$ **22.** $(2a+b),(a-b)$ **23.** $\frac{a+b}{2},\frac{a-b}{2}$ **24.** $-(a+2),(a+1)$

25. $\left(a-\sqrt{5}\right),-\left(2a+\sqrt{5}\right)$ **26.** $\frac{a+b}{6},\frac{a-b}{6}$ **27.** $\left(a,\frac{1}{a}\right)$

28. $\frac{2}{a+b},\frac{-2}{a-b}$ **29.** $-\left(\frac{a+b}{2}\right),\frac{a-b}{2}$ **30.** $\frac{2b}{a},\frac{b}{a}$ **31.** $\frac{4b^2}{a^2},\frac{-3a^2}{b^2}$

32. $(-a,-b)$ **33.** $\frac{a-b}{a+b}$ **34.** $\frac{2a-1}{5},-1$ **35.** $\frac{-b^2}{a^4},\frac{-b^2}{a^4}$

36. $-\left(a-\sqrt{3}\right),-\left(a+\sqrt{3}\right)$ **37.** $x=\frac{1}{\left(12a^2-3\right)},\frac{-1}{2a^2+3}$

38. $x=\frac{-2b^2}{a^2},\frac{2b^2}{3a^2}$ **39.** $x=\frac{b^2}{a^2},2b^2$ **40.** $\frac{-b^2}{\sqrt{7}a^2},\frac{-\sqrt{7}b^2}{2a^2}$ **41.** $\frac{2b}{\sqrt{5}a},\frac{-\sqrt{5}b}{a}$

42. $1,\frac{(b-a)}{a+b}$ **43.** $-1,\left(\frac{a-\sqrt{5}}{a+\sqrt{5}}\right)$ **44.** $\frac{-\sqrt{2}}{2a},\frac{-1}{\sqrt{2}a}$ **45.** $x=\frac{\sqrt{2}}{a^2},x=\frac{\sqrt{2}}{a^2}$

46. $2,3$ **47.** $1,\frac{-3}{4}$ **48.** $(6a+5),(6a-5)$

49. $\frac{5-2a}{5},\frac{-(2a+3)}{4}$ **50.** $\frac{5-2a}{3},\frac{-(6a+3)}{2}$ **51.** $\frac{a+\sqrt{3}}{2\left(a-\sqrt{3}\right)},\frac{\sqrt{3}-a}{a-\sqrt{3}}$

52. $\frac{-(a+1)}{3},\frac{-(3a-4)}{3}$ **53.** $\frac{1}{2},-\frac{2(a-b)}{3(a+b)}$ **54.** $-\sqrt{3}(a-5),\frac{-2(a+1)}{\sqrt{3}}$

55. $-2,\frac{1}{8}$ **56.** $\frac{-1\pm\sqrt{34}}{11}$ **57.** $\frac{4b^2}{a^2},\frac{3a^2}{b^2}$

58. $\frac{-2b}{3a},\frac{3a}{4b}$ **59.** $\frac{2(3a-5b)}{2a-3b},-5$ **60.** $1,\frac{-\left(\sqrt{2}a+\sqrt{3}\right)}{\left(\sqrt{2}a-\sqrt{3}\right)}$

61. $\frac{-(a+3)}{a-1},\frac{a-3}{a-2}$

EXERCISE - 4.12

Q1. Answer

1. $k=\frac{-25}{12}$ **2.** $k=\pm 2\sqrt{6}$ **3.** $k=9\sqrt{6}$ **4.** $k=\frac{9}{10}$

5. $k=\left(00,\sqrt{8}\right)$ **6.** $k=81$ **7.** $k=0$ or 4 **8.** $k=\pm\frac{4}{3}$

9. $k=-1$ or $\frac{1}{3}$ **10.** $k=\pm 3$ **11.** $k=\pm 9$ **12.** $k=\frac{25}{2}$

13. $k=\pm 4$ **14.** $k=\pm 3$ **15.** $k=\frac{9}{8}$ **16.** $k=\pm 2\sqrt{2}$

17. $k=\pm\frac{5}{2}$ **18.** $k=16$ **19.** $k=8$ **20.** $k=4$

21. $k = \frac{5}{4}$ **22.** $k = \frac{25}{24}$ **23.** $k = \pm 12$ **24.** $k = \pm 4$

25. $k = 2, \frac{1}{2}$ **26.** $k = \frac{1}{3}$ **27.** $k = \frac{-5+\sqrt{41}}{2}$ **28.** $k = (0, 3)$

29. $k = 0, 3$ **30.** $k = 3, 5$ **31.** $\left(\frac{-6}{5}, 1\right)$ **32.** $\left(\frac{-1}{2}, 1\right)$

33. $2, \frac{-14}{9}$ **34.** $k = \frac{2}{3}, -1$ **35.** $2, \frac{-10}{9}$ **36.** $5, -3$

37. $12, 14$

QII. Answer

1. $k \le 4$ **2.** $k \le 815$ **3.** $k > -4$ **4.** $k \ge 2$ or $k \le -2$

5. $k \ge 4$ or $k \le -4$ **6.** $k \le \frac{9}{8}$ **7.** $k \le 2\sqrt{6}$ or $k \ge 2\sqrt{6}$

8. $k \ge \frac{-25}{8}$ **9.** $k \le 9$ **10.** $k \le -6$ or $k \ge 6$ **11.** $k \le -4$ or $k \ge 4$

12. $k \le \frac{1}{3}$ **13.** $k \le \frac{-4}{3}$ or $k \ge \frac{4}{3}$ **14.** $k \in R$ **15.** $k \ge \frac{-9}{2}$

16. $k \le -4$ or $k \ge 4$ **17.** $k \ge 20$ or $k \le -20$ **18.** $k \ge 4\sqrt{2}$ or $k \le -4\sqrt{2}$

QIII. Answer

1. $k \le 4$ **2.** $k > 4$ **3.** $k > 2\sqrt{6}$ or $k < -2\sqrt{6}$ **4.** $k > \frac{-26}{8}$

5. $k < 9$ **6.** $k < -4$ or $k > 4$ **7.** $k < \frac{1}{3}$ **8.** $k < -6$ or $k > 6$

9. $k < -\frac{4}{3}$ or $k > \frac{4}{3}$ **10.** $k < 4$ or $k \le \frac{2}{5}$ **11.** $k < \frac{25}{6}$ **12.** $k < \frac{9}{8}$

QIV. Answer

1. $k > 4$ **2.** $k > 1$ **3.** $\frac{-2}{5} < k < \frac{2}{5}$ **4.** $k > -2\sqrt{6}$ or $k < 2\sqrt{6}$

5. $k < 20$ or $k > -20$ **6.** $k > -4$ or $k < 4$ **7.** $k < \frac{-9}{2}$

8. $k > \frac{1}{3}$ **9.** $k > -4$ or $k < 4$ **10.** $k > \frac{-4}{3}$ or $k < \frac{4}{3}$ **11.** $k > \frac{-4}{3}$ or $k < \frac{4}{3}$

12. $k < \frac{-25}{8}$ **13.** $k > 2$ **14.** $k > -2\sqrt{3}$ or $k < 2\sqrt{3}$

EXERCISE - 4.13

1. $k = 16, 4/3$ **2.** $p = 3, k = 9/4$ **3.** $7, 5$ **4.** $p = 7, k = 7/4$

5. $k = 4$ **6.** $k = 16$ **7.** **8.**

9. **10.** $k = 5$ or $k = -3$ **11.** $k = -1, -3/2$ **12.** $k = \frac{15}{2}, m = 9$

13. $a = \pm 1$ **14.** 16 **15.** $-2 < b < 2$ **16.** $p = 1, q = -2$

17. $\frac{-1}{2}$ **18.** 2 **19.** $\frac{b^2}{a}$ **20.** $k = -3/2$

21. $a^2 + 2ac$ **22.** –2 or –1 **23.** k = 12 or k = 14 **24.** 16 : 3

25. 8 **26.** c/b or $-b/a$ **27.** $x = \frac{2a+b}{3}$ or $x = \frac{a+2b}{3}$

28. $x = \frac{2b}{a}$ or $x = \frac{b}{a}$ **29.** $x = 5$ or $5/2$ **30.** $-8/5 < k < 8/5$

EXERCISE - 4.14

1. 8, 4 **2.** 9, 10 **3.** 7, 5 **4.** 1, 2, 3, 4

5. $3, \frac{1}{3}$ **6.** 12, 14 **7.** 11, 13 **8.** 9, 11

9. 5, 10 **10.** 6, 8 **11.** 15, 20, 25 or –15, –20, –20

12. 3, 5 **13.** 10, 6 **14.** 8, 9, 10 **15.** 6, 8

16. 9, 6, 17 **17.** 23 **18** 5, or – 5, –4 **19.** 36, 12

20. 16, 13 **21.** $\frac{1}{25}$ **22.** 12, 16 or –16, –12 **23.** 7, 3

24. 6, 7, 8 **25.** 7, 2 **26.** 4, 6

EXERCISE - 4.15

1. 23 **2.** 19 **3.** 26 **4.** 34

5. 35 **6.** 92 **7.** 72 **8.** 82

9. 36 **10.** 63 **11.** 45 **12.** 54

13. 63 **14.** 65 **15.** 34 **16.** 35

17. 36 **18.** 36 **19.** 27 **20.** 56

21. 63

EXERCISE - 4.16

1. 12cm, 20 cm **2.** 20m × 5 m **3.** 30 cm, 40 cm, 50 cm

4. 10 cm, 24 cm, 26 cm **5.** 20 cm, 21 cm **6.** 8cm, 15 cm, 17 cm

7. 12m, 7m **8.** 15 cm, 17 cm, 8 cm **9.** 13 cm, 15 cm

10. 10 cm, 8 cm, 6 cm **11.** 3m, 4m, 5m **12.** 1.5m

13. 120m **14.** 24 cm **15.** 15m, 22m

16. 16m, 12m **17.** 15 cm, 20 cm

EXERCISE - 4.17

1. 20 days **2.** 20 students **3.** 100 **4.** 50 **5.** 25

6. 16 **7.** 20m, Rs. 10/m **8.** Rs.8 **9.** 12 days

10. 50 **11.** 16 **12.** 20 **13.** Rs.20 **14.** 10m

EXERCISE - 4.18

1. 60 km/hr **2.** 45 km/hr **3.** 25 km/hr. **4.** 80 km/hr.

5. 30 km/hr. **6.** 8 km/hr **7.** 40 km/hr., 50 km/hr.

8. 10 km/hr. **9.** 5 km/hr. **10.** 5 km/hr. **11.** 3 km/hr.

12. 3 km/hr. **13.** 5/2 hr. **14.** 500 km/hr. **15.** 800 km/hr

16. 20 km/hr, 30 km/hr.

EXERCISE - 4.19

1. 6, 36 **2.** 3, 24 **3.** 2, 22 **4.** 45 **5.** 45 **6.** 6 **7.** 36, 9 **8.** 49, 7 **9.** 5, 25 **10.** 36, 9 **11.** 7 **12.** 42, 12

13. No **14.** 6, 12 **15.** 20, 7 **16.** 7 **17.** 9, 27 **18.** 7 years

EXERCISE - 4.20

1. 6 points **2.** 12 **3.** 3 cm **4.** 36 **5.** 1 km/hr **6.** 14 yrs.

7. 27, 5 **8.** 12 **9.** $\frac{5}{8}$ **10.** 20 **11.** k = 3, s = 5

12. 8 m, 5min. **13.** 5% **14.** 12, 16 or 9, 19 **15.** 30 days

16. $100\left(-1+\sqrt{2}\right)$ **17.** 20 **18.** 100 **19.** 36 **20.** 12m **21.** 16

22. 5m from B **23.** 12, 16 **24.** 12, 18 **25.** 6, 15 **27.** 34m, 24m **28.** 4 m

EXERCISE - 4.21

4. $0, \left(a+b\right)$ **5.** $\frac{2ab-bc-ac}{a+b-2c}$ **6.** 1 **7.** 3

14. $\frac{-11a+\sqrt{3}a}{6}$ **15.** 100 **16.** 5, 6 **17.** 12m **18.** 20

29. $r^2+11r-52=0$ **20.** $0, \left(a+b\right)$

EXERCISE - 4.22

1. $k=15/2, m=9$ **2.** 12cm, 16 cm **3.** $p>4, p\le -4$ **4.** 13, 16 **5.** 1, 6 **6.** 5, 10 **7.** $3b/a, -4a$ **9.** 10, 5

11. k = 4, 1 **12.** $\frac{5}{6}$ or $\frac{6}{5}$ **13.** $\frac{1}{b^2}, \frac{1}{a^2}$ **14.** 9, 27 **15.** $\frac{2}{3}, -1$ **16.** 30 cm, 40 cm **17.** $k=\frac{9}{4}$ **18.** 30 days

19. $\frac{5}{8}, \frac{11}{5}$ **20.** $\frac{-\sqrt{2}}{3}, \frac{3\sqrt{2}}{4}$ **21.** 20 days **22.** $\frac{3a}{4b}, \frac{-2b}{3a}$ **23.** 1 Hr. **24.** $-a, -b$ **25.** 20, 10 **27.** 50

28. $\frac{=1\pm\sqrt{33}}{4}$ **29.** 60 km/hr **30.** $\frac{1}{2}, -\frac{1}{2}$ **31.** 600 **32.** –9, 7 **33.** 5, 6 **34.** $k\ge -\frac{4}{3}$ or $k\le\frac{4}{3}$ **35.** 36

36. $\frac{-3}{2}, \frac{3}{5a}$ **37.** 20 **38.** $\frac{-1}{\sqrt{5}}, \frac{-1}{\sqrt{2}}$ **40.** $\frac{-1}{2}, 1$ **41.** 35 **42.** Real an unequal **43.** 25 km/hr **44.** $-1, \frac{-3}{2}$

45. 750 k/hr **46.** $-2<b<2$ **47.** 5 km/hr **49.** 9, 27 **51.** $3/4$ **52.** $\frac{4b^2}{a^2}, \frac{-3a^2}{b^2}$ **53.** $\frac{5}{8}$ **54.** $\frac{4}{a}, a$ **55.** 5 Hr

56. $-2, -3/2$ **58.** 0, 3 **59.** 14.1% **60.** 10 m, 26 m, 24 m **61.** 5 m from B **62.** $a, \frac{1}{2}$ **63.** Rs.20 **64.** 13, 9

65. $2, \frac{1}{2}$ **66.** 7, 49 **67.** k = 5, –3 **68.** Rs.20 **69.** $-(a+2), (a+1)$ **70.** 10, 6 **71.** $\frac{3}{2}$ or $\frac{-5}{2}$ **72.** 36

73. $\frac{34}{63}, \frac{-8}{21}$ **74.** 18, 12 **75.** $4, \frac{-2}{9}$ **76.** $-\frac{3}{7}$

TEST - 1

1. $k=\frac{15}{2}, m=9$ **2.** $k=-1, x=-3/2, 2$

3. $y=-\sqrt{3}, -\sqrt{3}$ **4.** $\frac{-bc}{ad}, \frac{-bc}{ad}$

5. $4=-2, \frac{-4a}{3}$ **6.** $x=\frac{a}{b}, \frac{-b}{a}$

7. $x=-\sqrt{3}/2, -2\sqrt{3}$ **8.** $x=-8, 12$

9. $\frac{a^2}{2}, \frac{b^2}{2}$

TEST - 2

1. $k=1$ **2.** No

3. $x=a, \frac{-1}{a}$ **4.** $2\pm 2\sqrt{3}$

5. $-1, -\sqrt{5}/2$ **7.** $P\ge\frac{9}{8}$

7. $p\le\frac{25}{8}$ **8.** 25 km / hr

9. $k=16, x=\frac{4}{3}$ or $\frac{4}{3}$

TEST - 3

1. $p=3, K=\frac{9}{4}$ **2.** x = (a + 1) ; –(a + 2)

3. 3, 4/5

5. k = 16 **6.** No real roots

7. –a, – b **8.** 16

9. $\frac{a^2}{2}, \frac{b^2}{2}$

TEST - 4

1. 0, 3 **2.** $\frac{3b}{a}; -4a$

3. $\frac{3}{5a}, \frac{-3}{2}$ **4.** $\alpha=12, 14$

5. $x=-\sqrt{3}/2, -\sqrt{3}/2$ **6.** $x=\frac{-1}{5}, 10$

7. 34 **8.** 600 km/hr

9. 36

— Notes —

CH – 5 – ARITHMETIC PROGRESSION

Sequence : A sequence is an arrangement of numbers in a definite pattern according to some rule.

Arithmetic Progression : A sequence in which each term differs from its proceeding term by a constant is called an arithmetic progression, written as an A.P. The constant difference is called (Common difference).

To find the n^{th} Term of an A.P

Theorem : If the first term of an AP is 'a' and its common difference is d then show that nth term is given by $a_n = a\ (n-1)\times d$

Proof : In the given AP, we have,

First term = a, and common difference = d

So, the Given AP may be written as

a, a + d, a + 2d, a + 3d, a + 4d, a + 5d, ...

in this AP, we have

First term, $a_1 = a = a + (1 - 1)\ d$

Second term= $a_2 = a + d = a + (2 - 1)d$

Third term = $a_3 = a + 2d = a + (3 - 1)d$

$\therefore$ nth term $(a_n) = a + (n - 1)d$

Note : The nth term of an AP is called General Term.

To find the nth term from the end of an AP

Theorem : If a be the first term, d the common difference and ℓ is the last term of a given AP then show that its nth term from the end is $\{\ell - (n-1)d\}$

Proof : We may write the given AP as

a, (a + d), (a + 2d),....., $(\ell - d)$, ℓ

Thus, we have

Last eterm = $\ell = \ell - (1-1)d$

2nd term from the end = $(\ell - d) = \{\ell - (2-1)d\}$;

3rd term from the end = $(\ell - 2d) = \{\ell - (4-1)d\}$;

$\therefore$ nth term from the end = $\{\ell - (n-1)d\}$

Important Results :

It is always convenient to make a choice of

(i) 3 No's in AP as (a –d), a, (a + d)

(ii) 4 No's in AP as (a – 3d), (a –d), (a+d), (a +3d)

(iii) 5No's in AP as (a –2d), (a – d), a, (a + d), (a + 2d)

Derivation of Sum Formula

1. If an A.P has first term 'a' and common difference 'd', then the sum of the first n terms is given by :

$$S_n = \frac{n}{2}\left[2a + (n-1)d\right] \text{ or } S_n = \frac{n}{2}(a + a_n)$$

where ℓ is the last term of A.P, $l = a_n$

Proof :

Let a_1, a_2, a_3 .....be an A.P. with first term 'a' and common difference 'd'. Then,

$a_1 = a$; $a_2 = a + d$; $a_3 = a + 2d$ $a_n = a + (n - 1)\ d$

$S_n = a_1 + a_2 + \ ..... \ a_{n-1} + a_n$

$S_n = a + (a + d\} + ...[a + (n - 2)d] + [a + (n - 1)\ d]$ (i)

Writing the above series in reverse order

$S_n = \{a + (n - 1)d\} + \{a + (n - 2)d\} + ... + (a + d) + a$ (ii)

Adding (i) and (ii), we get

$2S_n = [2a + (n - 1)d] + \ ..... \ [2a + (n - 1) \times d]$

$2S_n = n\ [2a + (n - 1)\ d]$

$\{\because\ 2a + (n - 1) \times d\}$ repeated n times.

$$S_n = \frac{n}{2}\left[2a + (n-1)\times d\right] \text{ OR } S_n = \frac{n}{2}(a + a_n)$$

Where, a_n = last term or nth term.

PRACTICE EXERCISE 5.1

Q1. Write the first three terms of the sequence defined by $a_n = 3n + 2$.

Q2. Write the first three terms of the sequence defined by $a_n = n^2 + 1$.

Q3. Write the first five terms of the sequence defined by $a_n = (-1)^{n-1}.2^n$.

Q4. Write the first four terms of the sequence defined by $a_1 = 3, a_n = 3a_{n-1} + 1\ (n > 1)$.

Q5. Write the three terms of the sequence defined by $a_1 = 1, a_2 = 1$ and $a_n = a_{n-1} + a_{n-2} (n > 2)$

Q6. Find $\frac{a_{n+1}}{a_{n-1}}$ for n = 1, 2, 3, 4.

Q7. Write the first five terms of the sequence is defined by $a_n = \frac{n-2}{3}$.

Q8. Write the first three term of the sequence is defined by $a_n = 3^n$.

Q9. Write the first three terms of the sequence is defined by $a_n = \frac{3n-2}{5}$.

Q10. Write the first three terms of the sequence is defined by $a_n = (-1)^n.2^n$.

Q11. Write the first three terms of the sequence is defined by $a_n = \frac{n(n-2)}{5}$.

Q12. Write the first three terms of the sequence is defined by $a_n = n^2 - n + 1$.

Q13. Write the first three terms of the sequence is defined by $a_n = 2n^2 - 3n + 1$.

Q14. Write the first three terms of the sequence is defined by $a_n = \frac{2n-3}{6}$.

Q15. Write the first three terms of the sequence is defined by $a_n = 3n + 2$.

Q16. Find 12th term of the sequence defined by $a_n = 5n - 4$.

Q17. Find the term of the sequence defined by $a_n = \frac{3n-2}{4n+5}$.

Q18. Find the 5th term of the sequence defined by $a_n = n(n-1)(n-2)$.

Q19. Find the third term of the sequence defined by $a_n = (n-1)(2-n)(3+n)$.

Q20. Find fifth term of the sequence is defined by $a_n = (-1)^n.n$.

Q21. Find the next three terms of the sequence defined by $a_1 = 1, a_n = a_{n-1} + 2\ (n \geq 2)$.

Q22. Find the next three terms of the sequence defined by $a_1 = a_2 = 2,\ a_n = a_{n-1} (n > 2)$

Q23. Find the next three terms of the sequence defined by $a_1 = -1,\ a_n = \frac{a_{n-1}}{n}\ (n \geq 2)$.

Q24. Find the next three terms of the sequence defined by $a_1 = 4,\ a_n = 4a_{n-1} + 3\ (n > 1)$.

Q25. Show that the sequence defined by $a_n = 4n + 7$ is an A.P. Also find its common difference.

Q26. Show that the sequence whose nth term is $3n^2 + 1$ is not an A.P.

Q27. The nth term of a sequence is given by $a_n = 4n + 5$ is an A.P. Also, find its common difference.

Q28. The nth term of a sequence is given by $2n^2 + n + 1$. Show that its is not an A.P.

Q29. The nth term of a sequence is defined by $a_n = \frac{3n-2}{5}$ is the sequence in A.P. Find its common difference.

Q30. Find next three terms of the sequence is defined by $a_1 = 1, a_n = a_{n-1} + 2\ (n \geq 2)$ is the sequence in A.P. If yes find its common difference.

Q31. A sequence is defined by $a_1 = 4, a_n = 4a_{n-1} + 3\ (n > 1)$ is segment in A.P if yes then find its common difference.

Q32. A sequence is defined by $a_1 = -1, a_n = \frac{a_{n-1}}{n} (n \geq 2)$ is the sequence in A.P. If yes then find its common difference.

PRACTICE EXERCISE 5.2

Q1. Find the missing terms of the AP 3, □, 33, 48.

Q2. For an AP, if $a_{25} - a_{20} = 35$, then find common difference.

Q3. Find the next term of the A.P $\sqrt{3}, \sqrt{12}, \sqrt{27}, ...$

Q4. Find the fifteenth term of an A.P. $(y - 7), (y - 2), (y + 3), ...$

Q5. If 17th term of an A.P exceeds its 10th term by 14, then find its common difference.

Q6. How many terms are there in the A.P 7, 16, 25, ... if nth term is 349.

Q7. Show that sequence 71, 70, 69, 68..... is an A.P.. Find its 13th term and the general term.

Q8. Find the common difference of the A.P. and write the next two terms 51, 59, 67, 75.

Q9. Find the 10th term of the AP, – 40, –15, 10, 35, ...

Q10. Find the 12th term of the A.P. with first term 9 and common difference 10.

Q11. Find the 12th term of the A.P. with first term -20 and common difference 4.

Q12. Which term of the A.P. 21, 42, 63, 84, 105, 126 is 420.

Q13. Using the formula for the nth term, find a_{18} and T_n. For the arithmetic sequence having $a_2 = 9$ and $a_3 = 15$

Q14. Suppose that an arithmetic sequence has $a_8 = -16$ and $a_{16} = -40$ find a.

Q15. How many terms are there in the following Arithmetic sequence 2, 5, 8, ... 41.

Q16. Find $a_{30} - a_{20}$ for the A.P. -9, -14, -19, -24

Q17. The first term of an A.P. is 5 and its 100th term is -292. Find the 50th term of this A.P.

Q18. If the nth term of an A.P. is $(5n - 2)$, find (i) first term (ii) common difference (iii) 19th term.

Q19. The ninth term of an A.P. is zero. Show that 29th term is double the 19th term.

Q20. How many numbers of two digits are divisible by 5 ?

Q21. Find the first term and the common difference of an A.P. Whose 8th and 12th term are 23 and 305 respectively.

Q22. If an A.P. the 24th term is twice the 10th term, prove that 36th term is twice the 16th term.

Q23. The 4th term of an A.P. is three times the first and the 7th term exceeds twice the third term by 1. Find the first term and the common difference.

Q24. If 10 times the 10th term of an A.P. is equal to 15 times the 15th term, show that 25th term of the A.P. is zero.

Q25. Determine 25th term of an A.P. Whose 9th term is -6 and common difference is $5/4$.

Q26. The 10th term of an A.P. is 41 and the 18th term is 73 ; find the Arithmetic progression.

Q27. If (K + 1), 3K and (4 K + 2) be any three consecutive terms of an A.P., find the value of K.

Q28. Which term of the sequence 7, 10, 13 ..... is 79.

Q29. Find 6 term of an A.P. if first term is $2/3$ and the last term is $22/3$.

Q30. Which term of the series 12 + 9 + 6 +3 + 0 – 3 is equal to –30.

Q31. Find the nth term of the series –1/2–1/3–1/6+0 ..... what is is 100th term.

Q32. Find the series whose pth term is $1/2P + 1/3$, Prove that it is an A.P.

Q33. Is 310 a term of the A.P. 3, 8, 13, 18, ...?

Q34. Find the numbers between 1038 and 2053 are divisible by 19.

PRACTICE EXERCISE 5.3

Q1. For what value of n, the nth term of the series "9, 7, 5....." and "15, 12, 9, ..." is the same.

Q2. Subba Rao started work in 1995 at an annual salary of Rs. 5000 and received an increment of Rs.200 each year when did his income reach Rs. 7000 ?

Q3. A sum of Rs. 1000 is increased at 8% simple interest per annum. Calculate the interest at the end of 1, 2, 3..... years. Is the sequence of interest an A.P.. Find the interest at the end of 30 years.

Q4. A scooter is bought for RS. 15,000. If its value depreciate at the rate of Rs. 900 per year, what its value at the end of 9th year.

Q5. The 7th term of an A.P. is 34 and its 15th term is 74. Find its 40th term.

Q6. The 10th term of an A.P. is -4 and its 22nd term is -16. Find its 38th term an the nth term.

Q7. If twice the 2nd term of an A.P. is equal to 5 times the 5th term of the A.P. then show that the 7th term is zero.

Q8. Find three digits number, which are divisible be 13.

Q9. The sum of three numbers is an A.P. is 18, and their product is 192. Find the numbers.

Q10. The sum of the first four terms of an A.P. is 16 and the sum of their squares is 84. Find the terms.

Q11. Ramkali saved Rs. 5 in the first week of a year and then increased her weekly savings by Rs. 1.75. If nth week her weekly savings become Rs. 20.75, find n.

Q12. Find the three numbers in A.P., Whose sum is 21 and whose product is 315.

Q13. In a flower bed, there are 43 rose plants in the first raw, 41 in the second, 39 in the third, and 50 on. There are 11 rose plants in the last raw. How many rose are there are in the flower bed.

Q14. Find the four numbers in A.P whose, sum is 50 and in which the greatest number is 4 times the least.

Q15. The sum of three consecutive terms of an A.P. is 15 and the sum of their squares is 83. Find the terms.

Q16. The sum of three numbers in A.P. is 9 and the sum of their squares is 59. Find the numbers.

Q17. Find the numbers between 2032 and 18995 which are divisible by 17.

Q18. The sum of five numbers in A.P. is 25 and the sum of their squares is165. Find the numbers.

Q19. The sides of a right angle-triangle are in A.P. Show that they are in the ratio 3 : 4 : 5.

Q20. The angles of a quadrilateral are in A.P. Whose common difference is 10^o. Find the angles.

Q21. The sum of three numbers in A.P. is -3 and their product is 8. Find the numbers.

Q22. Devide 32 into four parts which are in A.P. such that the product of extremes is to the product of means is 7 : 15.

Q23. The sum of three numbers in A.P. is 12 and the sum of their cubes is 288. Find the numbers.

Q24. Find the all three digit numbers are divisible by 7.

Q25. The 16th term of an AP is 1 more than twice its 8th term, if the 12th term of an AP is 47, then find its nth term.

Q26. Which term of the AP 4, 12, 20, 28,... will be 120 more than its 21st term. [Ans. n = 36]

Q27. Find the 11th term from the last term towards the first term of the AP 10, 7, 4, ..., (–62).

Q28. Find the 8th term from the end of hte AP 7, 10, 13, ... 184.

Q29. Amith gets pocket money from his father everyday. Out of the pocket money, he saves Rs.2.75 on first day end on each succeeding day he increases his saving by 25 paise i.e. Rs.0.25. Find the amount saved.

Q30. The sum of the 4th and 8th terms of an AP is 24 and the sum of its 6th and 10th term is 44. find the first three terms of the A.P.

Q31. The sum of the 4th and 8th terms of an AP is 24 and the sum of the 6th and 10th terms is 44. Find the first three terms of the AP.

PRACTICE EXERCISE 5.4 (OPTIONAL, NTSE)

Q1. Find the middle term of the A.P. 10, 7, 4, –62.

Q2. Which term of the AP 24, 21, 18, 15, ... is the first negative term.

Q3. For what value of n are the nth terms of the following two APs the same 13, 19, 25,... and 69, 68, 67,.... ? Also find this term.

Q4. If the nth term of a progression be a linear expression in n, then prove that this progression is an A.P. [Hint : $a_n = a + b$]

Q5. In a given AP if pth term is q and qth term is p, then show that the nth term is (p + q – n).

Q6. If m times the nth term of an AP is equal to n times the mth term and $m \neq n$. Show that $(m+n)^{th}$ term is zero.

Q7. If the pth, qth and rth terms of an AP be a, b, c respectively then show that
$a(q – r) + b(r – p) + c(p – q) = 0$.

Q8. If the mth term of an AP be 1/nand its nth term be 1/m, then show that its(mn)th term is 1.

Q9. If the pth term of an AP is q and its qth term is p then show that its (p + q)th term is zero.

Q10. The first and last term of an AP are a and ℓ respectively. Show that the sum of the nth term from the bigning and the nth term from the end is $(a + \ell)$.

Q11. In a given AP if pth term is q and the qth term is p, then show that the nth term is $(p+q-n)$

Q12. Which term of the sequence 20, $19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}$ ... is the first negative term.

Q13. An AP consists of 70 terms of which the 6th term is 25 and the last term is 57. Find the 35th term of the A.P.

Q14. If pth, qth and rth terms of an AP are a, b, c respectively then show that $(a – b)r + (b – c)p + (c – a)q = 0$.

Q15. Two AP's have the same common difference. The first term of one of these is 3 and that of other is 8. Find the difference between their 30th term.

Q16. Two AP's have the same common difference. The difference between their 100th term is 111222333. What is the difference between their millionth terms.

Q17. If (m + 1)th term is twice the (n + 1)th term. Prove that (3m +1)th term is twice the (m + n + 1)th term.

Q18. If the numbers a, b, c, d, e form on A.P., then find the value of $a – 4b + 6c – 4d + e$.
Hints : $b = a + D$, $c = a + 2D$, $d = a + 3D$, $e = a + 4D$.

Q19. If the mth term of an AP be 1/n and the nth term be 1/m, find the (10mn)th term.

Q20. Show that $(a-b)^2, (a^2+b^2)$ and $(a+b)^2$ are in AP.

Q21. If $(m+1)$th term of an AP is twice the $(n+1)$th term prove that $(3m+1)$th term is twice the $(m+n+1)$th term.

Q22. If mth term of on AP be 1/n and nth term be 1/m, find (10mm)th term of the AP.

Q23. Determine k so that $k^2+4k+8, 2k^2+3k+6, 3k^2+4k+4$ are three consecutive terms of an AP.

Q24. Sham Bajaj borrowed Rs.40,000 from Madan Mohan and promised to pay him in 12 monthly instalments in the following ways, 4200, 4250, 4300, 4350, ... (in Rupees). Find the amount of the 11th instalment by Sham Bajaj.

Q25. Surinder Mohan got a plot of land for construction of house in the year 1994 from a state government urban development authority for construction the house, he has to pay penality as below : (i) upto 31st Dec. 1994, Rs.4000 (ii) upto 31st Dec. 1995 Rs.5300 (iii) upto 31st Dec. 1996 Rs.6600 and so one on what date and year. The amount of penelity will be Rs.20,900.

Q26. Find three digit numbers leave the remainder 3, when divide by 5.

Q27. In a garden ther are 30 mangoes trees in the first row, twenty seven in the second. twenty four in the third so on. There are six trees in the last row. How many rows are there of mango tree.

Q28. Prove that $a_{p+q} + a_{p-q} = 2a_p$.

PRACTICE EXERCISE 5.5

Q1. Find the sum of first 19 terms of the AP 2, 7, 12, 17,...

Q2. Find the sum of first 26 terms of the AP 1, 3, 5, 7, ...

Q3. Find the sum of first 18 terms of the AP 9, 7, 5, 3, ...

Q4. Find the sum (5 + 13 + 21 + ... + 181]

Q5. Which term of the AP 5, 9, 13, 17, ... is 81 ? Also find the sum (5 + 9 + 13 +... + 81).

Q6. Find the sum of first 20 terms of the given AP 1/2, 1/3, 1/6 + ...

Q7. Find the sum of all two-digits whole numbers divisible by 3.

Q8. Find the sum of all even numbers between 5 and 100.

Q9. Find the sum of all natural numbers less than 100 which are divisible by 6.

Q10. Find the sumof allnautral numbers between 100 and 500 which are divisible by 7.

Q11. Find the sum of all multiples by 9 lying between 300 and 700.

Q12. Find the sum of all three-digit nautral numbers which are divisible by 13.

Q13. Find the sum of first 15 multiples of 8.

Q14. Find the sum of all odd numbers between 0 and 50.

Q15. Find the sum of first hundred even natural numbers which are divisible by 5.

Q16. Find the sum of all 3-digit nantural numbers which are divisible by 13.

Q17. Find the sum of 51 terms of the AP whose second term is 2 and the 4th term is 8.

Q18. If the 5th and 12 terms of an AP are –4 and –18 respectively, find the sum of the first 20 terms of the AP.

Q19. How many terms of the AP 21, 18, 15,... must be added to get the sum 0 ?

Q20. Find the number of terms of the AP 63, 60, 57, ... so that their sum is 693. Explain the double answer.

Q21. The sum of first n terms of an AP is given by $\left(n^2+8n\right)$. Find the 12th term of the AP. Also find the nth term of the AP.

Q22. Find the number of terms of the AP 18, 15, 12,... so that their sum is 45. Explain the double answer.

Q23. If the nth term of an AP is (4n + 1), find the sum of the first 15 terms of this AP. Also, find the sum of its n term.

Q24. The sum of the first n terms of an AP is given by $S_n=(2n^2+5n)$. Find the nth term of the AP.

Q25. If the sumof the first n terms of an AP is given by $S_n=(3n^2-n)$, find its (i) nth term (ii) first term, and (iii) common difference.

Q26. The sum of n terms of an AP is given by $5n^2/2+3n/2$. Find its 20th term.

Q27. If the sum of first 7 terms of an AP is 49 and that of first 17 terms is 289, find the sum of first n terms.

Q28. The sum of the first 9 terms of an AP is 81 and the sum of its first 20 terms is 400. Find the first term and the common difference of the AP.

Q29. The first and last terms of an AP are 4 and 81 respectively. If the common difference is 7, how many terms arwe there in the AP and what is their sum ?

Q30. In an AP the first term is 22, nth term is –11 and sum to first nth term is 66. Find n and d, the common difference.

Q31. In an AP the first term is 2, the last term is 29 and sum of the terms is 155. Find the common difference of the AP.

Q32. Find the sum of the following :

$$\left(1-\frac{1}{n}\right)+\left(1-\frac{2}{n}\right)+\left(1-\frac{3}{n}\right)+\ldots\text{ upto n terms.}$$

Q33. The production of TV in a factory increases uniformly by a fixed number every year. It produced 8000 acts in 6th years and 11300 in 9th year. Find the production in (i) first year (ii) 8th year and (iii) 6th year.

Q34. A sum of Rs. 2800 is to be used to ward four prizes. If each prize after the first is Rs. 200 less than the preceding prize, find the value of each of the prizes.

Q35. Solve the equation $1+4+7+10+13+16.....x=287$.

PRACTICE EXERCISE 5.6

Q.1 Using the sum formula, evaluate S_{12} for the ariththmetic sequence "-9, -5, -1, 3, 7.....

Q.2 Find the sum of first 13terms of the A.P. -6, 0, 6, 12, 18.

Q.3 Find the sum of the first ten terms for arithmetic sequence $a_2 = 9$, $a_4 = 13$.

Q.4 Find the sum of the first 100 natural number.

Q.5 Find the sum $2 + 4 + 6 + \ldots\ldots\ldots\ldots 200$.

Q.6 Find the sum $-5 - 8 - 11 \ldots\ldots - 230$.

Q.7 Find a and d for arithmetic sequence if $S_{31} = 5580$ and $a_{31} = 360$

Q.8 Find a and d for arithmetic sequence if $S_{25} = 650$ and $a_{25} = 62$

Q9. A man saved Rs. 32 during the first year, Rs. 36 in the second year and in this way he increases his saving by Rs. 4 very year. Find in what time his saving will be Rs. 200.

Q10. The first term and the last term of an A.P. are -4 and 146 and the sum of the A.P. is 7171. Find the number of terms in the A.P. and common difference.

Q11. Find the sum of all natural numbers between 250 and 1000 exactly divisible by 3.

Q12. Find the sum of first 20 terms of an A.P. in which 3rd term is 7 and 7th term is two more than thrice of its 3rd term.

Q13. In an AP, the sum of first ten terms is -150 and the sum of its next ten terms is -550. Find the AP.

Q14. How many term of the A.P. 26, 21, 16, 11, 6, 3 are need to give the sum 11.

Q15. A man sared Rs.16,500 in ten years. In each year after the first he saved Rs. 100 more than he did in the preceding year. How much did he saves in the first year.s

Q16. The 5th and 11th term of an A.P. are 41 and 20 respectively. Find the first term and the sum of first 11 terms.

Q17. The sum of the first 20 terms of an A.P is equal to the sum of the first 30 terms. Show that the sum of the first 50 terms of the same A.P is zero.

Q18. The sum of an A.P. is 136, the common difference 4, and the last term 31 find n.

Q19. Find the sum of all natural numbers between 500 and 1,000 which are divisible by 13.

Q20. The sum of first six terms of an AP is 42. The ratio of its 10th term to 30th term is 1 : 3 calculate the first and 13th term of the AP.

Q21. Find the sum of first 25 terms of an A.P. whose nth term is given by $a_n = (7 - 3n)$.

Q22. Find the sum of all two-digit odd positive integers.

Q23. If the sum of first five terms of an AP is equal to the sum of the first ten terms of the AP. Show that the sum of its 15 terms is zero.

Q24. How many terms of the AP 17, 15, 13, 11 must be added to get the sum 72 ? Explain the double answer.

Q25. A club consists of members whose ages are in A.P. The common difference being 3 months. If the youngest member of the club is just 7 years old and the sum of the ages of all the members is 250 years, find the members in the club.

Q26. A man borrows Rs. 1,000 and agrees to repay with a total interest of Rs. 140 in 12 Installments, each installment being less than the preceding by Rs. 10. What should be his first Instalment.

Q27. A person borrows Rs. 4500 and promise to pay back (without any interest) in 30 installments, each of value Rs. 10 more than the last (preceding one) find the first and the last Installments.

PRACTICE EXERCISE 5.7 (HOTS)

Q1. If Pth term of an AP is $\frac{1}{q}$ and the qth term is $\frac{1}{p}$ then find the sum of its first 20 terms.

Q2. Find the sum of series :

$(x-y)^2+(x^2+y^2)+(x+y)^2+...+n$

Q3. The ratio of the sum of n terms of two A.P is (7n + 1) : (4n + 27). Find the ratio of their mth terms.

Q4. Find the sum of all positive integers in the first 1000 intergers with are neither divisible by 2 nor 5.

Q5. The first, second and last term of an AP are a, b and 2a respectively. Show that its sum is $\frac{3ab}{2(b-a)}$.

Q6. Show that the sum of an AP whose first term is a. The second term is b and lost term is equal to $\frac{(a+c)(b+c-2a)}{2(b-c)}$.

Q7. Find A.P whose sum to n terms is $2n^2+n$.

Q8. Find the sum of the first n natural numbers.

Q9. If sum of p terms of an AP is the same as the sum of q terms , show that the sum of its (p + q) term is zero.

Q10. The sum of n terms of three A.P's are S_1, S_2 and S_3. The first term of each is unity and the common difference are 1, 2 and 3 respectively. Prove that $S_1+S_3=2S_2$.

Q11. Find the common difference of an A.P whose first term is 100 and the sum of whose first six term is five times the sum of the next six terms.

Hint : $S_6=5(S_{12}-S_6)$

Q12. Prove that no matter what are the real numbers a and b are, the sequence with the nth term a + nb is always an A.P. What is the common difference. What is the sum of the first 20th terms.[Ans. d = b, S_{20} = 20a + 210b]

Q13. Find the sum of all 3 digits numbers which have the reminaer 2, when divided by 3.

Q14. If S_n the sum of first n terms of an A.P., is given by $Sn=Sn^2+3n$, then find its $n+n$ term.

Q15. Write the expression a_n-a_k for th A.P : a, a + d, a + 2d,... Hence find the common difference of the AP for which 11th term is 5 and 13th term is 79.

Hints : $a_n = a+(n-1)\times d$; $a_k = a+(k-1)d$

$a_n-a_k=(n-k)d \Rightarrow 79-5=2d$]

Q16. 390 plants are to be planted in a garden in a number of rows. There are 40 plants in the first row, 38 plants in the second row, 36 plants in the third row and 30 on. Each next row has two plants less than those in the previous row in how many rows the 390 plants are planted. Also find the number of plants in the last row.

Q17. If the mth term of an AP is $1/n$ and the nth term is $1/m$, show that the sum of mn terms is $1/2(mn+1)$.

Q18. The sum of n, 2n, 3n terms of an A.P are S_1, S_2, S_3 respectively. Prove that $S_3=3(S_2-S_1)$.

Q19. If in an AP, the sum of m terms is equal to n and the sum of n terms is equal to m, then prove that the sum of (m + n) terms is –(m + n).

Q20. The sum of the first p, q, r terms of an A.P are a, b, c respectively. Show that

$$\frac{a}{p}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-q)=0$$

PRACTICE EXERCISE 5.8 (HOTS)

Q1. The ratio of the sum of m and n terms of an AP. is $m^2 : n^2$. Show that the ratio of the mth and nth terms is (2m – 1) : (2n – 1).

Q2. If there are (2n + 1) terms in AP then prove that the ratio of the sum of odd terms and the sum of even terms is (n + 1) : n.

Q3. Ram buys a shop for Rs. 1,20,000. He pays half of the amount in cash and agrees to pay the balance in 12 instalemnts of Rs. 5000 each. If the rate of interest is 12% and he pays with the instalment the interest due on the unpaid amount find the total cost of the shop.

Q4. The digits of positive integers, having three digits are in A.P and their sum is 15. The number obtained by reversing the digits is 594 less than the original numbr. Find the number.

Q5. 150 workers were engaged to finish a piece of work in a certain numbers of days. Four workers dropped the second day, four more workers dropped the third day and so on. It takes 8 more days to finish the work now. Find the number of days in which the work was completed.

Hints : Let total work finish in *n* day, then

$$=\frac{n}{2}[2\times150+(n-1)(-4)] = 180\,(n-8)$$

Q6. A long a road lie on odd number of stones placed at intervals of 10 metres. These stones have to be assembled around the middle stone. A person can carry only one stone at a time. A man came the job with one of the end stones by carrying them in succession. In carrying all the stones he covred a distance of 31km. Find the number of stones.

Q7. A man arranged to pay off debt of Rs. 3600 by 40 annual. Instalments which form an arithmetic series. When 30 of the instalments are paid, he dies leaving one third of the debt unpaid, find the value of the first instalment.

Q8. There are 25 trees at equal distances of 5 metres in a line with a well, the distance of the well from the nearest tree being 10 metres. A gardner waters all the trees separately starting from the well and he returns to the well after watering each tree to get water for the next. Find the total distance the gardener will cover in order to water all the trees.

Q9. A man is employed to count Rs. 10710. He counts at the rate of Rs. 100 per minute for half an hour. After this he counts at the rate of Rs. 3 less every minute than the preceding minute. Find the time by him to count the entire amount.

Q10. A piece of equipment cost a certain factory Rs. 600,000. If it depreciates in value 15% of the first, 13.5% of the next year, 12% the third year, and son on. What will be its value at the end of 10 years.

Q11. A ball rolling up inclined plane cover during the Ist, 27th during 2nd and 24 m during the third second and 50 cm. How much distance does it travels during 10th second. Also find the total distance covered in 10 seconds.

Q12. Show that a^2, b^2, c^2 are in A.P., if $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$ are in A.P.

Q13. If $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ is the A.M between a and b then find the value of n

Q14. The interior angles of a polygon are in A.P. The smallest angle is 120^0 and the common difference is 5^0. Find the number of sides of polygon.

Hint : Sum of all angles = $(n-2)\times180$.

Q15. Poonam buys an old car for Rs.44,000. She pays Rs.16,000 cash and promise to pay the balance in 28 annual. instalment of Rs.1000 each along with interest due on unpaid amount. If the interest changed at 10%. What will be car cost her.

Q16. Two car start in the same direction from the same place. The first goes with uniform speed of 10 km/hr. The second goes at a speed of 8km/hr in the first hour and increases the speed by 1/2 km, each succeding hour. After how many hours will be second car overtake. The first car if both car go nonstop.

Hint : $10n=\frac{n}{2}\left[2\times8+(n-1)\frac{1}{2}\right]$

PRACTICE EXERCISE 5.8

Q.1 Find p, q such that 18, p, q, 3 are in A.P.

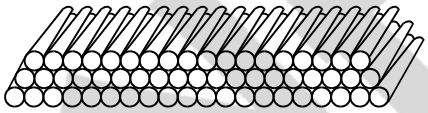
Q.2 Find k, if the given value of x is the kth term of the given A.P. 25, 50, 75 ..... ; x = 1000.

Q.3 The fourth term of an A.P. is ten times the first. Prove that the sixth term is four times as great as the second term.

Q.4 The first term of an A.P. is 5 and its 100th term is -292. Find the 50th term of this A.P.

Q.5 Suba Rao started work in 1995 at an annual salary of Rs. 5000 and received Rs. 200 raise each year. In what year did his income reach Rs. 7000 ?

Q.6 200 logs are stacked in the following manner: 20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on (see figure). In how may rows are the 200 logs and how many logs at in the top row ?



Q.7 A club consists of member whose ages in A.P the common difference being 3 months. If the youngest member of the club is just 7 years old and the sum of ages of all the members is 250 years, find the number of members in the club.

Q.8 In a flower bed, there are 23 rose plants in the first row, 21 in the second, 19 in the thrid and 50 on there are 5 rose plants in the last row. How many rows are. There are in the flower bed.

Q.9 Which term of the sequence 45, 41, 37, 33 is the first negative term.

Q.10 The first term of an A.P. is 5 and its 100th term is -292. Find the 50th term of this A.P.

Q.11 For what value of n, the nth term of the series "9, 7, 5....." and "15, 12, 9, ..." s the same.

Q.12 The 7th term of an A.P. is 34 and its 15th term is 74. Find its 40th term.

Q.13 The sum of three numbers is an A.P. is 18, and their product is 192. Find the numbers.

Q.14 Write the sequence with nth term of 6 - n. Show that the sequence in A.P. Find the sum of 15th terms of sequence.

Q.15 Find the sum of all natural numbers between 1 and 99 which are multiples of 5.

Q.16 Find the common difference of an A.P. whose first term is 100 and the sum of whose first six terms is five times the sum of the next six terms.

Q.17 If the sum of p terms of an A.P. is the same as the sum of q terms, show that the sum of its (p + q) terms is zero.

Q.18 Find the sum of all natural numbers between 100 and 1000 which are multiples of 7.

Q.19 Find the sum of all 3 digit numbers which leave the remainder 2, when divided by 3.

Q.20 The sum of an A.P. is 136, the common difference 4, and the last term is 31, find n.

PRACTICE EXERCISE 5.9 (MCQ)

Q1. If 7th and 13th terms of an A.P. be 34 and 64 respectively, then its 18th term is

(a) 87 (b) 88

(c) 89 (d) 90 Ans. (c)

Q2. If the sum of P terms of an A.P. is q and the sum of q terms is p, then the sum of p + q terms will be

(a) 0 (b) p – q

(c) p + q (d) – (p + q) Ans. (d)

Q3. If the sum of n terms of an A.P. be $3n^2 + n$ and its common difference is 6, then its first term is

(a) 2 (b) 3

(c) 1 (d) 4 Ans. (d)

Q4. The first and last terms of n terms an A.P.are 1 and 11. If the sum of its terms is 36, then the number of terms will be

(a) 5 (b) 6

(c) 7 (d) 8 Ans. (b)

Q5. If the sum of n terms of an A.P. is $3n^2 + 5n$, then which of its nth term is 164 ?

(a) 26th (b) 27th

(c) 28th (d) none of these Ans. (b)

Q6. If the sum of n terms of an A.P. is $2n^2 + 5n$, then its nth term is

(a) 4n –3 (b) 3n – 4

(c) 4n + 3 (d) 3n + 4 Ans. (c)

Q7. If the sum of three consecutive terms of an increasing A.P. is 51 and the product of the first and third of these term is 273, then the term is

(a) 13 (b) 9

(c) 21 (d) 17 Ans. (c)

Q8. If four numbers in A.P. are such that their sum is 50 and the greatest number is 4 times the least, then the numbers are

(a) 5, 10, 15, 20 (b)4, 10, 16, 22

(c) 3, 7, 11, 15 (d) none of these Ans. (a)

Q9. The first and last term of an A.P. are a and *l* respectively. If S is the sum of all the terms of the A.P. and the common difference is given by $\frac{\ell^2 - a^2}{k - (\ell + a)}$ then k =

(a) S (b) 2S

(c) 3S (d) none of these Ans. (b)

Q10. If the sum of first n even natural numbers is equal to k times the sum of first n odd natural numbers, then k =

(a) $\frac{1}{n}$ (b) $\frac{n-1}{n}$

(c) $\frac{n+1}{2n}$ (d) $\frac{n+1}{n}$ Ans. (d)

Q11. If the first, second and last term of an A.P. are a, b and 2a respectively, its sum is

(a) $\frac{ab}{2(b-a)}$ (b) $\frac{ab}{b-a}$

(c) $\frac{3ab}{2(b-a)}$ (d) none of these Ans. (c)

Q12. If S_1 is the sum of an arithmetic progression of 'n' odd number of terms and S_2 the sum of

the terms of the series in odd places, then $\frac{S_1}{S_2}$ =

(a) $\frac{2n}{n+1}$ (b) $\frac{n}{n+1}$

(c) $\frac{n+1}{2n}$ (d) $\frac{n+1}{n}$ Ans. (a)

Q13. If S_n denote the sum of the first n terms of an A.P. If $S_{2n} = 3S_n$, then $S_{3n} : S_n$ is equal to

(a) 4 (b) 6

(c) 8 (d) 10 Ans. (b)

Q14. If an AP, $S_p = q$, $S_q = p$ and S_r denotes the sum of first r terms. Then, S_{p+q} is equal to

(a) 4 (b) 6

(c) 8 (d) 10 Ans. (b)

Q15. If S_r denotes the sum of the first r terms of an A.P. Then, $S_{3n} : (S_{2n} - S_n)$ is

(a) n (b) 3n

(c) 3 (d) none of these Ans. (c)

Q16. If the first term of an A.P. is 2 and common difference is 4, then the sum of its 40 terms is

(a) 3200 (b) 1600

(c) 200 (d) 2800 Ans. (a)

Q17. The number of terms of the A.P. 3, 7, 11, 15, ... to be taken so that the sum is 406 is

(a) 5 (b) 10 Ans. (d)

(c) 12 (d) 14 (e) 20

Q18. Sum of n terms of the series $\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + ...$ is

(a) $\frac{n(n+1)}{2}$ (b) 2n(n + 1)

(c) $\frac{n(n+1)}{\sqrt{2}}$ (d) 1 Ans. (c)

Q19. The 9th term of an A.P. is 449 and 449th term is 9. The term which is equal to zero is

(a) 501th (b) 502th Ans. (c)

(c) 508th (d) none of these

Q20. If $\frac{1}{x+2}, \frac{1}{x+3}, \frac{1}{x+5}$ are in A.P. Then x =

(a) 5 (b) 3

(c) 1 (d) 2 Ans. (c)

Q21. If the sums of n terms of two arithmetic progressions are in the ratio $\frac{3n+5}{5n+7}$, the their nth terms are in the ratio

(a) $\frac{3n-1}{5n-1}$ (b) $\frac{3n+1}{5n+1}$

(c) $\frac{5n+1}{3n+1}$ (d) $\frac{5n-1}{3n-1}$ Ans. (b)

Q22. If the first term of an A.P. is a and nth term is b, then its common difference is

(a) $\frac{b-a}{n+1}$ (b) $\frac{b-a}{n-1}$

(c) $\frac{b-a}{n}$ (d) $\frac{b+a}{n-1}$ Ans. (b)

Q23. The sum of first n odd natural numbers is

(a) 2n – 1 (b) 2n + 1

(c) n^2 (d) $n^2 - 1$ Ans. (c)

Q24. Two A.P.'s have the same common difference. The first term of one of these is 8 and that of the other is 3. The difference between their 30th term is

(a) 11 (b) 3

(c) (d) 5 Ans. (d)

Q25. If 18, a, b, –3 are in A.P., the a + b =

(a) 19 (b) 7

(c) 11 (d) 15 Ans. (d)

SELF EVALUATION TEST SERIES

M.M : 25 **M.T: 60 min.**

TEST - 1

Q1. If $(x+2)$, $2x$, $(2x+3)$ are three consecutive terms of an AP, find the value of x. **[Ans.5] 3**

Q2. Find the sum of the series : **3**

$$\frac{x-y}{x+y}, \frac{3x-2y}{x+y}, \frac{5x-3y}{x+y} + \text{.....n terms.}$$

Ans : $\frac{n}{2}\left[\frac{(2x-y)n-y}{x+y}\right]$

Q3. Find the nth term of the given A.P. : 1, 4, 7, 10, ... [**Ans :** n = 3n – 2] **3**

Q4. Which term of the A.P. 5, 13, 21, ... is 181. [**Ans :** 231] **3**

Q5. The 5th term of an A.P. is 20 and its 10th term is 40. Find the first and the common difference. [**Ans :** a = 4, b = 4] **3**

Q6. The 4th term of an A.P. is equal to 3 times the first term and the 7th term exceeds twice the third term by 1. Find the 1st term and the A.P.

[**Ans :** a= 3, d = 2] **3**

Q7. The 10th term of an A.P. is -4 and its 22nd term is -16. Find its 38th term and the nth term.

[**Ans :** –32, $a_n = 6 - n$] **3**

Q8. If twice the 2nd term of an A.P. is equal to 5 times the 5th term of the A.P. then show that the 7th term is zero. **4**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

M.M : 25 **M.T: 60 min.**

TEST - 2

Q1. If eight times the 8th term of an A.P. is equal to 12 times the 12th term of the A.P. then find the 20th term. [**Ans :** $a_{20} = 0$] **3**

Q2. Which term of the sequence 48, 43, 38, 33, ... is the first negative term.

[**Ans :** n = 1] **3**

Q3. The sixth term of an A.P. is 3 times the first term and tenth term exceeds twice the third term by 5. Find the first term and the common difference. [**Ans :** a = 5, d = 2] **3**

Q4. If 5 times the 5th term of an A.P. is equal to 7 times the 7th term then prove that the 12th term is zero. **3**

Q5. If p times the pth term of an A.P. is equal to q times its qth term, show that the (p + q)th term of the A.P. is zero. **3**

Q6. How many numbers between 10 and 200 are exactly divisible by 7. [**Ans :** 27] **3**

Q7. If the sum of p terms of an A.P. is the same as the sum of q terms, show that the sum of (p + q) terms is zero. **3**

Q8. Solve 1 + 6 + 11 + 16 + ... + x = 148. **4**

[**Ans :** 36]

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.%	Grade
Marks											

SELF EVALUATION TEST SERIES

M.M : 25 **M.T: 60 min.**

TEST - 3

Q1. Find the sum of first 20 terms of A.P. in which 3rd term is 7 and 7th term is two more than thrice of its 3rd term. [**Ans :** 75] **3**

Q2. Two A.P.s have the same common difference. The first term of one of these is 3 and that of the other is 8 what is the difference between their 4th term. [**Ans :** –5] **3**

Q3. Find the common difference of an A.P. whose first term is 100 and the sum of whose first six terms is five times the sum of the next six terms. [**Ans :** d = –40] **3**

Q4. Two A.P.s have the same common difference. The difference between their 100th term is 111222333. What is the difference between their millionth terms. [**Ans :** 111,222,333] **3**

Q5. For an A.P a = -2, d = 4. S_n = 160, find n. [**Ans :** n = 10] **3**

Q6. Find the sum of integers between 50 and 500 which are divisible by 7. [**Ans :** 17696] **3**

Q7. For what value of n, the nth term of the A.P. 3 , 10, 17 ..... is equal to the nth term of the A.P. 63, 65, 67 ..... [**Ans :** n = 13] **3**

Q8. Determine the 10th term from the end of the A.P. 4, 9, 14, ... 25. [**Ans :** 149] **4**

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.(%)	Grade
Marks											

M.M : 25 **M.T: 60 min.**

TEST - 4

Q1. How many terms of the series 54, 51, 48 ..... to be taken so that their sum is 513. **3**

[**Ans :** n = 18, 19]

Q2. Find the sum of series : $(x - y)^2$, $(x^2 + y^2)$, $(x + y)^2$ ..... n terms.

$n\left(x^2 + y^2 - 3xy + nx\right)$ **3**

Q3. The first term of an A.P. is 2 and the sum of the first five terms is equal to one fourth the sum of next five terms, find the sum of first 20 terms. [**Ans :** – 1100] **3**

Q4. Find the middle term's of the A.P. 3, 9, 15, 21, ... 309. [**Ans :** 28, 29] **3**

Q5. Find the sum of all natural numbers between 200 and 800 which leave the remainder 9 when divided by 16. [**Ans :** 18685] **3**

Q6. Find the sum of the series : 3 + 5 + 7 + 6 + 9 + 12 + 9 + 13 + 17 + ... 30 terms.

[**Ans :** 960] **3**

Q7. If pth, qth and rth terms of an A.P. are a,b,c respectively, then show that : **3**

$a (q - r) + b (r - p) + c (p - q) = 0$

Q8. If pth, qth and rth terms of an A.P. are a,b,c respectively, then show that : **4**

$(a - b)r + (b - c)p + (c - a) q = 0$

RESULTS : SELF CHECKING PLAN

Q.No.	1	2	3	4	5	6	7	8	Total	Per.(%)	Grade
Marks											

PRACTICE EXERCISE 5.9 (VIQ)

Q.1 Find p, q such that 18, p, q, 3 are in A.P.

Q.2 Find k, if the given value of x is the kth term of the given A.P. 25, 50, 75 ..... ; x = 1000.

Q.3 The 8th and 15th terms of an A.P. are 5 and 33 respectively. Find the 5th term and nth term.

Q.4 The fourth term of an A.P. is ten times the first. Prove that the sixth term is four times as great as the second term.

Q.5 Find $a_{30} - a_{20}$ for the A.P -9, -14, -19, 24.

Q.6 If 5 times the 5th term of an A.P. is equal to 7 times the 7th term then prove that the 12th term is zero.

Q.7 Write the expression $a_n - a_k$ for the A.P. : a, a + d, a + 2d, ... Hence find the common difference of the A.P. for which 11th term is 5 and 13th term is 79.

Q.8 Which term of an A.P. : 3, 15, 27, 39,.... will be 132 more than its 54th term ?

Q.9 Two A.Ps have the same common difference. The difference between their 100th terms is 1111222333. What is the difference between their millionth terms ?

Q.10 The first term of an A.P. is 5 and its 100th term is -292. Find the 50th term of this A.P.

Q.11 How many numers of two digits are divisible by 5 ?

Q.12 The sum of three numbers in A.P. is -3, and their product is 8. Find the numbers.

Q.13 A sum of Rs. 1000 is invested at 8% simple interest per annum. Calculate the interest at the end of 1, 2, 3 .... years is the sequence of interest on A.P. Find the interest at the end of 30 years.

Q.14 Which term of the sequence 45, 41, 37 ..... is the first negative term.

Q.15 The 6th term of an A.P. is 5 times the first one and the 11th term exceeds twice the 5th term by 3, find the 8th term.

Q.16 If pth, qth and rth terms of an A.P. are a, b, c respectively, show that $(q - r)a + (r - p)b + (p - q)c = 0$

Q.17 If the mth term of an A.P. is $\frac{1}{n}$ and the nth term is $\frac{1}{m}$, find the (mn)th term.

Q.18 Find, A.P., whose sum to n terms is $2n^2 + n$.

Q.19 Ramkali saved Rs. 5 in the first week of a year and then increased her weekly savings by Rs. 1.75. If nth week her weekly savings become Rs. 20.75, find n.

PRACTICE EXERCISE 5.10 (VIQ)

Q.1 Find the sum of the First 11 terms of the A.P. of 2, 6, 10.....

Q.2 Find the sum of the first n natural numbers.

Q.3 Find the sum of 2 + 4 + 6 + ... 200

Q.4 Write the sequence with nth term of 6 - n. Show that the sequence in A.P. Find the sum of 15th terms of sequence.

Q.5 Find the sum of all natural numbers between 1 and 99 which are multiples of 5.

Q.6 Find the common difference of an A.P. whose first term is 100 and the sum of whose first six terms is five times the sum of the next six terms.

Q.7 If the sum of p terms of an A.P. is the same as the sum of q terms, show that the sum of its (p + q) terms is zero.

Q.8 If the sum of n terms of two Arithmetic series are in the ratio 7n + 1 : 4n + 27 ; find the ratio of their 11th terms.

Q.9 The sum of n terms of three A.P.'s are S_1,S_2 and S_3. The first term of each is unity and the common difference are 1,2 and 3 respectively. Prove that $S_1 + S_3 = 2S_2$.

Q.10 Two cars start in the same direction from the same place. The first goes with uniform speed of 10 km/h. The second goes at a speed of 8km/h in the first hour and increase the speed by $\frac{1}{2}$km, each succeeding hour. After how many hours will the second car overtake the first car if both cars go non-stop.

Q.11 Prove that no matter what the real numbers a and b are, the sequence with the term a + nb is always an AP. What is the common difference. What is the sum of the first 20 terms.

Q.12 Find the sum of all natural numbers between 100 and 1000 which are multiples of 7.

Q.13 Find the sum of all 3 digit numbers which leave the remainder 2, when divided by 3.

Q.14 How many terms of the AP $-6, \frac{-11}{2}, -5$ ..... are needed to give the sum -25 ? Explain the double answer.

Q.15 If pth, qth and rth terms of an A.P. are a,b,c respectively, then show that :

$(q - r) + b(r - p) + c(p - q) = 0$

Q.16 If pth, qth and rth terms of an A.P. are a,b,c respectively, then show that :

$(a - b)r + (b - c)p + (c - a)q = 0$

ANSWER SHEET

EXERCISE 5.1

1. 5, 8, 11 2. 2, 5, 10 3. 2, –4, 8
4. 10, 31, 94 5. 2, 3, 5 6. $1, 2, \frac{3}{2}, \frac{5}{3}$
7. $-\frac{1}{3}, 0, \frac{1}{3}, \frac{2}{3}, 1$ 8. –3, –9, 27 9. $\frac{1}{5}, \frac{4}{5}, \frac{7}{5}$
10. –2, 4, –8 11. $-\frac{1}{2}, 0, \frac{3}{2}$ 12. 1, 3, 7
13. 0, 3, 10 14. $-\frac{1}{6}, \frac{1}{6}, \frac{1}{2}$ 15. 5, 8, 11
16. 56 17. $\frac{19}{33}$ 18. 60
19. –12 20. –5 21. 3, 5, 7
22. –1, –4, –7 23. $-\frac{1}{2}, -\frac{1}{6}, -\frac{1}{24}$
24. 19, 79, 319 25. 4 27. 21
29. 3/5 30. 2 31. No
32. –3

EXERCISE 5.2

1. 18 2. 7 3. $\sqrt{48}$
4. y + 63 5. 2 6. 39
7. 59, 72, n 8. 83, 91 9. 185
10. 119 11. 24 12. 20^{th}
13. 105, 6n - 3 14. 5 16. -50
17. -142 18. (i) 3 (ii) 5 (ii) 93
20. 19 21. 2, 3 23. -3, 2
25. 14 26. 5, 9, 13, 17
27. 3 28. 18 29. 6
30. 2/3, 2, 10/3, 14/3, 6, 33/3 31. 15 + 4
32. $n/6 - 2/3$, 16 33. 5/6, 4/3, 11/6
34. No. 37. 67

EXERCISE 5.3

1. 7 2. n = 11 3. Rs.2400
4. Rs.6400 5. 199 6. –32, $6 - n$
8. 69 9. 4, 6, 8 10. 1, 3, 5, 7
11. n = 10 12. 5, 7, 9 or 9, 7, 5
13. 5, 9 , 13 14. 55, 10, 15, 20 15.
3, 5, 7 or 7, 5, 3 16. –1, 3, 7 17. 998
18. 1, 3, 5, 7, 9 20. $75^0, 85^0, 95^0, 105^0$
21. –4, –1, 2 22. 2, 6, 10, 14
23. 2, 4, 6 or 6, 4, 2 24. 128
25. $4n - 1$ 26. $n = 36$ 27. –32
28. 163 29. 6
30. –13, – 8, – 3 31. –13, – 8, – 7

EXERCISE 5.4

1. $n = 25$ 2. 10 3. 9
12. 28th term 13. 79/2 15. –5
16. 111222333 19. 10 22. 252
23. k = 0 24. Rs.4700
25. 31st December 2007 26. 80 27. 19

EXERCISE 5.5

1. 893 2. 676 3. –144
4. 2139 5. 20th, 860 6. 65/3
7. 1665 8. 2444 9. 816
10. 17157 11. 21978 12. 37674
13. 960 14. 625 15. 505000
16. 37674 17. 2652 18. –300
19. 15 20. $(21 \text{ or } 22), T_{22} = 0$
21. 31, 2n+7 22. $(3 \text{or } 10), 0$
23. 495, $(2n^2 + 3n)$ 24. $a_n = (4n + 3)$
25. (i) $6n - 4$ (ii) $a = 2$ (iii) $d = 6$
26. 99 27. n^2 28. $a = 1, d = 2$
30. $n = 12, d = -3$ 29. 12, 510
31. 3 32. $1/2(n - 1)$

ANSWER SHEET

33. (i) 2500 (ii) 10200 (iii) 31500
34. Rs.1000, Rs.800, Rs.600, Rs.400
35. 40

EXERCISE 5.6

1. 156 2. 390 3. 160
4. 5050 5. 10100 6. –8930
7. 0, 12 8. –10, 3 9. 54 cans
10. 101, 1.5 11. 156375 12. 740
13. 6, 2, –2 14. 11 15. Rs.1200
16. 55, 412½ 18. 8 19. 28405
20. 2, 26 21. –800 22. 2475
24. $n = 6$ or 12 25. 25 26. Rs.150
27. 5, 295

EXERCISE 5.7 (HOTS)

1. 210/pq 2. $6(x^2 + y^2 + 3xy)$]
3. 14m –6 : 8m + 23] 4. 20,000]
7. 3, 7, 11, 15,...] 8. $\frac{n(n+1)}{2}$] 11. d = 10]
12. d = b, S_{20} = 20a + 210b]
13. 164850 14. $a_n = 10n - 2$ 15. d = 37
16. 15, 12

EXERCISE 5.8

3. Rs. 1,66,800 4. 852 5. 25 days
6. 25 7. Rs.51 8. 3500m
9. 89 min. 10. Rs.10,500 11. 3m, 165m
14. 9 15. 70,200 16. 9 Hr.

EXERCISE 5.9

1 p = 13; q = 8 2 k = 4 4 –142
5 No. of years = 11 7 25
8 10 rows in the flower bed
9 13th Term 10 -142
11 7 12 199
13 4,6,8 or 8,6,4 14 S_{15} = -30
15 S_n = 950 16 d = -10 18 70336
19 164850 20 8

EXERCISE 5.10 (VIQ)

1 p = 13 ; q = 8 2 k = 40 3 -7 ; 4n - 27
5 $a_{30} - a_{20} = -50$ 7. d = 37 8. 65th term
9 111222333 10. -142 11 13
12 –4, –1 or 2, –1, –4 13 Rs. 2400.
14 13th term 15. 33 17 $t_{mn} = 1$
18 3, 7, 11, 15.... 19 n = 10

EXERCISE 5.11 (VIQ)

1. $S_{11} = 242$ 2. $\mathbf{S_n = \frac{n(n+1)}{2}}$ 3. $S_n = 10100$
4. $S_{15} = -30$ 5. $S_n = 950$ 6. d = -10
8. 4 : 3 10. 9 hours 11. $S_{20} = 20a + 210b$
12. 70336 13. 164850 14. n = 20 or n = 5

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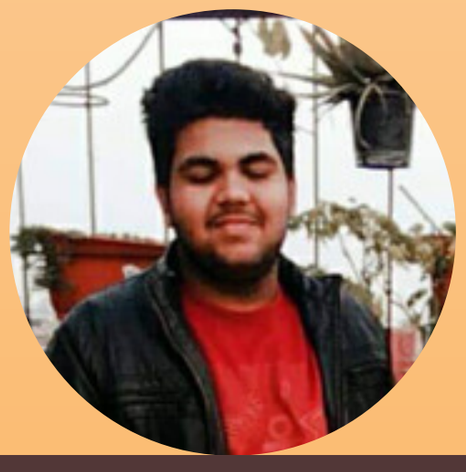

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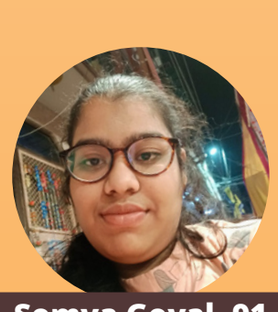

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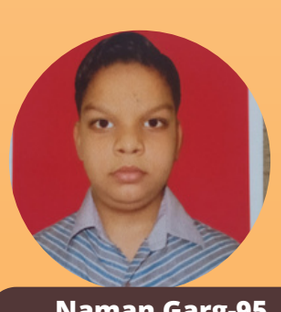

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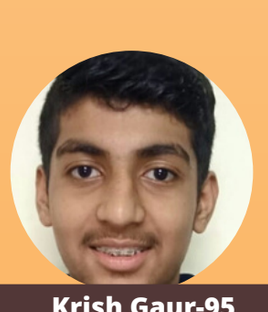

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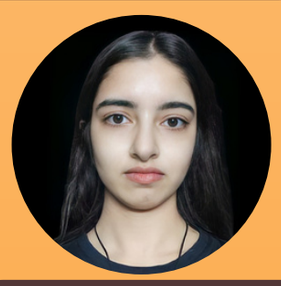

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