CONTENTS

Syllabus

Academic Session 2021-22

Term 1: MARCH-AUGUST

MARCH:

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES (Only Graphical Method)

Pair of linear equations in two variables. Geometric representation of different possibilities of solutions/inconsistency.

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES (Algebraic Methods)

Algebraic conditions for number of solutions. Solution of pair of linear equations in two variables algebraically – by substitution, by elimination and by cross multiplication. Simple situational problems must be included. Simple problems on equations reducible to linear equations may be included.

APRIL :

COORDINATE GEOMETRY

Review the concepts of coordinate geometry done earlier including graphs of linear equations. Awareness of geometrical representation of quadratic polynomials. Distance between two points and section formula (internal). Area of a triangle.

MAY:

ARITHMETIC PROGRESSIONS

Motivation for studying AP. Derivation of standard results of finding the nth term and sum of first n terms.

QUADRATIC EQUATIONS

Standard form of a quadratic equation $ax^2+bx+c=0$, $(a \neq 0)$. Solution of the quadratic equations (only real roots) by factorization and by completing the square and by using quadratic formula.Relationship between discriminant and nature of roots.

Problems related to day-to-day activities to be incorporated.

JULY:

QUADRATIC EQUATIONS

Continued.

POLYNOMIALS

Zeros of a polynomial.Relationship between zeros and coefficients of a polynomial with particular reference to quadratic polynomials.Statement and simple problems on division algorithm for polynomials with real coefficients.

REAL NUMBERS

Euclid's division lemma, Fundamental Theorem of Arithmetic - statements after reviewing work done earlier and after illustrating and motivating through examples. Proofs of results – irrationality of $\sqrt{2}$,$\sqrt{3}$, $\sqrt{5}$ decimal expansions of rational numbers in terms of terminating/non-terminating recurring decimals.

AUGUST:

SIMILAR TRIANGLES

Definitions, examples, counter examples of similar triangles.

1. (Prove) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.
2. (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.
3. (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.
4. (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.
5. (Motivate) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.
6. (Motivate) If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other.

7. (Prove) The ratio of the areas of two similar triangles is equal to the ratio of the squares on their corresponding sides.

8. (Prove) In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.

9. (Prove) In a triangle, if the square on one side is equal to sum of the squares on the other two sides, the angles opposite two the first side is a right triangle.

INTRODUCTION TO TRIGONOMETRY

Trigonometric ratios of an acute angle of a right-angled triangle. Proof of their existence (well defined); motivate the ratios, whichever are defined at 0^0 and 90^0.

Values (with proofs) of the trigonometric ratios of 30^0, 45^0 and 60^0. Relationships between the ratios.

Proof and applications of the identity $\sin^2 A + \cos^2 A = 1$.Only simple identities to be given.Trigonometric ratios of complementary angles.

Term II (SEPTEMBER-NOVEMBER)

SEPTEMBER:

HEIGHTS AND DISTANCES

Simple and believable problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation/depression should be only 30^0, 45^0 and 60^0.

SURFACE AREAS AND VOLUMES

(i) Problems on finding surface areas and volumes of combinations of the following solids: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones.

Frustum of a cone.

(ii) Problems involving converting one type of metallic solid into another and other mixed problems. (Problems with combination of not more than two different solids be taken.)

CIRCLES

Meaning of a tangent.

(Prove) Radius is perpendicular to the tangent at the point of contact (Prove) Tangents drawn to a circle from an external point are equal. Simple applications.

OCTOBER:

AREAS OF PLANE FIGURES

Motivate the area of a circle; area of sectors and segments of a circle.Problems based on areas and perimeter/circumference of the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of 60^0, 90^0 and 120^0. Plane figures involving triangles, simple quadrilaterals and circle should be taken.)

NOVEMBER:

CONSTRUCTIONS

Construction of tangents to a circle through an external point.To construct a triangle similar to a given triangle as per the scale factor.

STATISTICS

Mean , median and mode of grouped data (bimodal situation to be avoided).

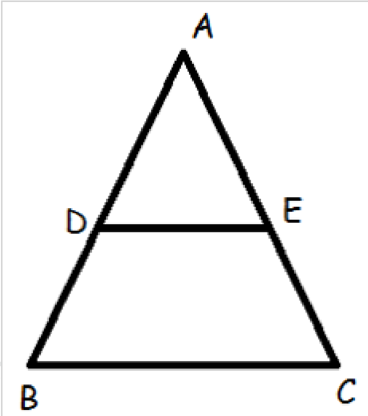
Cumulative frequency graph (less than and more than ogives)

PROBABILITY

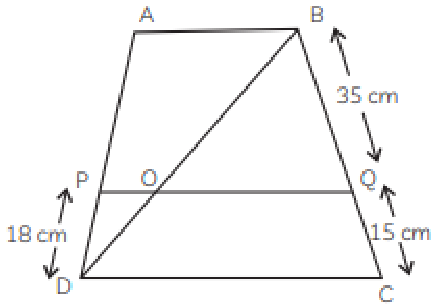
Classical definition of probability.Connection with probability as given in Class IX. Simple problems on single events, not using set notation.

Extra Questions on Similar Triangles

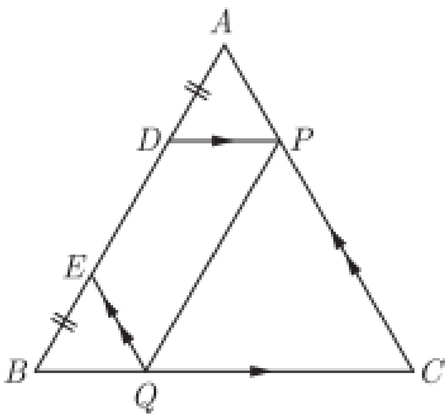
1. In ΔABC, D and E are points on the sides AB and AC respectively such that DE ∥ BC (i) If AD/DB = 3/4 and AC = 15 cm find AE.



2. ABCD is a trapezium in which AB∥ DC and P,Q are points on AD and BC respectively such that PQ ∥ BC, If PD=18cm, BQ=35cm and QC=15cm, find AD.

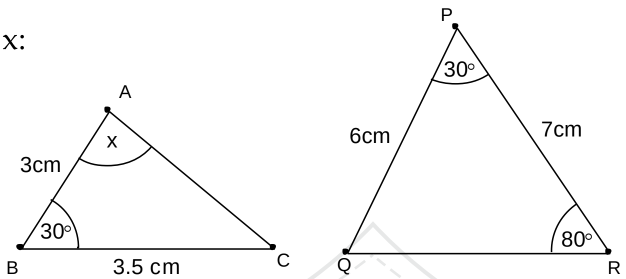


3. Let D and E be two points on the side AB of triangle ABC such that AD=BE. IF DP ∥ BC and EQ ∥ AC, Prove that PQ ∥ AB.

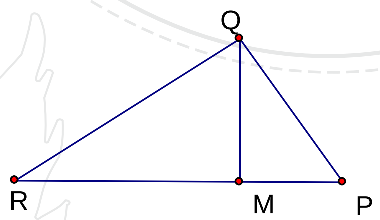


Assignment No. 1
SIMILAR TRIANGLES

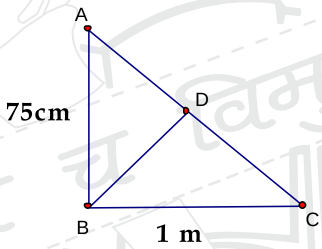
1) Find the value of x:



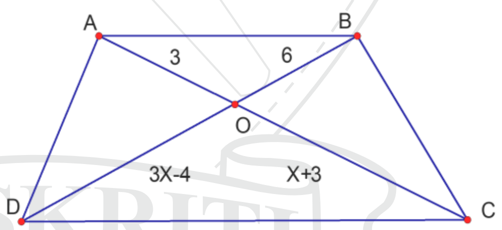
2) In the adjoining figure, QM ⊥ RP and $RP^2 - PQ^2 = QR^2$. If ∠QPM = 30°, Then find ∠MQR.



3) If AB ⊥ BC and BD ⊥ AC then find BD.



4) In the given figure, if AB ∥ CD then find the value of x.



5) In ΔABC, DE ∥ BC and DE = 4cm, BC = 8cm. If ar (ΔADE) = 15 sq cm, then find ar(DECB).

6) In ΔABC, DE ∥ BC. If AD = 3.6 cm, AE = 2.4 cm and EC =1.2cm, then find AB.

7) In ΔABC, D and E are points on AB and AC respectively such that AD = 2cm, DB = 6cm, AE = 3.1 cm and EC = 9.3 cm. Then ar(ΔABC) : ar(ΔADE) is ____________.

8) The diagonals of trapezium ABCD intersect at O and AB ∥ CD. If AB = 3 CD and ar(ΔAOB) = 48 sqcm then find ar(ΔCOD).

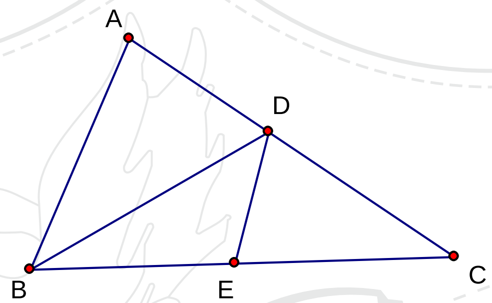
9) In ΔABC, DE ║ BC, AD =3cm, BD = 3.6cm, AE = 1.4cm and DE = 1.2 cm. Find AC and BC.

10) D and E are points on the sides AB and AC respectively of ΔABC. If AD = 5.7 cm, DB = 3.5 cm, AE = 3.6cm and AC = 4.5cm, is DE ║ BC?

11) In ΔABC, AD $\perp$ BC and $AD^2 = BD.CD$, prove that $\angle$ BAC = 90°.

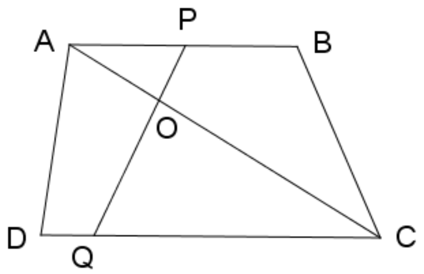
12) If in ΔABC,AB = AC and D is a point on AC such that $BC^2 = AC.DC$, prove that BD = BC.

13) In the given figure $\angle$DBC = $\angle$ACB and $\frac{AC}{BD} = \frac{CB}{CE}$. Prove that Δ ACB~Δ DCE



14) Prove that if two triangles are similar, then the ratio of their areas is equal to the square of the ratio of their corresponding altitudes.

15) In the following figure, AB || CD. Prove that OA.CQ = OC.AP



Learning Outcomes:

At the end of this chapter the student will be able to:

- Distinguish between congruency and similarity in order to understand the concept of similar figures.
- Compute the angles and ratio of sides of polygons in order to determine their similarity.
- Apply the Basic Proportionality theorem and its converse in order to determine the ratio of sides in the given triangle(s).
- Apply various criterions of similarity in order to prove whether the given triangles are similar or not.
- Compute the square of the ratio of the corresponding sides of triangles in order to find the area of similar triangles.
- Prove Pythagoras theorem and its converse in order to solve real life word problems and mathematical statements/questions.

Assignment No. 2(a)
TRIGONOMETRY

1. If $2\cos\theta = \sqrt{3}$, evaluate $3\sin\theta - 4\sin^3\theta$
2. In $\Delta ABC, \angle C = 90^\circ$. If $\tan B = \frac{1}{\sqrt{3}}$ then evaluate $\sin A\cos B + \cos A\sin B$
3. If $\sin\theta - \cos\theta = 0$, then evaluate $\sin^4\theta + \cos^4\theta$.
4. If $\tan(A+2B) = \frac{1}{\sqrt{3}}$ and $A = B$ find the values of A and B.
5. Evaluate $\cos 1^\circ \cos 2^\circ \cos 3^\circ .... \cos 180^\circ$
6. Find the value of x if $\tan 3x = \sin 45^\circ \cos 45^\circ + \sin 30^\circ$
7. If $\cos\theta = \frac{\sqrt{3}}{2}$ and $\sin\phi = \frac{1}{2}$, evaluate $\sin(\theta + \phi)$.
8. If $\cos A = \frac{12}{13}$, evaluate $\sin A(1 - \tan A)$.
9. If $\tan\theta = \frac{p}{q}$, evaluate $\frac{p\sin\theta - q\cos\theta}{p\sin\theta + q\cos\theta}$
10. If $\tan 2\theta = \frac{1}{\sqrt{3}}$, find $\cot 3\theta$.
11. If $3\sin\theta = 2\cos\theta$, evaluate $\frac{4\sin\theta - 3\cos\theta}{5\sin\theta + \cos\theta}$.
12. Find A and B if $\sin(2A+B) = \frac{\sqrt{3}}{2}$ and $\cos(A+2B) = 0$

Assignment No.2(b)
TRIGONOMETRY

1. If cos 9α = sin α and 9α< 90°, then find the value of tan 5α.

2. If $\tan 2A = \cot(A - 60^\circ)$, where $2A$ is an acute angle,find A.

3. If $\sin\theta + \cos\theta = \sqrt{2}\sin(90^\circ - \theta)$, find the value of $\cot\theta$.

4. If sin$x$ + cosec x =2, find the value of $\sin^2 x + \text{cosec}^2 x$.

5. If $x\sin\theta = y\cos\theta$ and $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$, then prove that $x^2 + y^2 = 1$.

6. Find the value of A if 3tanA + cotA = 5cosecA where 0°< A ≤ 90°.

7. If $\cos(A - B) = \cos A\cos B + \sin A\sin B$, evaluate $\cos 15°$

8. If cosecA +cotA = 5, find the value of sinA and cosA.

9. If $A + B = 90°$, prove that $\sqrt{\dfrac{\tan A\tan B + \tan A\cot B}{\sin A\sec B} - \dfrac{\sin^2 B}{\cos^2 A}} = \tan A$

10. Prove that $\dfrac{\tan^3\theta}{1+\tan^2\theta} + \dfrac{\cot^3\theta}{1+\cot^2\theta} = \sec\theta\,\text{cosec}\,\theta - 2\sin\theta\cos\theta$

11. Evaluate $\dfrac{2\cos 43°\,\text{cosec}\,47°}{5(\cos^2 29° + \cos^2 61^\circ)} - 3\tan^2 60° - \cos(35° - \theta) + \sin(55° + \theta)$

12. Without using trigonometric tables, find the value of :

$$\frac{2}{3}\left(\frac{\sec 56^\circ}{\text{cosec}\,34^\circ}\right) - 2\cos^2 20^\circ + \frac{1}{2}\cot 18^\circ\cot 35^\circ\cot 45^\circ\cot 72^\circ\cot 55^\circ - 2\cos^2 70°$$

13. Prove that $\text{cosec}^2\theta\,(\sin^4\theta - \cos^4\theta + 1) = 2$.

14. Prove that $\sqrt{\dfrac{\sec A - 1}{\sec A + 1}} + \sqrt{\dfrac{\sec A + 1}{\sec A - 1}} = 2\,\text{cosec}\,A$

15. Prove that $\dfrac{1}{\text{cosec}\,\theta - \cot\theta} - \dfrac{1}{\sin\theta} = \dfrac{1}{\sin\theta} - \dfrac{1}{\text{cosec}\,\theta + \cot\theta}$

Web Resources

- http://tinyurl.com/trigo-application
- http://tinyurl.com/trigo-application10

Learning Outcomes:

At the end of this chapter the student will be able to:

- Describe trigonometry as a study of the relationship between side and angle of a triangle.
- Define and distinguish various trigonometric ratios in order to describe and verify sine, cosine, tangent, cosecant, secant, cotangent of an angle.
- Use given trigonometric ratio(s) to find and verify other trigonometric ratios/angles of the triangle.
- Compute the trigonometric ratio of specific angles of 0°, 30°, 45°, 60°and 90°.
- Compute the trigonometric ratio of complimentary angles and apply the values in mathematical problems.
- Prove and apply trigonometric identities in order to simplify and solve mathematical problems.

Extra Questions
Real Numbers

1. Find the least number which when increased by 14 is exactly divisible by 364 and 572.
2. A circular field has a circumference of 360 km. Three cyclists start together and can cycle 48, 60 and 72 km daily round the field. When will they meet again?
3. Find the greatest number that will divide 508, 635 and 762 leaving remainders 4, 5 and 6 respectively.
4. Find the HCF of 468 and 222 and express it as $468x + 222y$ in two different ways, where x and y are integers.
5. A rectangular courtyard 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 minimum number of tiles required.
6. Show that one and only one of n, n + 2, n + 4 is divisible by 3.
7. Two tankers contain 583 litres and 242 litres of petrol respectively. A container with maximum capacity is used which can measure the petrol of either tanker in exact number of litres. How many containers of petrol are there in the first tanker.
8. The LCM of two numbers is 14 times their HCF. The sum of LCM and HCF is 600. If one of the numbers is 280, then find the other number.
9. Find the LCM (72,120), if it is given that HCF (72,120) = 24.
10. On a morning walk three persons step off together and their steps measure 40cm, 42cm, 45cm respectively. What is the minimum distance each should walk so that each can cover the same distance and complete steps?
11. 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.

Word Problems

1) A merchant has 120 liters and 180 liters of two kinds of oil. He wants to sell the oil by filling the two kinds in tins of equal volumes. Find the greatest volume of such a tin.
2) A wine seller had three types of wine. 403 litres of 1st kind, 434 litres of 2nd kind and 465 litres of 3rd kind. Find the least possible number of casks of equal size in which different types of wine can be filled without mixing.
3) Find the least number of square tiles by which the floor of a room of dimensions 16.58 m and 8.32 m can be covered completely.
4) A forester wants to plant 66 apples tree, 88 banana trees and 110 mango trees in equal rows (in terms of number of trees). Also, he wants to make distinct rows of tree (i.e. only one type of tree in one row). Find the minimum number of rows that is required.
5) The drama club meets in the school auditorium every 2 days, and the choir meets there every 5 days. If the groups are both meeting in the auditorium today, then how many days from now will they next have to share the auditorium?
6) Six bells commence tolling together and toll at intervals of 2, 4, 6, 8 10 and 12 seconds respectively. In 30 minutes, how many times do they toll together? (excluding the one at start)
7) The traffic lights at three different road crossings change after every 48 sec, 72 sec and 108 sec respectively. If they all change simultaneously at 8:20:00 hours, when will they again change simultaneously?
8) There is a track with a length of 120 meters and 2 people, A & B, are running around it at 12 m/min and 20 m/min respectively in the same direction. When will A and B meet at the starting point for the first time?
9) In a school annual day function parade, a group of 1420 students need to march behind the band of 540 members. The two groups have to march in the same number of columns. What is the maximum number of columns in which they can march?
10) Find the least number of soldiers in a regiment such that they stand in rows of 15, 20, 25 and form a perfect square.

Assignment No.3
REAL NUMBERS

State whether true /False

A) The sum of two prime numbers is always a prime number.

B) The product of two irrational numbers is irrational.

C) Two numbers have 12 as HCF and 350 as LCM.

Choose the correct answer from the given options:

D) The product of the HCF and the LCM of the smallest prime number and the smallest composite number is:

a)2 b)4 c)6 d)8

E) The least number that is divisible by all natural numbers from 1 to 10(both inclusive) is:

a)10 b)100 c)504 d)2520

Solve the following questions:

1) If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$ where x and y are prime numbers, then find HCF(a,b).

2) If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$ where x and y are prime numbers, then find LCM(a,b).

3) The decimal expansion of $\frac{147}{120}$ will terminate after how many places of decimal?

4) Without actual division state whether the following rational numbers have terminating or non terminating repeating decimal representation:

(i) $\frac{189}{270}$ (ii) $\frac{81}{96}$ (iii) $\frac{217}{2^2 \times 5^3 \times 7}$ (iv) $\frac{61}{360}$

5) Find the decimal representation of the following:

(i) $\frac{217}{2^2 \times 5^3 \times 7}$ (ii) $\frac{19}{2^3 \times 5^2}$ (iii) $\frac{25}{2^3 \times 5^5}$ (iv) $\frac{187}{2^4 \times 5^6 \times 11}$

6) Find the HCF of the smallest prime number and the smallest composite number.

7) Can the HCF and LCM of two numbers be 9 and 2238 respectively?

8) If $32.3\overline{7}$ is expressed in the form $\frac{p}{q}$, what can you say about prime factors of q?

9) Find the LCM of 896 and 784 if HCF (896, 784) =112.

10) If n is an odd integer, show that $n^2 - 1$ is divisible by 8.

11) Find the HCF and LCM of 156 and 208 using fundamental theorem of arithmetic.

12) Using Euclid's division lemma, find the HCF of 391, 595 and 646.

Web Resources

http://tinyurl.com/irrational-numbers10

Learning Outcomes:

At the end of this chapter the student will be able to:

- Apply Euclid Division Algorithm in order to obtain HCF of 2 positive integers in the context of the given problem.
- Use the Fundamental Theorem of Arithmetic in order to calculate HCF and LCM of the given numbers in the context of the given problem.
- Recall the properties of irrational number in order to prove whether the sum/difference/product/quotient of numbers is irrational.
- Apply theorems of irrational number in order to prove whether a given number is irrational.
- Apply properties of rational numbers in order to understand the nature of their decimal representation.

The 3n+1 Problem (Collatz Problem)

Take any natural number, from which you derive a sequence of numbers according to the following rules.

If the number is even, the next number is half of it. If the number is odd, you have to treble it and add 1. This is the next number. Strangely enough this sequence always **ends with the number 1.**

1st example: The first number is 16.

Sequence: 16, 8, 4, 2, 1

2nd example: The first number is 15.

Sequence: 15, 46, 23, 70, 35, 106, 53, 160, 80, 40, 20,10, 5, 16, ,8 ,4 ,2 ,1

3rd example: If you begin with 77 671, you reach 1,570,824,736 as the biggest number. In the end you reach 1 after 232 steps.

Extra Questions
Polynomials

1) If sum of the zeros of a quadratic polynomial $kx^2 + 2x + 3k$ is equal to the product of its zeros then find the value of k.

2) If α and β are zeroes of the polynomial $4x^2 - 4x - 3$ find the value of:

   (i) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ (ii) $\frac{1}{\beta^2} + \frac{1}{\alpha^2}$ (iii) $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$ (iv) $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}}$ (v) $\alpha^2 + \beta^2$

   (vi) $\alpha^3 + \beta^3$ (vii) $\alpha^4 + \beta^4$ (viii) $\frac{1}{\alpha+2\beta} + \frac{1}{\beta+2\alpha}$

3) If sum of the zeroes of the polynomial $(a+1)x^2 + (2a+3)x + (3a+4)$ is -1, find the product of its zeroes.

4) Find k, if sum of the zeroes of the polynomial $x^2 - (k+6)x + 2(2k-1)$ is half their product.

5) If zeroes of the polynomial $x^2 + px + q$ are double of the zeroes of $2x^2 - 5x - 3$ find p and q.

6) If zeroes of the polynomial $x^3 - 3x^2 + x + 1$ are a-b, a and a+b find a and b.

7) If zeroes of the polynomial $x^2 - px + q$ are in the ratio 2 : 3 prove that $6p^2 = 25q$.

8) If the remainder on division of $x^3 + 2x^2 + kx + 3$ by $x - 3$ is 21, find the quotient and the value of k. Hence find the zeroes of the cubic polynomial $x^3 + 2x^2 + kx - 18$.

9) For what values of a and b are the zeroes of $q(x) = x^3 + 2x^2 + a$ also the zeroes of the polynomial $p(x) = x^5 - x^4 - 4x^3 + 3x^2 + 3x + b$?

10) What must be added to the polynomial $p(x) = 6x^4 + 5x^3 - 11x^2 - 42x + 9$ so that the resulting polynomial is divisible by polynomial $q(x) = x^2 + 3x + 2$

Assignment No. 4
POLYNOMIALS

Fill in the blanks:

A) The degree of a zero polynomial is-------------

B) The degree of a polynomial is 0 if and only if it is a -----------------polynomial.

C) A cubic polynomial can have atmost---------------zeroes.

D) If a polynomial of degree 5 is divided by a quadratic polynomial, then the degree of the quotient polynomial is-------------

E) If x-a is a factor of a polynomial f(x), then a is a --------------of f(x).

Solve the following:

1) If sum of the zeros of a quadratic polynomial $kx^2 + 2x + 3k$ is equal to the product of its zeros then find the value of k.

2) If 1 is a zero of the polynomial $p(x) = a^2x^2 - 3ax + 3x - 1$, then find the value(s) of a.

3) What must be added to $6x^5 + 5x^4 + 11x^3 - 3x^2 + x + 5$ so that it may be exactly divisible by $3x^2 - 2x + 4$?

4) Find a quadratic polynomial whose sum and product of zeroes are $\frac{-6}{7}, \frac{-2}{3}$ respectively.

5) Find a quadratic polynomial whose zeroes are -15 , $\frac{-3}{5}$.

6) Find the quadratic polynomial whose one zero is $5 - \sqrt{3}$ and product of zeroes is 22.

7) If α, β are zeroes of the polynomial $x^2 - 2x - 15$ then form a quadratic polynomial whose zeroes are 2α and 2β.

8) Find the value of k if the zeroes of the polynomial $6x^2 - 13x + (4k - 6)$ are the reciprocal of each other. Also find the zeroes.

9) On dividing $x^3 - 5x^2 + 6x - 4$ by a polynomial g(x), the quotient and remainder are $x - 3$ and $-3x + 5$ respectively. Find the polynomial g(x).

10) Find the quadratic polynomial whose sum of the zeroes is 8 and one zero is $4 + 2\sqrt{3}$.

11) If α, β are the zeroes of the polynomial p(x)= $2x^2 - 5x + 3$,without finding the zeroes evaluate (i) $\frac{1}{\alpha} + \frac{1}{\beta}$ (ii) $\alpha^2 + \beta^2$ (iii) $\alpha^3 + \beta^3$ (iv) $\alpha^3\beta + \alpha\beta^3$

12) Find all zeroes of the polynomial $3x^4 - 9x^3 + 4x^2 + 6x - 4$ if $\sqrt{\frac{2}{3}}$ and $-\sqrt{\frac{2}{3}}$ are two of its zeroes.

13) If the polynomial $6x^4 + 8x^3 - 5x^2 + ax + b$ is exactly divisible by $2x^2 - 5$, then find the values of a and b.

14) The polynomial $x^2 - k(x-4) - 2(3x+1)$ has zeroes α, β. Find the value of k if $\alpha + \beta = \frac{\alpha\beta}{2}$.

Web Resources

http://tinyurl.com/polynomials10

Learning Outcomes:

At the end of this chapter the student will be able to:

- Recall degree of polynomial in order to find the number of zeroes of a given polynomial.
- Analyse the graph of the polynomials in order to find the number of zeroes of polynomial.
- Compute zeroes of the polynomials in order to verify the relationship between zeroes and the coefficients.
- Compute the sum and product of zeroes of the polynomial in order to find the quadratic polynomial.
- Divide the two given polynomials and verify the division algorithm.
- Factorise a cubic and biquadratic polynomial using the division algorithm in order to find all its zeroes.

Extra Questions
Linear Equations
Word Problem Extra Questions

1) 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 are we?
2) 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. How old are they now?
3) Two years ago a father was five times as old as his son. Two years later his age will be eight more than three times the age of his son. Find their present ages.
4) 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 of the first number. Find the first number.
5) A two digit number is obtained either by 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 number.
6) A fraction is such that if the numerator is multiplied by 3 and the denominator is reduced by 3, we get $\frac{18}{11}$, but if the numerator is increased by 8 and the denominator is doubled, we get $\frac{2}{5}$, find the fraction.
7) A train covered a certain distance at uniform speed. If the train had been 6km/hr faster, it would have taken 4 hrs less than the scheduled time. And if the train were slower by 6km/hr, it would have taken 6hrs more than the scheduled time. Find the length of the journey.
8) A motorboat can travel 30km upstream and 28km downstream in 7hrs. It can travel 21km upstream and return in 5hrs. Find the speed of the boat in still water and the speed of the stream.
9) Ramesh travels 760km to his home partly by train and partly by car. He takes 8 hrs if he travels 160km by train and the rest by car. He takes 12minutes more if he travels 240km by train and the rest by car. Find the speed of the train and car respectively.
10) A shopkeeper sells a sari at 8% profit and a sweater at 10% discount, thereby getting a sum of Rs1008. If she had sold the saree at 10% profit and the sweater at 8% discount, she would have got Rs1028. Find the cost price of the sari and the list price (price before discount) of the sweater.
11) 2 men and 7 boys can do a piece of work in 4 days. The same work is done in 3 days by 4 men and 4 boys. How long would it take one man alone and one boy alone to complete the work?
12) The area of a rectangle remains same if length is increased by 7mrtres and the breadth is decreased by 3 metres. The area remains unaffected if the length is decreased by 7metres and breadth is increased by 5 metres. Find the dimensions of the rectangle.

Assignment No. 5(a)
LINEAR EQUATIONS

1) The pair of equations $x = a$ and $y = b$ graphically represents lines which are

   a) parallel b) intersecting at (a, b)

   c) coincident d) intersecting at (b, a)

2) For what value of k will the equations $3x+4y=1$ and $(1-7k)x-(9k-2)y-(1-2k)=0$ have infinitely many solutions?

3) For what value of k will the equations $4x + 5y = 12$ and $kx + 10y = 48$ represent intersecting lines?

4) For what values of a and b will the equations $(a+b)x-(a+b-3)y=4a+b$ and $2x - 3y = 7$ be dependent?

5) Draw the graphs of $3x+5y-15=0$ and $3x-4y+12=0$. Determine the area bounded by these lines and the x-axis.

6) Draw the graphs of $x+2y=12$ and $4x-y=3$. Also, determine the area bounded by these lines and the y-axis.

7) Solve graphically the equations $4x-3y=0$ and $2x+3y-18=0$. Find the ratio of the areas of the triangles formed by these lines and the axes.

8) Determine graphically the vertices of the triangle the equations of whose sides are $2y-x=8$, $5y-x=14$ and $-2x+y=1$.

9) Solve the following equations for x and y :

   a. $148x + 231y = 527$, $231x + 148y = 610$

   b. $\frac{4y-6x}{xy}=1$, $\frac{3y+4x}{xy}=5$, $x\neq 0, y\neq 0$

   c. $\frac{631}{x}+\frac{279}{y}=910$, $\frac{279}{x}+\frac{631}{y}=910$

   d. $\sqrt{2}\,x+\sqrt{18}\,y=0$, $\sqrt{3}\,x+\sqrt{45}\,y=0$

10) Solve the following equations for x and y :

$$\frac{2}{3(2x+y)}-\frac{1}{3x-y}=\frac{-5}{12}, \frac{1}{2x+y}-\frac{2}{3(3x-y)}=\frac{-5}{6}, 2x+y\neq 0, 3x-y\neq 0$$

Web Resources

- http://tinyurl.com/equations10
- http://tinyurl.com/linear-equations10

Assignment No. 5(b)
LINEAR EQUATIONS

1) Father's age is twice the sum of ages of his two children. After 20 years, his age will be equal to the sum of the ages of his children.Find the age of the father.
2) On selling a tea set at 5% loss and a lemon set at 15% gain, a shopkeeper gains Rs 7.If he sells the tea set at 5% gain and the lemon set at 10% gain, he gains Rs13. Find the actual price of the tea set.
3) Points A and B are 90 km apart from each other on the highway. A car starts from A and another from B at the same time. If they travel in the same direction, they meet after 9 hours and if they travel towards each other, they meet after 9/7 hours. Find their speeds.
4) A person invested some money at 12% simple interest and some other amount at 10%simple interest. He received yearly interest of Rs 130. But if he had interchanged the amounts invested, he would have received Rs 4 more as interest. How much did he invest at different rates?
5) Seven times a two digit number is equal to four times the number obtained by reversing the digits. If the digits differ by 3, find the number.
6) Rohan travels 600 km partly by train and partly by car. He takes eight hours if he travels 120 km by train and the rest by car. He takes 20 minutes more if he travels 200 km by train and the rest by car. Find the speed of the train and the car.
7) A boat covers 32 km upstream and 36 km downstream 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.
8) 8 men and 12 boys can finish a piece of work in 10 days while 6 men and 8 boys can finish the work in 14 days. Find the time taken by one man alone and one boy alone to finish the work.
9) A part of monthly expenses of a family is constant and the remaining varies with the price of wheat.When the rate of wheat is Rs 250 per quintal, the total monthly expenses is Rs 1000 and when the rate of wheat is Rs 240 per quintal, the total monthly expenses is Rs 980. Find the total monthly expenses when the rate of wheat is Rs 350 per quintal.

10) 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 for 9 hours, only half the pool can be filled. How long would each pipe take to fill the pool separately?

Learning Outcomes:

At the end of this chapter the student will be able to:

- State the properties of linear equation and classify the given equations as linear or not.
- Interpret a given situation into a pair of linear equations in two variables and represent it algebraically.
- Demonstrate given two linear equations graphically and comment on the nature of the lines representing the linear equations.
- Use different algebraic methods to solve a pair of linear equations.
- Calculate the ratio of coefficients of linear equations and discuss the nature of solution of pair of linear equations.
- Rewrite the given irreducible equations as reducible pair of linear equations and thus find the solution of those equations.

Fun Corner

The Number 2997 Mr. Pfiffigknows a trick.

"Tell me three numbers with 3 digits without 0. I also tell you three numbers (below Underlined). If we add these six numbers, the result always is 2997."

Three examples:

724	166	111
+196	+456	+555
+732	+822	+888
+803	+177	+888
+267	+543	+444
+275	+833	+111
----	----	----
2997	2997	2997

Do you recognize Pfiffig's trick?

Did You Know?

Mathematics is full of fascinating facts and I can only give a small flavour of them here. I hope one or two of them will make you think "Wow!"

1. Language

George Bernard Shaw said Britain and America are "two nations separated by a common language", but did you know that this happens even in mathematics which is supposed to be a language all of its own. The differences aren't confined to spelling (as in centre/center).

	British	American	
	Maths	Math	I don't know how this came about but, unlike the next example, no-one I know in the UK uses the US form
	Soluble	Solvable	A specialized term in group theory
			I came across this one quite recently. The definitions are completely reversed:
	Trapezium trapezoid	trapezoid trapezium	Quadrilateral with one pair of sides parallel Quadrilateral with no sides parallel
	right-angled triangle	right triangle	
	sine rule	law of sines	A trigonometric formula for triangles
	Formulae	Formulas	The US version of the plural of formula is taking over rapidly in Britain
	billion = 10^{12}	billion = 10^{9}	In Britain this battle has been lost many years ago. A British billion used to mean a million million but its use for finance has ensured that the US thousand million has taken over. There were similar differences for trillion etc

There must be many other differences. Do you know of any?

Extra Questions on Statistics

1. Find the arithmetic mean of the following frequency distribution:

Class	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Frequency	14	22	16	6	5	3	4

2. The mean of the following data is 42, find the missing frequencies x and y , if the sum of the frequencies is 100.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	7	10	x	13	Y	10	14	9

3. The daily expenditure of 100 families are given below. Calculate x and y if the mean daily expenditure is Rs 188.

Expenditure (in Rs)	140-160	160-180	180-200	200-220	220-240
Num of families	5	25	X	y	5

4. If the median of the following frequency distribution is 32, find the missing frequencies.

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	Total
No. of students	10	?	25	30	?	10	100

Assignment No. 6
STATISTICS

1. If the mode of a data is 45 and mean is 27, then find the median.

2. If $u_i = \frac{x_i - 25}{10}$, $\sum f_i u_i = 20$ *and* $\sum f_i = 100$ then $\bar{x}$ is equal to

   a) 27 b) 25 c) 30 d) 35

3. If the 'less than' and the 'more than' Ogives intersect at the point (27, 34), then find the median of the distribution and also find the total number of observations.

4. Find the mean for the following frequency distribution:

C.I	84-90	90-96	96-102	102 -108	108-114
Frequency	8	12	15	10	5

5. Median of the following frequency distribution is 46. Find the missing frequencies.

Class Intervals	10-20	20-30	30-40	40-50	50-60	60-70	70-80	Total
Frequency	12	30	f_1	65	f_2	25	18	230

   Hence find the mode of the distribution correct to two places of decimal.

6. Calculate the mode:

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60	Below 70	Below 80
No. of students	16	21	35	52	58	78	94	100

7. Calculate the median and mode of the following distribution. Using the empirical formula, find the mean.

C.I	500-509	510-519	520-529	530-539	540-549	550-559	560-569
Freq	15	20	25	32	18	7	3

8. The mean of the following distribution is 78. Evaluate the missing frequencies corresponding to the classes 80-90 and 90-100.

C.I	50-60	60-70	70-80	80-90	90-100	Total
Freq	8	6	12	$4x - 1$	$2y + 3$	50

9. Draw the less than Ogive for the following distribution. Also find the median from the graph.

Marks	Above 0	Above10	Above 20	Above 30	Above 40	Above 50
No of students	76	72	64	52	20	0

10. Draw 'less than' and 'more than' Ogives for the following distribution. Find the median from the graph.

Heights(in cm)	145-150	150-155	155-160	160-165	165-170	170-175
No of persons	8	10	9	15	10	8

Web Resources

- http://tinyurl.com/statistics-recap
- http://tinyurl.com/cumulative-frequency10
- http://tinyurl.com/cumulativefrequency-median

Learning Outcomes:

At the end of this chapter the student will be able to:

- Apply direct method to calculate the mean of the grouped data.
- Apply assumed mean method or step deviation method to calculate the mean for a grouped data when the class mark and frequency is large.
- Compute median and mode of grouped data and to interpret the two measures of central tendency.
- Calculate missing values of Frequency using the measures of central tendency given.
- Differentiate between mean, median and mode with examples and understand the most effective measure of central tendency in various cases.
- Derive the co-ordinates to plot on the graph in order to represent the two ogives.
- Graph both ogives for the data obtained and determine the median of the given grouped data using the graph.

Extra Questions
Applications of Trigonometry

1. At a particular time of the day a flagstaff throws a shadow whose length is 3 times it's height. Find the angle of elevation of the source of light.
2. Two poles of equal height stand on either side of a roadway 120 metres wide. From a point on the road between the poles, the angles of elevation of the poles is found to be 30° and 60°. Fnd the height of each pole and the position of the observation point.
3. The angle of elevation of a plane from a point on the ground is found to be 60°. After 15 seconds of flight, the angle of elevation of the plane, from the same observation point changes to 30°. If the plane is flying horizontally at a height of 10003 metres, find the speed of the plane.
4. A tree breaks in a such a way during a storm that the top of the tree touches the ground and makes an angle of 60˚ with it. If the top of the tree is at a distance of 15m from the root, find the original height of the tree.
5. From the top of a building 100 m high, the angles of depression of the top and bottom of the tower are observed to be 45˚ and 60˚ respectively. Find the height of the tower. Also find the distance between the foot of the building and the bottom of the tower.
6. There are two poles one each on either bank of a river, just opposite to each other. One pole is 60m high. From this pole the angles of depression of the top and foot of the other pole are 30˚ and 60˚ respectively. Find the width of the river and the height of the other pole.
7. An aeroplane when flying 3000 m high, passes vertically above another plane at an instant when the angles of elevation of the two planes from the same point on the ground are observed to be 60° and 45° respectively. How high is one plane than the other?
8. From a window 15 metres high above the ground in a street, the angles of elevation and depression of the top and foot of another house on the opposite street are 30° and 45° respectively. Find the height of the opposite house.
9. A man standing on the deck of a ship, which is 10 m above the water level, observes the angle of elevation of the top of the hill as 60° and the angle of depression of the base of the hill as 30°. Find the distance of the hill from the ship and the height of the hill.
10. From a point 150 metre above the surface of a lake, the angle of elevation of a cloud is found to be 60° and the angle of depression of its reflection in the lake is found to be 30°. Find the height of the cloud.

Assignment No.7
HEIGHTS & DISTANCES

1. If the shadow of a vertical pole at a particular time of the day is equal to $\sqrt{3}$ times its height,what is the elevation of the source of light at that time?
2. The distance between two vertical poles is 60 m. The height of one of the poles is double the height of the other. The angles of elevation of the top of the poles from the middle point of the line segment joining their feet are complementary to each other. Find the heights of the poles.
3. A tower stands near an airport. The angle of elevation θ of the tower from a point on the ground is such that its tangent is 5/12. On walking 192 metres towards the tower in the same straight line, the tangent of the angle of elevation ϕ is found to be ¾. Find the height of the tower.
4. The angle of elevation of a stationary cloud from a point 60 m above the lake is 30° and the angle of depression of its reflection in the lake is found to be 60°. Find the height of the cloud.
5. A man on the top of a vertical observation tower observes a car moving at a uniform speed coming directly towards it. If it takes 10 min for the angle of depression to change from 30° to 45°, how soon after this will the car reach the observation tower?
6. Two pillars of equal heights stand on either side of a road which is 150 m. At a point on the road between the pillars, the angles of elevations of the top of the pillars are 60° and 30°. Find the height of the pillars and the position of the observation on the road.
7. The angle of elevation of an aeroplane from a point on the ground is 45°. After flying for 15 seconds, the angle of elevation changes to 30°. If the aeroplane is flying at a height of 2500 m, find the speed of the plane.
8. The angle of elevation of the top of a vertical tower from a point on the ground is 60°. From another point 10m vertically above the first, its angle of elevation is 45°. Find the height of the tower.
9. From the top of a tower h metres high, the angles of depression of two objects, which are in line with the foot of the tower are α and β ($\beta>\alpha$). Find the distance between the two objects.

10. The angles of depression of the top and bottom of a 100 m high building from the top of a tower are 30° and 60° respectively. Find the height of the tower.

Learning Outcomes:

At the end of this chapter the student will be able to:

- Identify line of sight in order to determine angle of elevation and angle of depression.
- Determines all trigonometric ratios with respect to a given acute angle (of a right triangle) and use them in solving problems in daily life contexts like finding heights of different structures or distances from them.

Extra Questions

QUADRATIC EQUATIONS

1) A two-digit number is such that the product of its digits is 18. When 63 is subtracted from the number, the digits interchange places. Find the number.

2) A two-digit number is four times the sum and three times the product of its digits. Find the number.

3) If the sum of n successive odd natural numbers starting from 3 is 48, find the value of n.

4) One fourth of a herd of camels was seen in the forest. Twice the square root of the herd had gone to the mountains and the remaining 15 camels were seen on the bank of a river. Find the total number of camels.

5) In a flight of 600km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200km/hr and the time of flight increased by 30 minutes. Find the duration of flight.

6) The sum of the ages of a father and a son is 45 years. Five years ago, the product of their ages (in years) 124, determine their present ages.

7) The perimeter of a right triangle is 60cm. Its hypotenuse is 25cm. Find the area of the triangle.

8) A shopkeeper buys a number of books for Rs80/-. If he had bought 4 more books for the same amount, each book would have cost Re1/- less. How many books did he buy?

Assignment No. 8

QUADRATIC EQUATIONS

1) Which constant should be added and subtracted to solve the quadratic equation $x^2+\sqrt{3}x-5=0$ by the method of completing the square?

2) Find the discriminant of $2\sqrt{3}\,x^2-3\sqrt{2}x-5=0$.

3) In each of the following, find the value(s) of p for which the given equations will have real roots:

(i) $px^2+8x-4=0$ (ii) $7x^2-31x-p=0$

4) 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.

5) The hypotenuse of a right triangle is 5m. If the smaller leg is doubled and the longer leg is tripled, the new hypotenuse is $6\sqrt{5}$ m.Find the sides of the triangle.

6) Two trains leave a railway station at the same time. The first train leaves due west and the other due north. The first train travels 5 km/hr faster than the second train. If they are 50 km apart after 2 hours, find their speeds.

7) A motor boat takes 2 hrs more to cover a distance of 30 km upstream than it takes to cover the same distance downstream. If the speed of the stream is 5km/hr, find the speed of the boat in still water.

8) The sum of two natural numbers is 8. Find the numbers if the sum of their reciprocals is 8/15.

9) A plane left 30 minutes later than the scheduled time and in order to reach its destination 1500 km away it increases its speed by 250km/hr from its usual speed. Find its usual speed.

10) A train travels at a certain average speed for a distance of 63km and then travels a distance of 72km at an average speed of 6km/h more than its original speed. If it takes 3 hours to complete the total journey, what is its original average speed?

11) 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.

12) Two circles touch externally.The sum of their areas is 130π sq.cm and the distance between the centres is 14 cm. Find the radii of the circles.

13) A two digit number is such that the product of its digits is 18. When 63 is subtracted from the number, the digits interchange their places. Find the number.

14) Solve the following equations for x:

i) $2\sqrt{3}\,x^2 + 5x - 4\sqrt{3} = 0$

ii) $3x^2 + 2\sqrt{5}x - 5 = 0$

iii) $15x^2 - 4x - 22 = 0$

iv) $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$

v) $4x^2 - 4mx + m^2 - n^2 = 0$

vi) $\frac{x+1}{x-1} + \frac{x-2}{x+2} = 3,\ x \neq 1\ ,-2$

vii) $\frac{4x}{x-2} - \frac{3x}{x-1} = 7\frac{1}{2},\ x \neq 1,\ 2$

<u>Learning Outcomes:</u>

At the end of this chapter the student will be able to:

- Represent the given situation algebraically using a quadratic equation.
- Solve quadratic equations through factorization in order to find its roots.
- Solve quadratic equations through middle term splitting.
- Solve quadratic equations by completing the square method.
- Use the quadratic formula to find the roots of quadratic equation.
- Examine the discriminant of quadratic equation in order to find out the nature of its roots.
- Describe the nature of the roots of a quadratic equation and determine whether a given situation is possible.

Arithmetic Progression

Extra Questions

1. How many multiples of 6 lie between 18 and 354?
2. Find "n" so that the nth term of the APs 74, 77, 80,........ And 14, 20, 26,......... are equal.
3. For what value of "k" are 3k+2, 4k+3, 6k-1 are in AP?
4. If the 5th and 21st terms of an AP are 14 and -14 respectively, then which term of the AP is zero?
5. How many terms of the AP, 72, 69, 66,.......make the sum 897? Explain the double answer.
6. Find three positive integers in AP such that their sum is 27 and the sum of their squares is 275.
7. If the sum of the first five terms of an AP is equal to one fourth the sum of the next five terms, and the first term is 2, then find the first 20 terms of the AP.
8. If the nth term of a sequence is 5+2n, then find the sum of the first 20 terms.
9. The third term of an AP is 8 and the ninth term of the AP exceeds three times the third term by 2. Find the sum of its 19 terms.
10. Find the middle term of the AP 6, 13, 20, …….216.
11. Consider the AP:2,5,8,11,…….,302. Show that twice the middle of the above AP is equal to the sum of its first and last term.
12. If the 'p'*t*h term of an AP is equal to 'q' and the 'q'th term is equal to 'p' prove that its 'n'th term is (p+q-n).
13. If m times the mth term of an AP is equal to n times the nth term, show that the (m+n)th term is zero.
14. The sum of three numbers in an AP is -3 and the product is 8, find the numbers.
15. Find four numbers in AP whose sum is 20 and the sum of whose squares is 120.
16. The angles of a triangle are in AP. The greatest angle is twice the least. Find all the angles.
17. The sum of the first n terms of an AP whose first term is 8 and the common difference is 20 is equal to the sum of the first 2n terms of an AP whose first term is -30 and common difference is 8. Find n.
18. Split 207 into three parts such that these are in AP and the product of the two smaller parts is 4623.
19. The ratio of the 11^{th} term to the 18^{th} term of an AP is 2:3. Find the ratio of the 5^{th} term to the 21^{st} term, and also the ratio of the sum of the first 5 terms to the sum of the first 21 terms.
20. An AP consists of 37 terms. The sum of the three middle most terms is 225 and the sum of the last three terms is 429.Find the AP.

Assignment No. 9

ARITHMETIC PROGRESSION

Choose the correct option:

1) If the 7th and 13th terms of an AP are 34 and 64 respectively, then the 18th term is:
a)87 b) 88 c) 89 d) 90
2) If the 1st and last terms of an AP are 1 and 11 respectively, the sum of its terms is 36 then the number of terms will be;
a) 5 b) 6 c) 7 d) 8
3) If the sum of n terms of an AP is $3n^2 + n$ and its common difference is 6, then its first term is:
a) 2 b) 3 c) 1 d) 4

Fill in the blanks:

4) In an AP if the first term is a, and the common difference is d, then the nth term is denoted by ----------------------------.
5) If $a, a + d, a + 2d, \ldots \ldots$ is an AP then its nth term – mth term = --------------------
6) Three terms a,b &c are in AP if and only if------------------------.

Solve the following questions:

7) If $2x+1,\ x^2+x+1,\ 3x^2-3x+3$ are the consecutive terms of an A.P. then find the value(s) of x.
8)If 5 times the 5th term of an A.P is equal to 9 times its 9th term then find its 14th term.
9)If in an A.P, the sum of three consecutive numbers is 15 and their product is 45 then find the numbers.
10) If the 10th term of an AP is 0, then find 27th term : 15th term.
11)Solve the equation for x: $1+4+7+\ldots+x=287$
12) If for an AP, $S_n = 3n^2 + n$, then find its 22nd term. Also find k if $a_k = 64$.
13) Which term of the AP: 241, 236, 231, …… is the first negative term?
14) Find the sum of first 15 terms of an AP whose nth term is $2n + 1$.
15) Three numbers are in the ratio 3: 7 : 9. If 5 is subtracted from the second, the resulting numbers are in AP. Find the original numbers.
16) In an AP, if the 12th term is –13 and the sum of the first four terms is 24, find the sum of first ten terms of the AP.
17) How many terms of the AP 20, $19\frac{2}{3}, 18\frac{2}{3}, \ldots$ must be taken so that the sum is 300?
Explain the **double answer**.
18) Find the sum of the two middlemost terms of the AP: $-11, -7, -3, \ldots, 49$.

Learning Outcomes:

At the end of this chapter the student will be able to:

- Produce patterns and observe that succeeding terms in AP are obtained by adding a fixed number to the preceding terms.
- Distinguish between finite and infinite AP.

- Calculate the nth term of a given AP.
- Calculate the nth term of a given AP in order to solve for a real-life word problem.
- Calculate the sum of terms of a given AP in order to get the solution for a real-life word problem.
- Use appropriate formula to calculate the last term of the given AP.

Coordinate- Geometry

Extra Questions

Distance Formula:

1) Find the centre of a circle passing through (6,-6), (3, -7) and (3,3).
2) Two opposite vertices of a square are (-1,2) and (3,2), Find the coordinates of the other two vertices.
3) If the point A(0,2) is equidistant from the points B(3,p) and C(p,5), find p. Also find the length of AB.
4) In the seating arrangements of desks in a classroom, three students Rohini, Sandhya and Bina are seated at A(3,1), B(6,4) and C(8,6). Are they seated in a line?
5) If A(3,y) is equidistant from points P(8,-3) and Q(7,6) find the value of y and find the distance AQ.
6) If the point P(x,y) is equidistant from the points A(5,1) and B(1,5), show that x=y.
7) Find a point which is equidistant from the points A(-5,4)and B(-1,6). How many such points are there?
8) The points A(2,9), B(a,5) and C(5,5) are the vertices of a triangle ABC right angled at B. Find the value of a and also the area of triangle ABC.
9) Prove that the points $(2a, 4a)$, $(2a, 6a)$ and $(2a + \sqrt{3}a, 5a)$ are the vertices of an equilateral triangle.
10) Points A(-1,y) and B(5,7) lie on a circle with centre O(2, -3y). Find the values of y, hence find the radius of the circle.

Assignment No.10
COORDINATE GEOMETRY

1) Find the distance between $(a\cos 35°, 0)$ and $(0, a\cos 55°)$.

2) Find the point on the y-axis which is equidistant from A(-2,3) and B(5, 4).

3) A line intersects the x and y axes at P and Q respectively. If (2, 6) is the midpoint of PQ, then find the coordinates of P and Q.

4) Find the perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0).

5) A(3,1) , B(12,-2) and C(0,2) cannot be the vertices of a triangle. State true or false and justify your answer.

6) Find the area of the triangle ABC with A(3, -6) and midpoints of sides through A being (4,-5) and (5,-2).

7) The midpoints of the sides of a triangle are (3, 4), (4, 6) and (5, 7). Find the vertices of the triangle and also the area of the triangle.

8) Find the ratio in which the x-axis divides the join of the points (1,-3) and (4, 5). Also find the coordinates of the point.

9) If P(9a-2,-b) divides the line segment joining A(3a+1,-3) and B(8a,5) in the ratio 3:1, find the values of a and b.

10) Find the point of intersection of y-axis and the perpendicular bisector of the line segment joining (-5, -2) and (3, 2).

11) The vertices of a triangle are (0, 0), (0, 2x) and (2y, 0). Find the coordinates of the point equidistant from each vertex.

12) Amit starts walking from his house to office but instead of going to the office directly, he goes to a bank first, from there to his daughter's school and then reaches the office. If the house is situated at (2, 4), bank at (5, 8), school at (13, 14) and office at (13, 26), find the extra distance travelled by Amit in reaching his office. (Assume that all distances are in *km*)

Learning Outcomes:

At the end of this chapter the student will be able to:

- Identify x and y coordinate in order to plot points on the graph.
- Apply and derive distance formula to determine the distance between two coordinates on the graph.
- Apply and derive section formula and use it to divide the line segment in a given ratio.

- Apply distance and section formula to determine the vertices/diagonals/mid points of given geometrical shapes.
- Apply and derive the formula of area of triangle geometrically and use it to determine the area of quadrilateral/triangle.

Assignment No. 11
CIRCLES

1) If radii of the two concentric circles are 6 cm and 10 cm, then the length of the chord of one circle which is tangent to the other is

a) 8 cm b) 16 cm c) 20 cm d) 10 cm

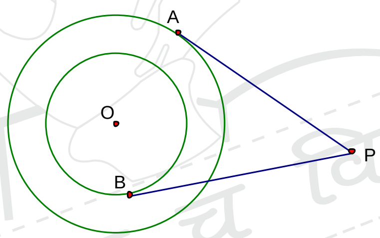
2) PA and PB are tangents to a circle with centre O. If $\angle OAB = 35°$, then $\angle APB$ is

a) 70° b) 65° c) 90° d) 55°

3) The distance between two parallel tangents of a circle whose radius is 3.5 cmis

a) 7 cm b) 3.5cm c) 10cm d) cannot determined

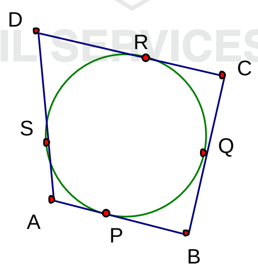
4) Two concentric circles with centre O are of radii 5 cm and 3 cm. From an external point P, tangents PA and PB are drawn to these circles. If AP = 12 cm,find BP.



5) AB is the tangent to a circle with centre O through a point A outside the circle. If $OA = x + 2$ cm, $OB = x - 6$ cm, $AB = x + 1$ cm, find the actual lengths of AB, OA and OB.

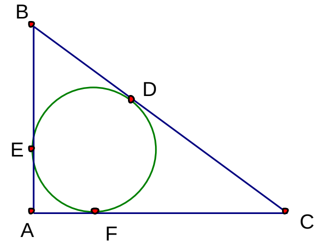
6) The lengths of three consecutive sides of a quadrilateral circumscribing a circle are 4cm, 5 cm and 7 cm. Find the length of the fourth side of the quadrilateral.

7) A circle is inscribed in a quadrilateral ABCD. Given BC = 38 cm, BQ = 27 cm, CD = 25 cm and ∠ADC = 90°, find the radius of the circle.



8) Prove that the tangents drawn at the ends of a chord of a circle make equal angles with the chord.

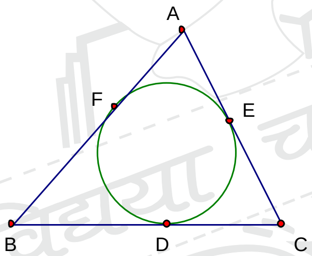
10)The sides BC, AB and AC of ΔABC right angled at A, touch a circle at D, E and F respectively. If BD = 30 cm and CD = 7cm, calculate AF and radius of the circle.



11) ABC is a triangle. A circle touches sides AB and AC produced and side BC at X, Y and Z respectively. Show that $AX = AY = \frac{1}{2}$Perimeter of ΔABC.

12) Two tangent segments AB and AC are drawn to a circle with centre O through a point A such that $\angle BAC = 120°$. Prove that OA = 2AB.

13) In the following figure, prove that $AF + BD + CE = \frac{1}{2}$ Perimeter of ΔABC.



14) If ABC is an isosceles triangle in which AB=AC in the above figure, prove that D is the midpoint of BC.

<u>Learning Outcomes:</u>

At the end of this chapter the student will be able to:

- Draw, identify and differentiate between secant and tangent of a circle.
- Prove and apply theorems related to tangent of a circle in order to determine number of tangents and the length of tangents from the given point(s).

Assignment No.12

AREAS RELATED TO CIRCLES

1. The area (in sq.cm) of a sector whose radius is 18 cm and angle 30° is

   a) 3π b) 18π c) 27π d) 54π

2. In a circle of diameter 12cm, an arc subtends 120° at the centre. Length of the arc (in cm) is

   a) 2π b) 4π c) 8π d) 12π

3. If the perimeter and the area of a circle are numerically equal, then the radius of the circle is

   a) 2 units b) π units c) 4 units d) 7 units

4. If a circular grass lawn of 35m in radius has a path 7 m wide running around it on the outside, then the area of the path is

   a) 1450m^2 b) 1576 m^2 c) 1694 m^2 d) 3368 m^2

5. If the length of the arc of a sector of a circle of radius 16cm is 18.5 cm, then the area of the sector is equal to

   a) 148 cm^2 b) 154 cm^2 c) 176 cm^2 d) 296 cm^2

6. The areas of two concentric circles forming a ring are 154 cm^2 and 616 cm^2. Find the width of the ring.

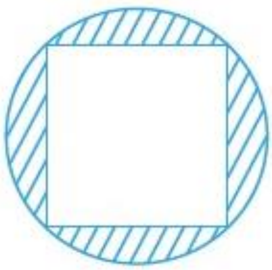
   a) 14cm b) 21cm c) 7cm d) 8cm

7. The difference between the circumference and the radius of a circle is 37cm. Find the area of the circle.

8. Find the radius of a circle whose circumference is the sum of the circumferences of ten circles of radii 4cm, 7cm, 10cm, 13cm,….

9. Three horses are tethered at three corners of a triangular field whose sides are 150 m, 200 m and 260m. How much area will the horses be able to graze altogether if the length of their ropes is 7m each?

10. In the given figure, a square of diagonal 8cm is inscribed in a circle. Find the shaded area.



11. A chord of length 10cm subtends at the centre of a circle an angle of 90°. Find the area of the minor segment formed by this chord.
12. PQRS is a diameter of a circle of radius 6 cm. The length PQ, QR and RS are equal. Semi-circles are drawn on PQ and QS as diameters as shown in figure 1. Find the perimeter of the shaded region.
13. In figure2, BC is a tangent to a circle with centre A, AC = 18 cm and AB = 9 cm. Find the area and the perimeter of the shaded region.

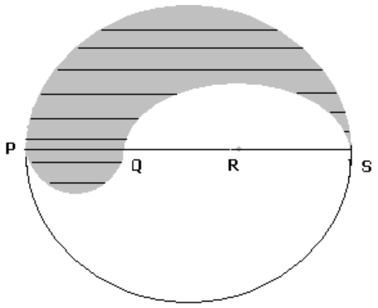


figure 1

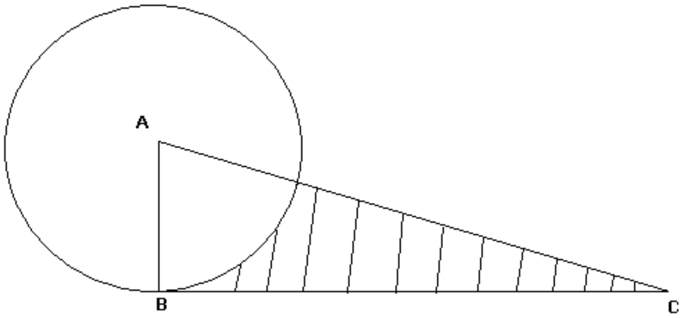
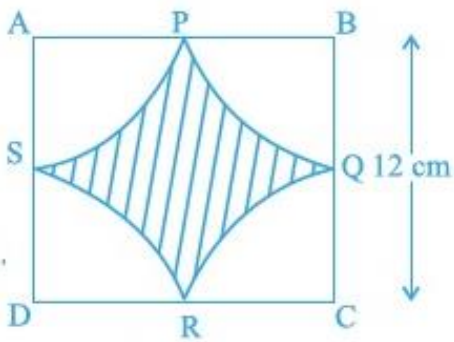


figure 2

14. In the given figure, arcs drawn with centres A, B, C, D intersect at midpoints P, Q, R, S of the sides AB, BC, CD and DA respectively of a square ABCD. Find the shaded area.

(Use π = 3.14)



Web Resources

http://tinyurl.com/arc-length-sector

Learning Outcomes:

At the end of this chapter the student will be able to:

- Describe the relationship between circumference and diameter of a circle.
- Describe sector and segment of a circle and differentiate between the two.
- Describe minor and major sector of a circle.
- Describe minor and major segment of a circle.
- Apply the formula of area of sector and segment of a circle in order to compute the area of a specified region.
- Calculate the length of an arc of a circle.

Assignment No.13
CONSTRUCTIONS

1) Construct a triangle with sides 5cm, 7.5 cm and 6cm.Construct a similar triangle to it whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.

2) Construct a triangle with sides 6cm, 3cm and 5cm.Construct a similar triangle to it whose sides are $\frac{5}{3}$ of the corresponding sides of the first triangle.

3) Construct Δ ABC with BC = 6cm, $\angle$B = 45° and $\angle$C = 60°. Then construct a $\Delta A'B'C \sim \Delta ABC$ such that its sides are $\frac{3}{5}$ of the corresponding sides of ΔABC.

4) Draw a circle of radius 4cm. Take a point 6cm away from its centre, construct a pair of tangents to the circle and measure their lengths.

5) Draw a pair of tangents to a circle of radius 6cm which are inclined to each other at an angle of 75°.

6) Construct triangle ABC with AB = BC = 6cm and AC = 4cm. Then construct a $\Delta PAQ \sim \Delta BAC$ such that AQ = 6cm. From the figure, measure the lengths of PA and PQ.

Learning Outcomes:
At the end of this chapter the student will be able to:

- List and execute steps of construction to divide a line segment in a given ratio.
- List and execute steps of construction to construct a similar triangle as per a given scale factor.
- List and execute steps of construction to construct tangent(s) to a given circle.
- Justify the steps of constructions while doing the above constructions.

An Interesting Fact

π =3.2 By Law

In 1897 the General Assembly of the State of Indiana in the USA tried to pass legislation that appears to say that π is to be 3.2, though the Bill does not make it very clear. On top of that they had the nerve to try to get everyone else to pay royalties for this 'discovery'.

The Bill was referred to the House Committee on Canals, which was also referred to as the Committee on Swamp Lands! By chance a professor of mathematics happened to be present during a debate and heard an ex-teacher saying "The case is perfectly simple. If we pass this bill which establishes a new and correct value for π, the author offers to our state without cost the use of his discovery and its free publication in our school text books, while everyone else must pay him a royalty." Fortunately, the professor was able to teach the senators about mathematics and the Bill was stopped becoming an object for ridicule.

Assignment No.14
SURFACE AREAS AND VOLUMES

1. The base radii of a cone and cylinder are equal. If their curved surface areas are also equal, then the ratio of the slant height of the cone to the height of the cylinder is

   a) 2 : 1 b) 1 :2 c) 1 : 3 d) 3 : 1

2. If the base area of a cone is 51 cm^2 and its volume is 85 cm^3, then its vertical height is

   a) 3.5 cm b) 4 cm c) 4.5 cm d) 5 cm

3. A solid sphere of radius x is melted and cast into the shape of solid cone of height x, the radius of the base of the cone is

   a) $2x$ b) $3x$c) x d) $4x$

4. What is the radius of a sphere whose volume is numerically equal to five times its surface area?

   a) 5 b) 10 c) 15 d) 20

5. A solid is composed of a cylinder surmounted by a cone at one end and a hemisphere on the other. If the diameter and the total height of the solid are 7 cm and 23.5 cm respectively and the height of the cylindrical part is 8 cm, find the total surface area and the volume of the solid.
6. An open metal bucket is in the shape of a frustum of a cone mounted on a hollow cylindrical base made of the same metallic sheet. The diameters of the two circular ends are 30 cm and 10 cm. The total vertical height of the bucket is 30 cm whereas the height of the cylindrical base is 6 cm. Find the area of the metal sheet used to make the bucket. Also find the capacity of the bucket in litres.
7. Water flows out through a circular pipe, whose internal diameter is 2cm, at the rate of 0.8m/s into a cylindrical tank, the radius of whose base is 40 cm. By how much will the level of water rise in 1 hour 30 minutes?
8. Solid spheres of diameter 6 cm are dropped into a cylindrical beaker containing some water and are fully submerged. If the diameter of the beaker is 18 cm and the water rises by 40 cm, find the number of solid spheres dropped in the water.
9. A sector of a circle of radius 15 cm has an angle of 120°. It is rolled up so that the two binding radii are joined together to form a cone. Find the volume of the cone.

10. A hollow sphere of external and internal diameters 8 cm and 4 cm respectively is melted into a cone of height 14 cm. Find the diameter of the base of the cone.
11. The height of a cone is 40 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume is 1/8 of the volume of the given cone, at what height above the base is the section made?
12. A circle of radius 10.5 cm is rotated about its diameter. Find the surface area and the volume of the solid thus generated.
13. A hollow cylindrical pipe is made of copper and the volume of copper used in the pipe is $484\,cm^3$. If the internal radius is 6 cm and the length of the pipe is 14 cm, find the thickness of the pipe.
14. A cone of radius 4cm is divided into two parts by drawing a plane through the midpoint of its axis and parallel to its base. Compare the volumes of the two parts.

Learning Outcomes:

At the end of this chapter the student will be able to:

- Apply formulas of surface area of 3D solids in order to derive the area of a new solid.
- Understand that the volume of a converted solid is same as the volume of the original solid.
- Visualize objects in surrounding as a combination of different solids like cylinder and a cone, cylinder and a hemisphere, combination of different cubes etc. and use it to find their surface areas and volumes.
- Apply the formula of surface area of a cone in order to derive the area of the frustrum.
- Apply the formula of volume of a cone in order to derive the volume of the frustrum.
- Use concepts of surface areas and volumes for a variety of 3-D objects and apply it into real life situations.

Extra Questions on Probability

1) Two different coins are tossed simultaneously, what is the probability of getting atmost one head?
2) Three coins are tossed simultaneously. Find the probability of
   (i) getting exactly 2 heads (ii) getting at least 2 Heads
   (iii) getting no head (iv) getting at the most 2 tails
3) A card is drawn from a pack of 52 playing cards. Find the probability of getting :
   (i) red card (ii) a spade (iii) red 10 (iv) a king (v) a face card (v) a red face card
4) Jayanti throws a pair of dice and records the product of the numbers appearing on the dice. Pihu throws 1 dice and records the squares of the number that appears on it. Who has the better chance of getting the number 36? Justify?
5) Savita and Hamida are friends. What is the probability that both will have :
   (i) different birthdays? (ii) the same birthday? (ignoring a leap year).
6) A carton consists of 100 shirts of which 88 are good, 8 have minor defects and 4 have major defects. Jimmy, a trader, will only accept the shirts which are good, but Sujatha, another trader, will only reject the shirts which have major defects. One shirt is drawn at random from the carton. What is the probability that (i) it is acceptable to Jimmy? (ii) it is acceptable to Sujatha?
7) What is the probability that a randomly picked leap year has 52 Sundays?
8) In a family of 3 children find the probability of having at least 2 girls.

Assignment No. 15
PROBABILITY

1) Which of the following cannot be the probability of an event?

a) 0.7 b) 0 c) -1.2 d) 18%

2) Out of vowels of the English alphabet, one letter is selected at random. The probability of selecting 'e' is

a) $\frac{1}{26}$ b) $\frac{5}{26}$ c) $\frac{1}{4}$ d) $\frac{1}{5}$

3) A box contains 200 oranges. If one orange is taken out from the box at random and the probability of its being rotten is 0.05, then the number of rotten oranges in the box is

a) 5 b)10 c) 20 d) 2

4) The probability that a non leap year selected at random has 53 Sundays is

a) $\frac{1}{365}$ b) $\frac{2}{365}$ c) $\frac{2}{7}$ d) $\frac{1}{7}$

5) Probability that tomorrow will be holiday is 0.58. Probability that tomorrow will not be a holiday is

a) 0.42 b) 0.58 c) 1 d) 1.58

6) A single dice is rolled. Find the probability of getting

(i) a prime number (ii) a composite number (iii) even prime number (iv) multiple of 6 (v) factors of 6.

7) Two dice are rolled simultaneously. Write the total possible outcomes. Find the probability of getting

(i) a doublet (ii) a total of 8 (iii) total of 9 or 11

(iv) product 11 (v) product 6

8) Three coins are tossed simultaneously. Write the total possible outcomes. Find the probability of getting

(i) at least 2 heads (ii) at most 2 tails (iii) exactly 3 heads (iv) at least 3 heads (v) at most 3 heads

9) From a deck of 52 cards all face cards and aces are removed. From the remaining cards one card is drawn. Find the probability of getting

(i) a face card (ii) a red card(iii) a spade (iv)10 of hearts (v) black jack.

10) A bag contains tickets numbered from 10 to 50. One ticket is drawn at random. Find the probability that the number on the card is

(i) prime (ii) divisible by 3 (iii) a perfect square (iv) less than 20

(v) not less than 11 (vi) even prime.

11) A bag contains some red marbles and 4 blue marbles. If the probability of drawing a blue marble is double that of a red marble, find the total number of marbles in the bag.

12) In a bag there are some red balls, some green balls and the remaining are blue balls. The probability of drawing a red ball is $\frac{1}{3}$, that of blue is $\frac{1}{2}$. If there are 9 green balls in the bag, find the total number of balls and the number of red and blue balls in the bag.

13) An urn contains 7 black, 4 blue and 3 white marbles. One marble is drawn out of the urn. Find the probability that the marble drawn is

(i) red (ii) black or white (iii) blue (iv) not black.

14) In a bag there are 20 marbles out of which some are blue and some are red. If 4 blue marbles are removed from the bag, the probability of drawing a blue marble then becomes $\frac{1}{4}th$ of its original probability. Find the number of blue and red marbles in the bag.

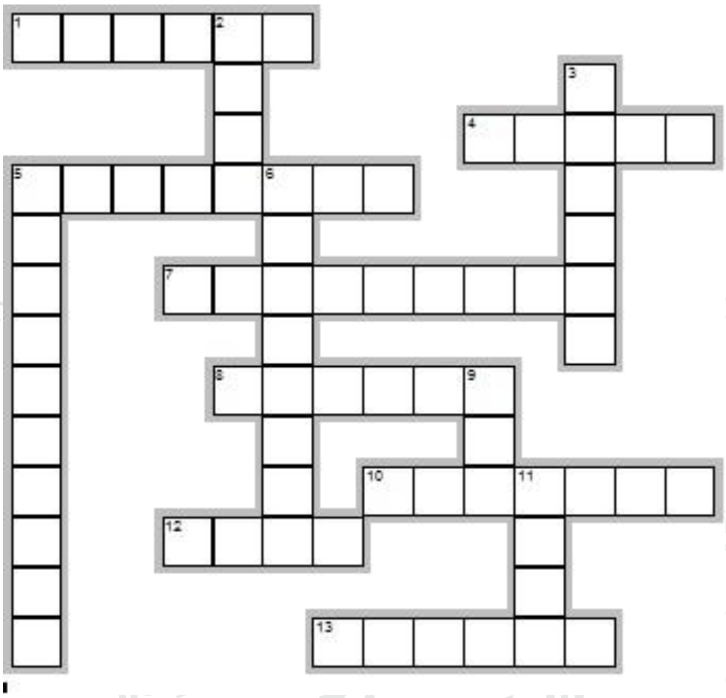
15) A three digit number is selected at random from the set of all three digit numbers. Find the probability of the number having all the three digits same.

Learning Outcomes:

At the end of this chapter the student will be able to:

- Differentiate between Empirical probability and theoretical probability.
- Calculate the probability of given events in an experiment in order to comment whether they are complementary events/Sure event/impossible event.
- Represent using organized lists, tables, or tree diagrams and list the sample space for compound events.
- Calculate the probability of various events in order to rank them from most to least probable.

Crossword Puzzle



Across

1. Amount of space taken up by a 3D object
4. Performing an experiment once
5. A three dimensional object with two parallel and congruent circular bases
7. A polynomial with degree two
8. A line that intersects a circle at two distinct points
10. A quadrilateral with four sides equal
12. Probability of an impossible event
13. An angle greater than 180^0 but less than 360^0

Down

2. A selfish average
3. In geometry- to divide into two equal parts
5. Mid value of class interval
6. A chord of a circle that passes through centre
9. Number of tangents drawn from an external point to a circle
11. Observation with highest frequency

Question Bank

1. Is $(x+2)^2 = 2x(x^2-2)$ a quadratic equation?

2. If a card is drawn from a well shuffled deck of cards, what is the probability of getting neither an ace nor a king?

3. State the Fundamental Theorem of Arithmetic.

4. Tom was born in August 2000. What is the probability that he was born on 3rd August?

5. A rational number $\frac{a}{b}$ will have a terminating decimal representation if b is of the form…………

6. For what values of k will the pair of equations $4x+2y=3$ and $5x+ky=-7$ have a unique solution?

7. What is the sum of the zeroes of $p(x)= x^3-4x^2+5x-29$?

8. On dividing a cubic polynomial by a quadratic polynomial, what would be the degree of the quotient obtained?

9. Why $13\times19\times23+23$ is a composite number?

10. Express $\cot\theta$ in terms of $\sin\theta$.

11. If H.C.F (114, 209) = 19, find the L.C.M of (114, 209).

12. State Euclid's Division Lemma.

13. ΔABC and ΔDEF are similar and $\frac{ar(\Delta ABC)}{ar(\Delta DEF)}=\frac{100}{36}$ .If AC = 5 cm, find DF.

14. Check whether $\frac{81027}{6^2\times5^2}$ will give a terminating or a repeating decimal.

15. If $\frac{p}{q}=43.78$, what can you say about the prime factors of q?

16. State the Pythagoras Theorem.

17. If α and β are the roots of the equation $2x^2-11x+14=0$, evaluate $\left(\alpha+\frac{1}{\beta}\right)\left(\beta+\frac{1}{\alpha}\right)$

18. Given below are three equations: Pick up the pair which has infinite solutions.

   $4x-5y=3$; $5x-4y=5$; $8x-10y=6$.

19. Write the equation of a line which is parallel to the line whose equation is

   $5x-3y+11=0$.

20. Express y in terms of x: $7x-3y=15$ and check whether the point $(2,1)$ is a solution of the equation or not.

21. What are the equations of the x-axis and the y-axis?

22. "The mean calculated in a grouped frequency distribution is the exact mean. " Do you agree? Give reasons.

23. For what value of k will the equations $2x+3y=7$ and $4x=ky+14$ represent a pair of coincident lines?

24. If one zero of the polynomial $(a^2+4)x^2+13x+4a$ is reciprocal of the other, find the value of a.

25. Small spherical balls are formed by melting a solid sphere. How many balls can be formed if radius of each ball is half of the radius of the given sphere?

26. If the 'less than' and the 'more than' ogives of a distribution intersect at (38,45) then find the median of the distribution.

27. Two AP's have the same common difference. The first terms of the APs are 39 and 58 respectively. What is the difference between their 16th terms?

28. For what value of k will the numbers $3k+4$, $7k+1$ and $12k-5$ be in A.P?

29. Find n so that the nth terms of the following two A.P's are equal.

   1, 7, 13, 19,……………………
   64, 63, 62, 61,…………………..

30. If $S_n=n^2+3n$, find t_{10}.

31. If the 19th term of an AP is 39, find S_{37}.

32. Find the nth term of $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}$,…………………….

33. A man goes 15 m due East and then 20 m due South. Find his distance from the starting point.

34. Two towers of heights 10 m and 30 m stand on a plane ground with their feet 15 m apart. Find the distance between their tops.

35. If ΔABC is similar to ΔPQR,perimeter of ΔABC=30 cm,perimeter of ΔPQR=45 cm, PR = 9 cm, then find AC.

36. ABCD is a trapezium in which AB is parallel to CD and AB = 2 CD. Diagonals AC and BD intersect at O. If $area(\Delta AOB) = 84cm^2$, find the $area(\Delta COD)$.

37. D and E are points on sides AB and AC of ΔABC. AD = 2 cm, AE = 3 cm,BD = 1.5 cm, CE = y, DE = 3.6 cm, BC = x, find x and y.

38. In ΔPQR, $\angle P = 90°$ and in ΔPSR, $\angle S = 90°$ .If PS = 6 cm, SR = 8 cm and QR = 26 cm, find the area ΔPQR.

39. If $\sin B = \frac{m^2 - n^2}{m^2 + n^2}$, find $\sec B + \tan B$.

40. Point $C(2,3)$ divides the segment joining A$(3,5)$ and B in the ratio 1 : 2, find the coordinates of B.

41. Find the length of the diagonals of a rhombus each of whose sides is of length 20 cm and each of whose acute angles is 60°.

42. Find the zeroes of $x^2 + 5x$.

43. If one zero of $5x^2 + 13x - a$ is reciprocal of the other, find the value of a.

44. Find the quadratic polynomial whose zeroes are $5 + \sqrt{2}$ and $5 - \sqrt{2}$.

45. How many terms are there in the AP: 25, 50, 75, …………1000 ?

46. TA and TB are the tangents drawn to a circle from a point T outside the circle. If $\angle ATB = 60°$, find $\angle AOB$ and $\angle TAB$.

47. The length of the tangent drawn from a point Q outside the circle is 16 cm. If the radius of the circle is 12 cm, how far is Q from the centre of the circle?

48. Find k so that $kx(x-2) + 6 = 0$ may have two equal roots.

49. The non negative real root of the equation $3x^2 - 5x - 2 = 0$ is ....

50. Find the non zero root of the equation $3z - 5z^2 = 0$.

51. State the nature of roots of $ax^2 + bx + c = 0$, if $b^2 - 4ac > 0$ (given a, b and c are real numbers).

52. "Sandeep's father is 30 years older than him. The product of their ages 2 years from now will be 400." Represent this information in the form of a quadratic equation.

53. If one root of $2x^2 - 8x - m = 0$ is $\frac{5}{2}$, find the values of m.

54. A cone and a hemisphere have equal bases and equal volumes. Find the ratio of their heights.

55. Find the missing terms in the following AP □, 13, □, 3.

56. Can the HCF and LCM of two numbers be 27 and 288?

57. A student draws both the ogives and finds that they intersect at (30, 45) then the median of the distribution is ---------and the total number of observations is ------.

58. Circumferences of two circles are in the ratio 2 : 3, find the ratio of their areas.

59. Evaluate $\frac{(1+\cos\theta)(1-\cos\theta)}{(1+\sin\theta)(1-\sin\theta)}$ if $\tan\theta = \frac{1}{\sqrt{5}}$

60. If $\frac{p}{q} = 3.\overline{9145}$, what can be said about q?

61. D and E are points on sides AB and AC of ΔABC, DE || BC. If AD = 3 cm, BD = 2 cm, then find $ar(ADE) : ar(ABC)$.

62. Find the common difference of the AP whose nth term is $t_n = \frac{3n}{3n+4}$.

63. PA and PB are tangents to the circle. CD is a third tangent touching the circle at Q. If PB = 10 cm and CQ =2 cm find PC.

64. Find the perimeter of a protractor having length of its base as 14 cm.

65. The probability of Subodh winning a race is $\frac{5}{9}$. What is the probability of his not winning the race?

66. The mean and median of a distribution both are equal to 635.97. Find the mode.

67. At how many points will the polynomial $x^3 + 8$ intersect the x-axis?

68. If 3 is a root of the equation $7x^2 - (k+1)x + 3 = 0$, find the value of k.

69. A race track is in the form of a ring whose inner and outer circumferences are 352 m and 396 m respectively. Find the width of the track.

70. Write a polynomial whose zeroes are $\frac{-4}{5}$ and $\frac{3}{4}$.

71. Three vertices of a parallelogram are (2, -2), (8, 4) and (5, 7), find the fourth vertex.

72. Find the point which is three-fourth of the way from (3, 1) to (-2, 5).

73. Find the perpendicular distance of (5, 12) from the y-axis.

74. Find the distance of the point P(-a cosθ, a sinθ) from the origin.

75. If sum and product of the zeroes of $ky^2 + 2y + 3k$ are equal, find k.

76. 3 cubes of edges 2 cm each are joined end to end to form a cuboid. Find the ratio of the volume of a cube to the volume of the cuboid formed.

77. What is the perimeter of a quadrant of a circle of radius 2r?

78. If ΔABC ~ΔPQR, $\angle A = 45°$ and $\angle B = 100°$, find $\angle R$.

79. If $x \cos A = 1$ and $\tan A = y$, Evaluate $5x^2 - 5y^2$.

80. Find the LCM of the smallest prime number and the smallest composite number.

81. Find the radius of the circle if its area is equal to three times its circumference.

82. What is the maximum number of terms a polynomial of degree 6 may have?

83. What is the maximum value of $\frac{1}{\operatorname{cosec}\theta}$?

84. Find the value of p for which the points (-1, 3), (2, p) and (5, -1) are collinear.

85. What type of a graph will be represented by the polynomial $-3x^2 + 5x + 4$?

86. Find the length of the diagonal of the largest cube that can be inscribed in a sphere of radius 21 cm.
87. Sumit and Amit want to go from home to school. The location of their house is at (3,-1) and the school is at (3,5). Sumit first drives to the community centre which is at (7,-1) and then to the mall which is at (7,5) and then reaches the school, whereas Amit walks from home straight to the school. Find the distances travelled by the two. Also who is wiser? Give two reasons justifying your choice.
88. A student left for his school 10 minutes later than the scheduled time. In order to reach on time, he increases his speed by 1 km/hr. If his school is 2 km away from home, find his speed of walking. Which value is displayed in his action?
89. Students of a school hostel which is 4 km away from the school building, 40% of the students walk to the school, 20% travel by bus and the remaining cycle to the school.

    Find the probability that a student (picked up at random) of the hostel:

    (a) cycles to school (b) walks to the school

    What suggestion will a teacher give to a student regarding travelling from hostel to the school? Why?
90. A person saves Rs 250 in the first month, Rs 300 in the second month, Rs 350 in the third month, and so on. How much saving would he be able to do in 5 years?

    What is the value promoted/displayed by his action?
91. A contract on construction job specifies a penalty for delay of completion beyond a certain date as follows: Rs 200 for the first day, Rs 250 for the second day, Rs 300 for the third day, etc, the penalty for each succeeding day being Rs 50 more than the preceding day.

    If the contractor delays the construction by 45 days, how much penalty will he be required to pay?

    Is charging the penalty justified? Give reasons.
92. Shubhra has a piggy bank in which she saves and puts coins. She has saved 100 coins of 50 paise, 50 coins of Re 1, 20 coins of Rs 2 and 10 coins of Rs 5 in it. If it is equally likely that one of the coins will fall out when the piggy bank is turned upside down. What is the probability that the coin that falls out?

(a) Re 1 coin (b) Rs 5 coin (c) 50 paisa coin?

What is the value displayed by the little girl Shubhra?

93. Rakesh goes to a mithai shop.

Offer 1) is a plate with one rasgulla. The radius of the rasgulla is 2.1 cm and is filled with sugar syrup which is 25% of its volume.

Offer 2) is a plate with 4 rasgullas,each having a radius which is $1/4^{th}$ of the radius of the bigger one. The sugar syrup in each rasgullais also 25% of the volume.

Which plate will you suggest to a diet conscious person? Why?

Case Study Practice Questions

Scan the following QR codes to obtain the practice material:

SAMPLE PAPER 1

TERM-1 (*Syllabus and format for the term subject to change)*

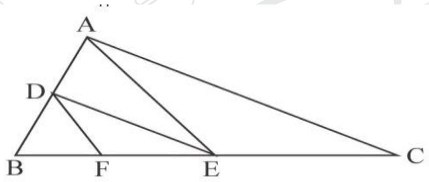
Time: 2 hours **Max Marks: 40**

Section-A

1. Find the value of p, for which one root of the quadratic equation $px^2 - 14x + 8 = 0$ is 6 times the other.
2. In the ΔPQR, PQ= 12 cm, PR=13 cm, ∠Q=90˚. Find $tanP - cosecR$.

OR

3. If $tan\theta = \frac{3}{4}$, then find the value of $cos^2\theta - sin^2\theta$.
4. In the figure, $DE \| AC$ and $DF \| AE$. Prove that $\frac{BF}{FE} = \frac{BE}{EC}$.



Section-B

5. 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.
6. Evaluate: $\frac{tan^2 60° + 4sin^2 45° + 3sec^2 30°}{cosec 30° + sec 60° - cot^2 30°}$
7. Find the zeroes of the quadratic polynomial $7y^2 - \frac{11}{3}y - \frac{2}{3}$ and verify the relationship between the zeroes and the coefficients.
8. Two right triangles ABC and DBC are drawn on the same hypotenuse BC and on the same side of BC. If AC and BD intersect at P, prove that AP×PC=BP×DP.

OR

9. Diagonals of a trapezium PQRS intersect each other at the point O, PQ||RS and
10. PQ=3RS. Find the ratio of the areas of triangles POQ and ROS.
11. If $sinA = \frac{\sqrt{3}}{2}$ and $cosB = \frac{1}{\sqrt{2}}$, find the value of $\frac{tanA - tanB}{1 + tanAtanB}$.

12. Determine whether the given quadratic equation has real roots and if so, find the roots:

    $3x^2 + 2\sqrt{5}x - 5 = 0.$

OR

13. Write all the values of p for which the quadratic equation $x^2 + px + 16 = 0$ has equal

14. roots. Find the roots of the equation so obtained.

Section-C

15. Prove that in a right angled triangle, the square of hypotenuse is equal to the sum of the square of other two sides.

16. Solve for x: $\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}$, $x \neq -1, -2, -4$

17. If α, β are the zeroes of the polynomial $p(x) = 2x^2 - 5x + 3$, without finding the zeroes, evaluate (i) $\alpha^2 + \beta^2$ (ii) $\alpha^3 + \beta^3$

18. BL and CM are medians of a ΔABC right angled at A. Prove that $4(BL^2 + CM^2) = 5BC^2$.

OR

19. In an equilateral ΔABC, D is a point on side BC such that $BD = \frac{1}{3}BC$.

    Prove that $9AD^2 = 7AB^2$.

SAMPLE PAPER-2

TERM-2 (*Syllabus and format for the term subject to change*

Time: 3 hours **MM- 80**

General Instructions:

1. This question paper contains two parts A and B.
2. Both Part A and Part B have internal choices.
3. This paper has 8 printed sides.

Part – A:
1. It consists of two sections- I and II.
2. Section I has 16 questions of **1 mark each**. Internal choice is provided in 4 questions.
3. Section II has 4 questions on **case study**. Each case study has 5 case-based sub-parts. An examinee is to attempt **any 4** out of 5 sub-parts.

Part – B:
1. Question No 21 to 26 are Very short answer Type questions of **2 mark each.**
2. Question No 27 to 33 are Short Answer Type questions of **3 marks each.**
3. Question No 34 to 36 are Long Answer Type questions of **5 marks each.**
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

Part – A

SECTION–I

Q1. If the product of the zeroes of the quadratic polynomial $ax^2 - 6x - 6$ is 4, find the value of a.

OR

For what value(s) of k, the equation $9x^2 + 8x + 16 = 0$ has equal roots.

Q2. If $7 \sin^2 \theta + 3 \cos^2 \theta = 4$, then find the value of $\tan\theta$.

Q3. Metallic spheres of radii 6 cm, 8 cm and 10 cm, respectively are melted to form a single solid sphere. Find the radius of the resulting sphere.

OR

A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of the solid in terms of π.

Q4. Find the 11th term from the last term of the AP: 10, 7, 4, . . ., – 62.

Q5. InΔABC, D and E lies on AB and AC respectively such that DE ∥ BC. If DE = $\frac{2}{3}$ BC and area of ABC = 81 cm^2 , find the area of ΔADE.

Q6. If $2\cos 3\theta = \sqrt{3}$ ($0° \le \theta \le 90°$), then find the value of θ.

Q7. Can two numbers have 15 as their HCF and 340 as their LCM? Give reason.

OR

If n is a positive integer and n^2 is divisible by 72, then find the largest positive integer that must divide n.

Q8. The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one of the sides of the first triangle is 9 cm, what is the corresponding side of the other triangle?

Q9. For which value(s) of p, will the lines represented by the following pair of linear equations be parallel?

$3x - y - 5 = 0$;
$6x - 2y - p = 0$

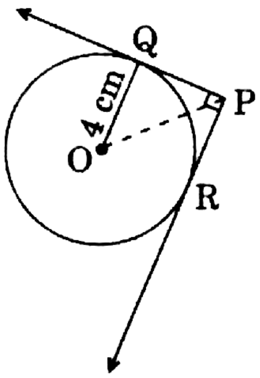
Q10. What is the probability of getting 5 Saturdays and 5 Sundays in the month of April?

Q11. The endpoints of diameter of a circle are (2, 4) and (–3, –1). What is the radius of the circle?

Q12. The mean and median of the same data are 24 and 26 respectively. Find the value of mode.

Q13. If the point C(m,4) divides the line segment joining two points A(2,6) and B(5,1) in the ratio 2:3, what is the value of m?

Q14. In the given figure, from an external point P, two tangents PQ and PR are drawn to a circle with centre O and radius 4 cm. If ∠QPR = 90°, then find the length of PQ.

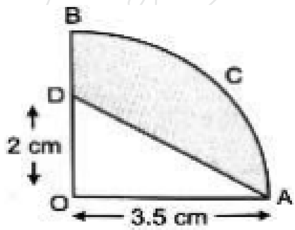


Q15. Find the area of the sector of a circle of radius 7 cm, if corresponding arc length is 6.2 cm.

Q16. Show that if the circumferences of two circles are equal, then their areas are also equal.

OR

In the given figure, AOBCA represents the quadrant of area 9.625 cm^2 . Calculate the area of the shaded portion.



SECTION–II

Q17. Mahesh works as a manager in a hotel. He has to arrange seats in the hall for a function. A hall has a certain number of chairs. Guests want to sit in different groups like in pairs, triplets, quadruplets, fives and sixes etc. When Mahesh arranges chairs in such patterns-like in 2's, 3's, 4's, 5's and 6's, then 1, 2, 3, 4 and 5 chairs are left respectively. But when he arranges in 11's, no chair will be left.

1. How many chairs are available in the hall?

(a) 407 (b) 143
(c) 539 (d) 209

2. If one chair is removed, which arrangements are possible now ?

(a) 2 (b) 3
(c) 4 (d) 5

3. If one chair is added to the total number of chairs, how many chairs will be left when arranged in 11's ?

(a) 1 (b) 2
(c) 3 (d) 4

4. How many chairs will be left in original arrangement if the same number of chairs will be arranged in 9's?

(a) 8 (b) 1
(c) 6 (d) 3

5. If the original number of chairs are arranged in 7's, how many rows of chairs will be there?

(a) 58 (b) 20
(c) 77 (d) 29

Q18. Underground water sump is popular in India. It is usually used for large water sump storage and can be built cheaply using cement-like materials. The water in the underground sump is not affected by extreme weather conditions. A builder wants to build a sump to store water in an apartment. The volume of the rectangular sump will be modelled by :

$$V(x) = x^3 + x^2 - 4x - 4$$

1. He planned in such a way that its base dimensions are (x + 1) and (x + 2) . How much depth does he have to dig ?

(a) $(x+1)$ (b) $(x-2)$
(c) $(x-3)$ (d) $(x+2)$

2. If x = 4 meter, then what is the volume of the sump?

(a) $30\ m^3$ (b) $20\ m^3$
(c) $15\ m^3$ (d) $60\ m^3$

3. If x = 4 and the builder wants to paint the entire inner portion on the sump, what is the total area to be painted ?

(a) $52\ m^2$ (b) $96\ m^2$
(c) $208\ m^2$ (d) $104\ m^2$

4. If the cost of paint is Rs. 25 per square metre, what is the total cost of painting ?

(a) 3900 Rs (b) 2600 Rs
(c) 1300 Rs (d) 5200 Rs

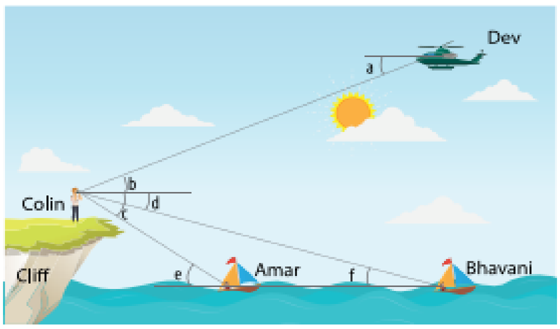
5. What is the storage capacity of this sump ?

(a) 3000 litre (b) 6000 litre
(c) 60000 litre (d) 30000 litre

Q19. Mr. Colin is a Navy officer who is tasked with planning a coup on the enemy at a certain date. Currently he is inspecting the area standing on top of the cliff. Agent Dev is on a chopper in the sky. When Mr. Colin looks down below the cliff towards the sea, he has Bhawani and Amar in boats positioned to get a good vantage point. Bhawani's boat is behind Amar's boat.

Following angle have been measured :

- From Colin to Bhawani : 30°
- From Dev to Colin : 60°
- From Amar to Colin : 60°



1. Which of the following is a pair of angle of elevation?

(a) $(\angle a^\circ, \angle e^\circ)$ (b) $(\angle b^\circ, \angle e^\circ)$
(c) $(\angle c^\circ, \angle d^\circ)$ (d) $(\angle a^\circ, \angle f^\circ)$

2. Which of the following is a pair of angle of depression?

(a) $(\angle a^\circ, \angle e^\circ)$ (b) $(\angle b^\circ, \angle e^\circ)$
(c) $(\angle c^\circ, \angle d^\circ)$ (d) $(\angle a^\circ, \angle f^\circ)$

3. If Colin's height along with the height of the cliff is taken as h, then what is the distance of Amar's boat from the base of the hill ?

(a) $\frac{\sqrt{3}\,h}{2}$ (b) $\frac{h}{\sqrt{3}}$
(c) $\frac{2h}{\sqrt{3}}$ (d) $\sqrt{3}\,h$

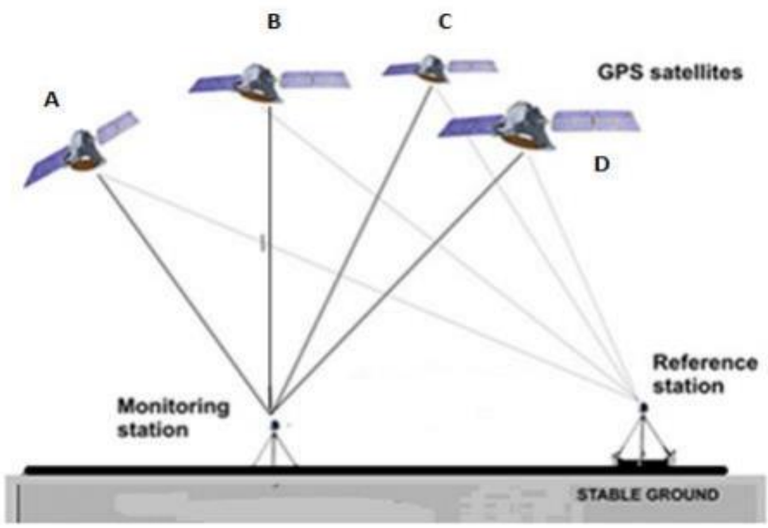
4. What is the distance of Amar's boat from Bhawani's boat?

(a) $\frac{\sqrt{3}\,h}{2}$ (b) $\frac{h}{\sqrt{3}}$
(c) $\frac{2h}{\sqrt{3}}$ (d) $\sqrt{3}\,h$

5. What is Dev's height taken along with the height of the cliff?

(a) h (b) $2h$
(c) $3h$ (d) $4h$

Q20. GPS, the Global Positioning systems are used for navigation by both the military and civilians. The diagram below shows the positioning of four satellites A, B, C and D at a particular time above the Earth's surface. These satellites are used by the armed forces to track the entry of any aircraft across the boundaries. At any instant the position of these satellites can be represented using the coordinate planes.



1. If the position of the monitoring station is considered to be the origin, which of the following satellites would have the coordinates as (0, 7)?

(a) A (b) B (c) C (d) D

2. The distance of the monitoring station (0,0) from A(– 3,5) is ________

(a) $\sqrt{34}$ units (b) $\sqrt{15}$ units (d) $\sqrt{12}$ units (d) 4 units

3. If another satellite has to be launched such that its position is exactly between C (5,10) and D (7, 4), find the position of the new satellite.

(a) (4, 1) (b) (0, 0) (c) (8, 2) (d) (6, 7)

4. Suppose if D (7, 4) is equidistant from the reference station and monitoring station, then the coordinates of the reference station is given by _____.

(a) (7, 0) (b) (0, 14) (c) (14, 0) (d) (0, 7)

5. Satellite A gives a signal to the monitoring station when an aircraft is tracked at a position P between A(-3, 5) and D(7, 4) dividing AD in the ratio 1: 2. The coordinates of P are ____.

(a) $(\frac{2}{3},\frac{14}{3})$ (b) $(\frac{1}{3},\frac{14}{3})$ (c) $(\frac{1}{3},\frac{-1}{3})$ (d) $(\frac{13}{3},\frac{14}{3})$

Part – B

Q21. John is printing orange and green forms. He notices that 3 orange forms fit on a page, and 5 green forms fit on a page. If John wants to print the exact same number of orange and green forms, what is the minimum number of each form that he could print ?

Q22. Find a relation between x and y such that the point (x,y) is equidistant from the points (7,1) and (3, 5).

OR

Find the fourth vertex D of a parallelogram ABCD whose three vertices are A(-2, 3) , B(6, 7) and C(8, 3).

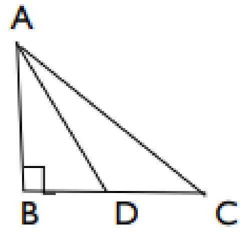
Q23. Prove that the parallelogram circumscribing a circle is a rhombus.

Q24. Find the roots of the following quadratic equation:

$p^2x^2 + (p^2 - q^2)x - q^2 = 0$

Q25. ΔABC is right angled at B, and D is the midpoint of BC. Prove that

$AC^2 = AD^2 + 3BD^2$



Q26. The median of the distribution given is 14.4. Find the values of x and y, if the sum of frequencies is 20.

Class Interval	0 – 6	6-12	12-18	18- 24	24 -30
Frequency	4	x	5	y	1

OR

Find the mean using assumed mean method for the following data

Marks	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	14	6	10	20	30	8	12

Q27. Prove that :

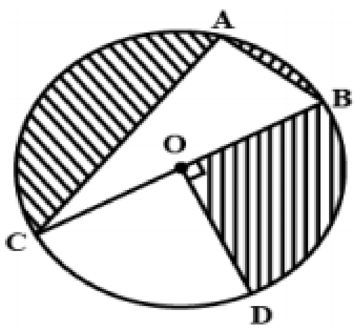
$$\frac{\tan A}{\sec A - 1} + \frac{\tan A}{\sec A + 1} = 2 \operatorname{cosec} A$$

OR

Find the value of x such that

$$2\operatorname{cosec}^2 30° + x \sin^2 60° - \frac{3}{4}\tan^2 30° = 10$$

Q28. In the given figure, O is the centre of the circle with AC = 24 cm, AB = 7 cm and $\angle BOD = 90°$.



Q29. If p^{th} term of an A.P. is $\frac{1}{q}$ and q^{th} term is $\frac{1}{p}$, then prove that its $(pq)^{th}$ term is 1.

Q30. A 20 m deep well with a diameter 7 m is dug and the earth from digging is evenly spread out to form a platform 22 m by 14 m. find the height of the platform.

Q31. Prove that in a right-angle triangle, the square of the hypotenuse is equal to the sum of squares of the other two sides.

OR

Sides AB and BC and median AD of a ΔABC are respectively proportional to sides PQ and QR and median PM of ΔPQR. Show that $\Delta ABC \sim \Delta PQR$.

Q32. Given that $\sqrt{3}$ and $\sqrt{5}$ are irrational, prove that $(\sqrt{3} + \sqrt{5})$ is also irrational.

Q33. Prove that : $2\sec^2\theta - \sec^4\theta - 2\operatorname{cosec}^2\theta + \operatorname{cosec}^4\theta = \cot^4\theta - \tan^4\theta$

Q34. A bird sitting on the top of a tree, which is 80m high. From a point on the ground the angle of elevation of the bird is 45°. The bird flies away from the point of observation horizontally and remains at a constant height from the ground. After 2 seconds, the angle of elevation of the bird from the point of observation becomes 30°. Find the speed of the flying bird. (Use $\sqrt{3} = 1.732$)

OR

A man standing on the deck of a ship, which is 10 m above water level, observes the angle of elevation of the top of a hill as 60° and the angle of depression of the base of hill as 30°. Find the distance of the hill from the ship and the height of the hill.

Q35. Draw the graph of the following pair of linear equations:

$x + 3y = 6$;
$2x - 3y = 12$.

Hence, find the area of the region bounded by $x = 0$, $y = 0$ and $2x - 3y = 12$.

Q36. Water is flowing through a cylindrical pipe of internal diameter 2cm, into a cylindrical tank of base radius 40 cm at the rate of 0.7m/sec. By how much will the water rise in the tank in half an hour?

SAMPLE PAPER-3

(Syllabus and format for the term subject to change)

Time: 3 hrs **Maximum Marks: 80**

Part – A

SECTION–I

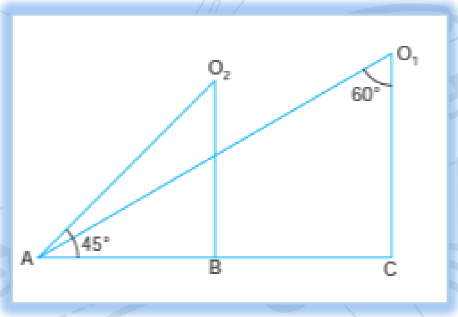
Q 1. What are the zeroes of the polynomial $x^2 - 3x - m(m+3)$?

OR

If α *and* β are the zeros of the polynomial f(x)= $x^2 - 5x + k$ such that $\alpha - \beta = 1$, find the value of k

Q 2. Find the ratio in which x -axis divides the join of A (2, -3) and B (5,6).

Q 3. What are the angles of depression from the observing positions O_1 and O_2 respectively of the object A?



Q 4. The diameter of a metallic sphere is 6 cm. The sphere is melted and drawn into a wire o uniform cross section. If the length of the wire is 36 cm, find its radius.

OR

A solid cylinder of radius r and height h is placed over other cylinder of same height and radius. What is the total surface area of the shape so formed?

Q 5. Find the value of θ if $\sqrt{3}\,tan 2\theta - 3 = 0$

Q 6. If the numbers k – 2, 4k – 1 and 5k +2 are in AP, then what is the value of k?

Q 7. Find the length of an altitude in an equilateral triangle of side 'a' cm.

Q 8. Find the area of the circle (in terms of π) that can be inscribed in a square of side 8 cm.

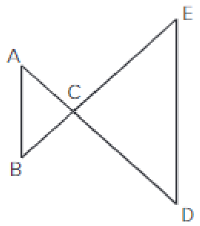
Q 9. If two tangents inclined at an angle of 60° are drawn to a circle of radius 3 cm, then what will be the length of each tangent?

Q 10. After how many places will the decimal expansion of $\frac{189}{125}$ terminate ?

Q 11. In triangle PQR, if PQ = 6 cm, PR = 8 cm, QS = 3 cm, and PS is the bisector of $\angle QPR$, what is the length of SR?

OR

In the figure, AB ||ED. Show triangle $\Delta ABC \sim \Delta DEC$.



Q 12. The perimeter of a semi - circular protractor is 36 cm. Find its diameter.

Q 13. One card is drawn at random from a pack of 52 cards. Find the probability that the card drawn is either red or queen.

Q 14. Find the LCM and HCF of $2^3 \times 3^5 \times 7$ and $2^5 \times 3^3 \times 5$ (final multiplication not required)

OR

Six bells commence tolling together and toll at intervals of 2, 4, 6, 8 10 and 12 seconds, respectively. In 30 minutes, how many times do they toll together?

Q 15. Find the median of the first 50 even natural numbers.

Q 16. Determine the value(s) of k for which the given equation $kx^2 + 6x + 1 = 0$ has real roots.

SECTION–II

Q 17.A fruit seller was selling apples in packing boxes containing varying number of apples.

No of apples	25-30	30-35	35-40	40-45	45-50	50-55
No of boxes	25	34	50	42	38	13

Answer the following questions:
(Answer any four)

1. Estimate the modal number of apples kept in a packing box.
   a. 37 b. 38.3 c. 36.7 d. 53.8

2. What is the lower limit of median class?
   a. 40 b. 45 c. 30 d. 35

3. Which of the following is not a measure of central tendency?
   a. Mean b. Median c. Range d. Mode

4. The difference of the upper limit of median and modal class.
   a. 0 b. 1 c. 5 d. 7

5. How many boxes contain ≥ 40 apples?

a. 93 b. 53 c. 13 d. 42

Q 18. Malini goes to a grocery shop for purchasing some glass jars for gifting in a party. She observed that the jars are arranged one above the other in a specific pattern. 3,6, 9……

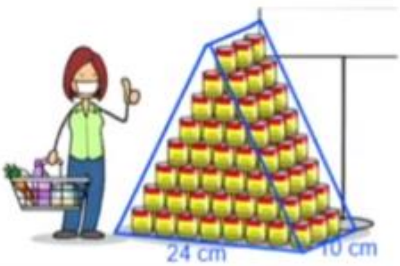
Answer the following questions:
(Answer any four)

1. How many total jars are there?
   a. 52 b. 108 c. 24 d. 96

2. If there are 100 such rows, then how many jars are there the 56^{th} row?
   a. 200 b. 168 c. 300 d. 303

3. If the shopkeeper puts 2 more rows on the top having 2 jars and 1 jar respectively, will it be an arithmetic sequence?
   a. Yes, because the common difference between each row is the same.
   b. No, because the common difference between each row is not the same.
   c. Yes, because the common difference between each row is not the same.
   d. No, because the common difference between each row is the same.

4. Ms Malini asked the shopkeeper to pack it in the same fashion as it is displayed. Shopkeeper used a box of dimension as shown. Front face of the box is an equilateral triangle. The capacity of the box used is:
   a. 480 X 1.73 cubic cm
   b. 240 X 1.73 cubic cm
   c. 2880 X 1.73 cubic cm
   d. 1440 X 1.73 cubic cm



5. Malini asked the shopkeeper to gift wrap it with a gift paper. The total surface area of the paper used is:
   a. 1.73 X 12 X 24 + 3X (10 X 24) square cm
   b. 3.14 X 12 X 24 + 3X (10 X 24) square cm
   c. 1.41 X 12 X 24 + 3X (10 X 24) square cm
   d. 1.73 X 24 X 24 + 3X (10 X 24) square cm

Q 19. A computer animation below shows a cat moving in a straight line, its height b metres above the ground, is given by $\mathbf{8s - 3b = -9}$ where s is the time in seconds after it starts moving. In the same animation, a mouse starts to move at the same time as the cat and its movement is given by $\mathbf{-3s + b = 1}$.

Answer the following questions:
(Answer any four)

1. Will the mouse and cat be able to meet at one point?
   a. Yes
   b. No
   c. Cannot be said
   d. Incomplete data

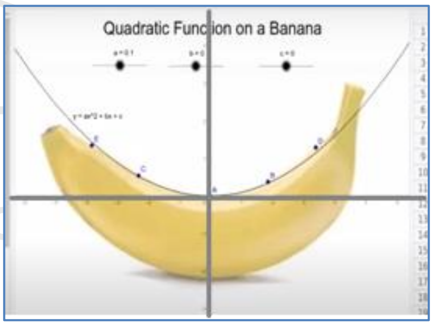
2. What condition is used to determine the above answer?
   a. $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
   b. $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
   c. $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
   d. None of the above

3. If yes, after how much time?
   a. 7 sec
   b. 6 sec
   c. 10 sec
   d. 5 sec

4. If yes, at what height?
   a. 9 m
   b. 19 m
   c. 15 m
   d. 7 m

5. If the movement of the cat is given by $2s - b = 9$ and that of the mouse is given by $6s - 3b = 21$, will they meet?
   a. Yes
   b. No
   c. Cannot be said
   d. Incomplete data

Q 20. The quadratic function can model the natural shape of a banana. From the picture we can see that this function is able to model the banana quite accurately with a=0.1, b=0 and c=0. Therefore, the equation here is **f(x)= 0.1 x^2**



Answer the following questions:
(Answer any four)

1. Name the shape of the banana curve from the given figure.

2. The number of zeroes of the polynomial for the shape of banana.
   a. 2 b. 3 c. 1 d. 0

3. If the curve of the banana is represented by f(x)= $x^2 - x - 12$, its zeroes will be
   a. 3,4 b. -3, -4, c. -3,4 d. 3, -4

4. For the graph of the quadratic polynomial $ax^2 + bx + c$ to be opening downwards:
   a. a> 0 b. a< 0 c. b=0 d. b > 0

5. The representation of the curve whose one zero is 4 and sum of zeros is zero, will be the quadratic polynomial:
   a. $x^2 + 16$ b. $x^2 - 16$ c. $x^2 + x + 16$ d. $x^2 - x + 16$

Part – B

Q 21. Find the middle most term (s) of the AP: 11, –7, –3, ..., 49

OR

Which term of the AP: 134, 129, 124…. is the first negative term?

Q 22. A line intersects the x and y axes at P and Q, respectively. If (2,6) is the midpoint of PQ, then find the coordinates of P and Q.

Q 23. Check whether 6^n can end with the digit 0 for any natural number n.

Q 24. If $\frac{cos\theta - sin\theta}{cos\theta + sin\theta} = \frac{1-\sqrt{3}}{1+\sqrt{3}}$, find the value of θ.

OR

Prove that $\sqrt{sec^2\theta + cosec^2\theta} = tan\theta + cot\theta$

Q 25. Solve for x: $4x^2 - 2(a^2 + b^2)x + a^2b^2 = 0$

Q 26. ABC is a triangle. A circle touches sides AB and AC produced and side BC at X, Y and Z, respectively. Show that AX = AY = $\frac{1}{2}$ Perimeter of Δ ABC.

Q 27. The given figure depicts a racing track whose left and right ends are semi-circular. The distance between the two inner parallel line segments is 60 m and they are each 106 m long. If the track is 10 m wide, find:

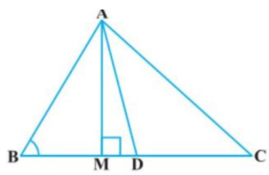
(i) the distance around the track along its inner edge.
(ii) the area of the track.

Q 28. If α and β are the zeros of the quadratic polynomial p(x)= $x^2 - 4x + 3$, find the value of $\alpha^4\beta^3 + \alpha^3\beta^4$

OR

Find the zeros of the polynomial f(x)= $x^2 + \sqrt{3}x - 60$ and verify the relationship between the zeros and their coefficients.

Q 29. In the given Fig, AD is a median of a ΔABC and A M ⊥ BC.



Prove that: $AC^2 = AD^2 + BC.DM + \left(\frac{BC}{2}\right)^2$

OR

An aeroplane leaves an airport and flies due north at a speed of 1000 km/hr. At the same time, another aeroplane leaves the same airport and flies due west at a speed of 1200 km /hr. How far will the two planes be after $1\frac{1}{2}$ hour?

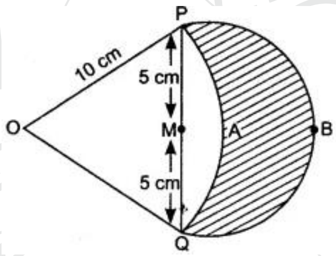
Q 30. (i) A game consists of tossing a one-rupee coin 3 times and noting the outcome each time. Ramesh wins the game if all the tosses give the same result (i.e. three heads or three tails) and loses otherwise. Find the probability of Ramesh losing the game.

(ii) In a single throw of a pair of dice, what is the probability of getting the sum a perfect square?

Q 31. The vertices of a Δ ABC are A (5, 5), B (1,5) and C (9,1). A line is drawn to intersect sides AB and AC at P and Q respectively, such that $\frac{AP}{AB} = \frac{AQ}{AC} = \frac{3}{4}$. Find the length of the line segment PQ.

Q 32. Prove that $2 + \sqrt{3}$ is irrational

Q 33. In figure, are shown two arcs PAQ and PBQ. Arc PAQ is a part of circle with centre and radius OP while arc PBQ is a semicircle drawn on diameter with centre M. If OP = PQ = 10 cm, show that area of shaded region is 25 ($\sqrt{3}$- π/6) cm²



Q 34. Find the median of the following data:

Marks (out of 90)	No. of Students
0-10	2
10-20	2
20-30	4
30-40	6
40-50	6
50-60	5
60-70	2
70-80	4
80-90	4
Total	35

Q 35. The angles of depression of the top and bottom of a 50m high building from the top of a tower are 45 and 60 degree, respectively. Find the height of the tower and the horizontal distance between the tower and the building. (Use $\sqrt{3}$ = 1.73)

Q 36. Water is flowing at the rate of 5 km/hr through a pipe of diameter 14 cm into a rectangular tank which is 50 m long and 44 m wide. Determine the time in which the level of the water in the tank will rise by 7 cm.

OR

Due to sudden floods, some welfare associations jointly requested the government to get 100 tents fixed immediately and offered to contribute 50% of the cost. If the lower part of each tent is of the form of a cylinder of diameter 4.2 m and height 4 m with the conical upper part of same diameter but of height 2.8 m, and the canvas to be used costs 100 rupees per sq. m, find the amount, the associations will have to pay.

Answers

Assignment 1 (SIMILAR TRIANGLES)

1. 70°	2. 30°	3. BD=60cm	4. X=10	5. 45 sqcm
6. 5.4cm	7. 16:1	8. $5\frac{1}{3}cm^2$	9. AC=3.08cm, BC=2.64cm	10. Not parallel

Assignment 2a (TRIGONOMETRY)

1. 1	2. 1	3. ½	4. 10^0, 10^0	5. 0
6. 15^0	7. $\frac{\sqrt{3}}{2}$	8. 35/156	9. $\frac{p^2-q^2}{p^2+q^2}$	10. 1
11. $\frac{-1}{13}$	12. A=10°, $B = 40°$			

Assignment 2b (TRIGONOMETRY)

1. 1	2. 50°	3. $\sqrt{2}+1$	4. 2	6. 60°
7. $\frac{\sqrt{6}}{4}+\frac{\sqrt{2}}{4}$	8. sinA=$\frac{5}{13}$, $cosA = \frac{12}{13}$	11. $\frac{-43}{5}$	12. $\frac{-5}{6}$	

Word Problem: Real Numbers

1) 60L	2) 42	3) 344864	4) 12	5) 10days
6) 15	7) 8:27:12	8) 30mins	9) 20	10) 900

Assignment 3 (REAL NUMBERS)

A)False	B)False	C)False	D)d	E)d
1) xy^2	2)x^3y^3	3) 1	4i) Terminating	4ii) Terminating
4iii) Terminating	4iv) Non-Terminating	5.i) 0.062	ii) 0.095	iii) 0.001
iv) 0.000068	6. 2	7. No	8. Has a prime factor other than 2 and/or 5	9. 6272
11. HCF=52, LCM=624	12. 17			

Assignment 4 (POLYNOMIALS)

A)not defined	B)non-zero constant	C)three	D)three	E)zero
1) $\frac{-2}{3}$	2) 1,2	3) $17x - 17$	4) $21x^2 + 18x - 14$	5) $5x^2 + 78x + 45$
6) $x^2 - 10x + 22$	7) $x^2 - 4x - 60$	8) k=3; $\frac{2}{3}, \frac{3}{2}$	9) $x^2 - 2x + 3$	10) $x^2 - 8x + 4$
11i) 5/3	11ii) 13/4	11iii) 35/8	11iv) 65/8	12) $\pm\sqrt{\frac{2}{3}}$, 1,2
13) a=-20, b=-25	14) k=7			

Assignment 5a (LINEAR EQUATIONS)

1. b	2. k=-2	3. k≠8	4. a=-5, b=-1	5. 13.5 sq units
6. 9squnits	7. 2:1	8. (2,5), (1,3), (-4,2)	9. a) x=2,y=1	b) x=1, y=2
c) x=1, y=1	d) x=0, y=0	10. x=-1, y=1		

Assignment 5b (LINEAR EQUATIONS)

1. 40 years	2 .Rs 100	3. 40km/h, 30km/h	4. Rs 500, Rs700	5. 36
6. 60km/h, 80km/h	7. 10km/h, 2km/h	8.140days, 280days	9. Rs1200	10. 20hrs, 30hrs

Assignment 6 (STATISTICS)

1. 33	2. 27	3. 27, 68	4. 98.04	5. f_1=34, f_2=46
6. 57.78	7. Median= 529.5, Mode=532.83, Mean= 527.835	8. 11, 13		

Assignment 7 (HEIGHTS AND DISTANCES)

1. 30 deg	2. $15\sqrt{2}, 30\sqrt{2}$	3. 180m	4. 80m	5. $5(\sqrt{3}+1)$min.
6. h= $37.5\sqrt{3}$ m Distance: 37.5m	7. $\frac{500}{3}(\sqrt{3}-1)$m/s	8. $5\sqrt{3}(\sqrt{3}+1)$ m	9. $h\left(\frac{\tan\beta - \tan\alpha}{\tan\beta \tan\alpha}\right)$	10. 150m

Extra Questions Quadratic Equations:

1) 92 2) 24 3)6 4)36 5) 1hr 6) 36yrs and 9yrs 7) 150sqcm 80 16

Assignment 8 (QUADRATIC EQUATIONS)

A) two B) $b^2 = 4ac$ C)False D)false E) d F) c

1. 3/4 2. $18+40\sqrt{3}$ 3i) $p \geq -4$ 3ii) $p \geq \frac{-961}{28}$

4. 7 years, 49 years 5.3cm, 4cm 6. 15 km/h, 20km/h 7. $5\sqrt{7}$ km/h

8. 3, 5 1 9. 750km/h 10.42km/h 11.50 12.11cm, 3cm 13. 92

14i) $x = \frac{\sqrt{3}}{2}, \frac{-4\sqrt{3}}{3}$ 14(ii) $x = \frac{\sqrt{5}}{3}, -\sqrt{5}$ 14iii) $x = \frac{2 \pm \sqrt{334}}{15}$ 14iv) $x = -a, -b$

14v) $x = \frac{m \pm n}{2}$ 14vi) $x = 2, -5$ 14vii) $x = 3, \frac{10}{13}$

Assignment 9 (ARITHMETIC PROGRESSIONS)

1. c) 89 2. b) 6 3. a) 2 4. a+(n-1)d 5. (n-m)d

6. b-a=c-b 7. 1, 2 8.0 9.1,5,9 or 9,5,1 10. 17:5

11. n = 14, x = 40 12. $a_{22} = 130, k = 11$ 13. 50th term 14. 255

15. 15, 35, 45 16. $a = 9, d = -2, S_{10} = 0$ 17. n= 25, 36

18. Sum = 38

Extra Questions Coordinate Geometry

1) (3,-2)	2) (1,0) (1,4)	3) $p = 1, \sqrt{10}$	4) yes	5) y=1 AQ=$\sqrt{41}$squnits
6) …….	7) (-3,5) Infinite All solns of 2x+y+1=0	8) a=2 area=6squnits	9) …	10) Y=-1,7 r=5, $\sqrt{793}$

Assignment 10 (COORDINATE GEOMETRY)

1) a	2) (0, 14)	3) (4,0), (0,12)	4) 12 units	5) True
6) 4 sq units	7) (2,3), (4,5), (6,9); 2 sq units	8) 3:5, $(\frac{17}{8}, 0)$	9) 1, -3	10) (0, -2)
11) (y, x)	12 (27-11 $\sqrt{5}$)km			

Assignment 11 (CIRCLES)

1. b) 2. A) 3. A) 4. $4\sqrt{10}cm$ 5. 12, 13, 5cm
6. 6cm 7.14cm 9. 5cm, 5cm

Assignment 12 (AREAS RELATED TO CIRCLES)

1. C) 27π	2. B) 4π	3. A) 2 units	4. C) 1694 m^2	5. A) 148 m^2
6. C) 7cm	7. 154 cm^2	8. 175cm	9. $77m^2$	10. $\frac{128}{7}cm^2$
11) 100/7 cm^2	12. 264/7 cm	13.$(81\frac{\sqrt{3}}{2}-\frac{297}{7})cm^2$, $\left(\frac{129}{7}+9\sqrt{3}\right)cm$	14) 30.96 cm^2	

Assignment 14 (SURFACE AREAS AND VOLUMES)

1.a) 2:1	2. d) 5 cm	3.a) 2x	4.c) 15	5.TSA=390.5 cm^2 V=55.83 cm^3
6.A=1901.43 cm^2 V= 8.64 *l*	7. 270cm	8. 90 spheres	9. $\frac{5500\sqrt{2}}{21}$ cm^3	10. 8cm
11) 35 cm	12)SA=1386cm^2 V=4851 cm^3	13) $\sqrt{47}-6$ cm	14) 1: 7	

Extra Questions: Probability

1) $\frac{3}{4}$	2) $\frac{3}{8},\frac{1}{2},\frac{1}{8},\frac{7}{8}$	3)) $\frac{1}{2},\frac{13}{52},\frac{1}{26},\frac{3}{13},\frac{3}{26}$	4) Pihu
5) $\frac{364}{365},\frac{1}{365}$	6) 0.88, 0.96	7) $\frac{5}{7}$	8) $\frac{1}{2}$

Assignment 15 (PROBABILITY)

1. c) 2. D) 3. B) 4. D) 5. A) 6i) 1/2 6ii) 1/3
6iii) 1/6 6iv) 1/6 6v) 2/3 7i) 1/6 7ii) 5/36 7iii) 1/6 7iv) 0
7v) 1/9 8i) ½ 8ii) 7/8 8iii) 1/8 8iv) 1/8 8v) 1 9i) 0
9ii) ½ 9iii) ¼ 9iv) 1/36 9v) 0 10i) 11/41 10ii) 13/41
10iii) 4/41 10iv) 10/41 10v) 40/41 10vi) 0 11.6 12. 54, 18 red, 27 blue
13i) 0 13ii) 5/7 13iii) 2/7 13iv) ½ 14. 5 blue, 15 red15. 1/100