10TH CLASS MATHEMATICS MATERIAL PAPER – 2

10TH CLASS MATHEMATICS MATERIAL PAPER – 2

Chapter - 08: Similar triangles

CONCEPTS

1. A polygon in which all sides and angles are equal is called a regular polygon.
2. Scale factor: The ratio of the two corresponding sides is called as scale factor (or representative factor).
3. Two polygons with the same number of sides are similar if
   i. All the corresponding angles are equal and
   ii. All the corresponding sides are in the same ratio.
4. For similarity of polygons only one of the above two conditions is not sufficient, both have to be satisfied.
5. All equilateral triangles, all squares, all circles are similar.
6. Any two congruent figures are similar.
7. If $\Delta ABC \sim \Delta DEF$ then $\angle A = \angle D, \angle B = \angle E, \angle C = F$ and also $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = K$.
8. In $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = K$.
   i. if K > 1 we get enlarged figures,
   ii. K = 1 We get congruent figures and
   iii. K < 1 gives reduced (or diminished figures).
9. **BASIC PROPORTIONALITY THEOREM (THALES THEOREM):** If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.
10. **CONVERSE OF BASIC PROPORTIONALITY THEOREM:** If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.
11. **AAA CRITERION FOR SIMILARITY OF T RIANGLES Theorem: -** If in two triangles, corresponding angles are equal, then their corresponding sides are in the same ratio and hence the two triangles are similar.
12. **AA similarity:** It two angles of one triangle are respectively equal to the two angles of anther triangle, then the two triangles are similar.
13. **SSS Criterion for Similarity of Triangles Theorem: -** In two triangles if, sides of one triangle are proportional to the sides of the other triangle, then their corresponding angles are equal and hence the triangles are similar.
14. **SAS CRITERION FOR SIMILARITY OF TRIANGLES Theorem: -** If one angle of a triangle is equal to one angle of the other triangle and the sides including these angles are proportional, then the two triangles are similar.
15. The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.
16. If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, then the triangles on both sides of the perpendicular are similar to the whole triangle and to each other.
17. **PYTHAGORAS THEOREM (BAUDHAYAN THEOREM): -** In a right triangle, the square of hypotenuse is equal to the sum of the squared of the other two sides.
18. **CONVERSE PYTHAGORAS THEOREM: -** In a triangle if square of one side is equal to the sum of squares of the other two sides, then the angle opposite to the first side is a right angle.
19. Pythagoras and the Babylonians gave a formula for generating triples as $2m, m^2 - 1, m^2 + 1$.
20. **Statement: -** A sentence which is either true or false but not both is called statement.
21. **Negation:** Denial of a statement is called its negation. Negation of p is denoted by $\sim p$.
22. **Open sentence:** A sentence having one or more variables is called an open sentence.
23. Converse of a statement: The statement obtained by interchanging hypothesis and conclusion is called the converse of the given conditional statement.
24. There are 2 ways in proving a theorem. They are
    I. Direct proof.
    II. Indirect proof.
25. There are 2 ways in disproving a theorem. They are
    I. Disproof by counter example.
    II. Disproof by Contradiction.

MULTIPLE CHOICE QUESTIONS

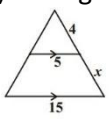
1). Two sides of an isosceles triangle measure 3cm and 7cm. Which of the following could be the measure of the third side? ( )
A) 9cm B) 7cm C) 5cm D) 3cm

2). Two.....are not always similar. ( )
A) Equilateral triangles B) Squares C) Circles D) Rectangles

3). Two.....are always similar. ( )
A) Equilateral triangles B) Squares C) Circles D) All

4). Two.....are always similar. ( )
A) Rhombus B) Rectangle C) Parallelogram D) Square

5). $\Delta ABC \sim \Delta DEF$, if $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = K$ and $K = 1$, we get.....triangles. ( )
A) Enlarged triangles B) Congruent triangles C) Reduced triangles D) None of the above

6). 

The value of x in the adjacent figure is..... ( )
A) 12 B) 14 C) 10 D) 8

7). Hari is 5 m tall. His shadow is 8 m long. At the same time of day, a tree's shadow is 32 m feet long. What is the height of the tree? ( )
A) 20m B) 24m C) 28m D) 32m

8). $\Delta LMN \sim \Delta XYZ$. $LM = 18\text{m}, MN = 12\text{m}, LN = 24\text{m}, XZ = 8\text{m}$. What is the length of $\overline{YX}$? ( )
A) 2m. B) 3m. C) 4m. D) 5m.

9). $\Delta PQR \sim \Delta XYZ$. PQ=5m, QR=6m, PR=10m, XY=30m, the perimeter of ΔXYZ is.....m. ( )
A) 21 B) 63 C) 105 D) 126

10). Ravi and Hari each drew a triangle with an angle of 20^0. Under which condition would the triangles be similar? ( )
A) If both are right triangles B) if both are obtuse triangles C) if the triangles have same area D) if both have same perimeter

11). In $\Delta ACB, \angle C = 90^0$, and $CD \perp AB$ then $\frac{BC^2}{aC^2} =$..... ( )
A) $\frac{AD}{DB}$ B) $\frac{BD}{AB}$ C) $\frac{AB}{BD}$ D) $\frac{AB}{BC}$

12). Area of an equilateral triangle is..... ( )
A) $\frac{\sqrt{3}}{2}a$ B) $\frac{\sqrt{3}}{2}a^2$ C) $\frac{\sqrt{3}}{4}a^2$ D) $\frac{\sqrt{3}}{4}a$

13). Height of an equilateral triangle is..... ( )
A) $\frac{\sqrt{3}}{2}a$ B) $\frac{\sqrt{3}}{2}a^2$ C) $\frac{\sqrt{3}}{4}a^2$ D) $\frac{\sqrt{3}}{4}a$

14). Hari travels 5m east and 12m towards north, then the distance he travelled is..... ( )
A) 7m B) 17m C) 10m D) 13m

MATCH THE FOLLOWING

1. Scale factor K>1	( )	A.	Congruent figures.
2. Scale factor K=1	( )	B.	Reduced figures.
3. Scale factor K<1	( )	C.	Enlarged figures.
4. E and F are points on the sides PQ and PR respectively of ΔPQR. PE = 3.9 cm EQ = 3 cm PF = 3.6 cm and FR = 2.4 cm.	( )	D.	$EF \parallel QR$
5. E and F are points on the sides PQ and PR respectively of ΔPQR. PE = 4 cm, QE = 4.5 cm, PF = 8 cm and RF = 9 cm.	( )	E.	$EF \nparallel QR$

1. The ratio of sides of 2 similar triangles is 1:2, then the ratio of their areas is.....	( )	A.	$2:5$
2. The ratio of areas of 2 similar triangles is 1:4, then the ratio of their sides is.....	( )	B.	$1:2$
3. The ratio of medians of 2 similar triangles is 2:1, then the ratio of their areas is.....	( )	C.	$1:4$

4. The ratio of altitudes of 2 similar triangles is 4:1, then the ratio of their areas is…… ( ) D. $4:1$
5. The ratio of areas of 2 similar triangles is 4:25, then the ratio of their sides is…… ( ) E. $16:1$

Fill in the blanks

1). All equilateral triangles are……
2). All isosceles triangles are……
3). Two polygons with same number of sides are …… if their corresponding angles are equal and corresponding sides are equal.
4). Reduced and Enlarged photographs of an object are……
5). Rhombus and squares are …… to each other.
6). If $\Delta ABC \sim \Delta PQR$ then $\frac{AB}{PQ} =$……
7). If $\Delta ABC \sim \Delta RST$ then $\frac{AB}{ST} = \frac{BC}{TR} =$……
8). If $\Delta ABC \sim \Delta PQR$ then $AB: AC =$……
9). If $\Delta ABC \sim \Delta PQR, \angle A = 60^0, \angle B = 70^0$ then $\angle R =$……
10). If $\Delta ABC \sim \Delta DEF,\ \angle A + \angle B = 130^0$ then $\angle F =$……
11). If $\Delta ABC \sim \Delta PQR,\ \angle A = 60^0,$ then $\angle Q + \angle R =$……
12). If $\Delta ABC \sim \Delta DEF,\ \angle A = 50^0$ then $\angle E + \angle F =$……
13). If $\Delta ABC \sim \Delta PQR,$ and $AB = 3.6\ c.m,\ \ PQ = 2.4 c.m,\ AC = 8.1 c.m$ then $PR =$……
14). If $\Delta ABC \sim \Delta PQR,$ and $AB = 3.6\ c.m, PQ = 2.4\ c.m,\ PR = 5.4\ c.m$ then $AC =$……
15). If $\Delta ABC \sim \Delta PQR$ and $AB = 6, BC = 4, AC = 8, PR = 6$ then $PQ + QR =$……
16). Basic proportionality theorem is also known as……theorem.
17). The line joining the midpoints of two sides of triangle is……
18). Diagonals AC and BD of a trapezium ABCD with $AB \parallel DC$ intersect each other at the point 'O', then $\frac{OA}{OB} =$……
19). If the areas of two similar triangles are equal, then they are ……
20). $\Delta ABC \sim \Delta DEF$ and their areas are respectively $64 cm^2$ and 121 cm^2. If EF = 15.4 cm. then $BC =$……
21). Diagonals of a trapezium ABCD with $AB \parallel BC$, intersect each other at the point 'O'. If AB = 2CD, then the ratio of areas of triangles AOB and $COD =$……
22). $x,\ x+1,\ \sqrt{2x+1}$ are the sides of……triangle.
23). If the ratio two corresponding sides of two similar triangles is $3:4$, then the ratio of its area is……
24). If the ratio of areas of two similar triangles is $1:2$, then the ratio of their altitudes is……
25). If the ratio of altitudes of two similar triangles is $1:\sqrt{2}$, then the ratio of their areas is……
26). If the ratio of perimeters of two similar triangles is $1:3$, then the ratio of their corresponding sides is……
27). If the perimeters of two triangles are 30cm and 20cm respectively. One of its sides is 12cm, and then the length of the corresponding side of the other triangle is ……
28). The Indian scientist who gave proof to Pythagoras Theorem is……
29). In ΔABC if 6cm, 8cm, and 10cm are sides, then it is……triangle.
30). If the sides are $m^2 + n^2,\ m^2 - n^2, 2mn$, then it is……triangle.
31). In $\Delta ABC, \angle B = 90^0, AB = 3cm, AC = 5cm$, then $BC =$……
32). In $\Delta ABC, \angle B = 90^0$ and $BD \perp AC$ then $BD^2 =$……
33). In $\Delta ABC, \angle C = 90^0, a = 3cm, b = 4cm$, then $c =$……
34). In $\Delta ABC, \angle C = 90^0, CD \perp AB$ then $CD^2 =$……
35). In $\Delta ABC, \angle A = 90^0, AD \perp BC$ then $AD^2 =$……
36). In $\Delta ABC, AB^2 + BC^2 = AC^2$, then $\angle B =$……
37). In $\Delta ABC,\ \angle C = 90^0$. If $AC = BC$ then $AB^2 =$……
38). The altitude of an equilateral triangle with side a is……
39). The altitude of an equilateral triangle is……times its side.
40). The area of an equilateral triangle with side a is……
41). The altitude of an equilateral triangle with side $2\sqrt{3}$ is……

42). The side of a rhombus is 5cm. One of its diagonal is 8cm, then its second diagonal is……

43). The diagonal of a square is……..times its side.

44). The diagonal of a square is 4cm, then its side is……

45). If the angles of a triangle are $45^0, 45^0, 90^0$, then the ratio of its sides is……

46). If the ratio of angles of a triangle is $1:1:2$ then the ratio of its sides is……

47). In ΔABC, $BE \perp AC$, $CF \perp AB$, $BE = 2.6cm$, $CF = 2.4cm$,then AC =……

48). 'O' is any point inside a rectangle ABCD, then $OB^2 + OD^2$ =……

49). If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the……

50). $\Delta ABC \sim \Delta DEF$. $BC = 3cm$, $EF = 4cm$ and area of ΔABC = 54 sq.cm, then the area ΔDEF is……sq.cm.

Very short answer questions (1 Mark Questions)

1). Define Basic proportionality theorem (THALES THEOREM).

2). Define converse of Basic proportionality theorem.

3). A ladder 25m long reaches a window of building 20m above the ground. Determine the distance of the foot of the ladder from the building.

4). A person 1.65m tall casts a 1.8m shadow. At the same instance, a lamp-posts casts a shadow of 5.4 m. Find the height of the lamp post.

5). The perimeters of two similar triangles are 30 cm and 20 cm respectively. If one side of the first triangle is 12 cm, determine the corresponding side of the second triangle.

6). A flag pole 4m tall casts a 6 m., shadow. At the same time, a nearby building casts a shadow of 24m. How tall is the building?

7). Define Pythagoras theorem.

8). Define converse of Pythagoras theorem.

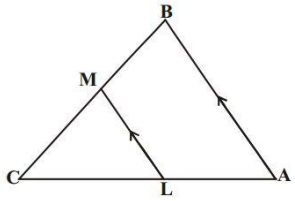
9). A ladder 25m coins reaches a window of building 20m above the ground. Determine the distance of the foot of the ladder from the building.

Short answer questions (2 Marks Questions)

1). A ladder 15m long reaches a window which is 9 m above the ground on one side of a street. Keeping its foot at the same point, the ladder is turned to other side of the street to reach a window 12m high. Find the width of the street.

2). In ΔABC, $DE \parallel BC$ and $\frac{AD}{DB} = \frac{3}{5}$. $AC = 5.6$. Find AE.

3). In the given figure$LM \parallel AB$, $AL = x - 3$, $AC = 2x$, $BM = x - 2$ and $BC = 2x + 3$. Find the value of x.



4). In ΔABC, $DE \parallel BC$. $AD = x$, $DB = x - 2$, $AE = x + 2$ and $EC = x - 1$. Find the value of x.

5). The diagonals of a quadrilateral ABCD intersect each other at point 'O' such that $\frac{AO}{BO} = \frac{CO}{DO}$. Prove that ABCD is a trapezium.

6). Prove that a line drawn through the mid-point of one side of a triangle parallel to another side bisects the third side.

7). Prove that a line joining the midpoints of any two sides of a triangle is parallel to the third side.

8). A man sees the top of a tower in a mirror which is at a distance of 87.6m from the tower. The mirror is on the ground facing upwards. The man is 0.4m away from the mirror and his height is 1.5m. How tall is the tower?

9). $\Delta ABC \sim \Delta DEF$ and their areas are respectively $64cm^2$ and 121 cm^2. If EF = 15.4 cm. then find BC.

10). $\Delta ABC \sim \Delta$. $BC = 3cm$, $EF = 4cm$ and area of $\Delta ABC = 54cm^2$. Determine the area of ΔDEF.

11). The areas of two similar triangles are $81cm^2$ and 49 cm^2respectively. If the attitude of the bigger triangle is 4.5cm. Find the corresponding attitude of the smaller triangle.

12). If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, then the triangles on both sides of the perpendicular are similar to the whole triangle and to each other.

13). Prove that the sum of the squares of the side of a rhombus is equal to the sum of the squares of its diagonals.

Essay type questions (4 Marks Questions)

1). Stare and prove Basic proportionality theorem (THALES THEOREM).
2). Prove that if a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side (Converse of Basic proportionality theorem) .
3). Draw a line segment of length 7.2 cm and divide it in the ratio 5: 3.
4). Construct a triangle of sides 4cm, 5 cm and 6 cm. Then, construct a triangle similar to it, whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.
5). Prove that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.
6). State and prove BAUDHAYAN THEOREM (PYTHORGORAS THEOREM).
7). State and prove converse of BAUDHAYAN THEOREM (PYTHORGORAS THEOREM).
8). ABC is a right triangle right angled at C. Let $\mathrm{BC} = a, \mathrm{CA} = b, \mathrm{AB} = c$ and let p be the length of perpendicular from C on AB. Prove that (i) $pc = ab$ (ii) $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$.

Chapter -09: TANGENTS AND SECANTS TO A CIRCLE.

CONCEPTS

1. **Secant:** A line intersecting a circle in two points is called a secant.
2. **Tangent:** A line intersecting a circle in one point is called a tangent.
3. **Point of tangency or Point of contact:** The common point of a tangent to a circle and the circle is called is called point of tangency.
4. The word 'tangent' came from the Latin word 'tangere', which means to touch and was introduced by Danish mathematician Thomas Fineke in 1583.
5. We can draw infinitely many tangents to a circle.
6. There is no tangent to a circle passing through a point lying inside the circle.
7. We can draw only one tangent at any point lying on the circle.
8. We can draw two tangents from a point outside the circle.
9. We can draw infinitely many tangents to a circle, which are parallel to each other.
10. We can draw one tangent to circle which is parallel to the given tangent.
11. The tangent at any point of a circle is perpendicular to the radius through the point of contact.
12. **Normal:** The line containing the radius through the point of contact is also called the normal to the circle at the point.
13. If a line in the plane of a circle is perpendicular to the radius at its endpoint on the circle, then the line is tangent to the circle.
14. **Length of the tangent:** The length of the segment of the tangent from the external point and the point of contact with the circle is called the length of the tangent.
15. The lengths of tangents drawn from an external point to a circle are equal.
16. Length of tangent $\mathrm{PA} = \mathrm{PB} = \sqrt{d^2 - r^2}$.
17. Tangents drawn at the end points of a diameter of a circle are parallel.
18. The centre of a circle lies on the bisector of the angle between two tangents drawn from a point outside it.
19. In two concentric circles, such that a chord of the bigger circle, that touches the smaller circle is bisected at the point of contact with the smaller circle.
20. The parallelogram circumscribing a circle is a rhombus.
21. **Segment:** A region, bounded by the arc and a chord of a circle is called segment.
22. A chord divides the circle in two segments. 1) Minor segment. 2) Major segment.
23. **Minor segment:** The region bounded by the chord and the minor arc intercepted by the chord is called minor segment.

24. **Major segment:** The region bounded by the chord and the major arc intercepted by the chord is called major segment.
25. Area of segment of a circle = area of the corresponding sector – area of the corresponding triangle.
26. Area of the sector $= \frac{x}{360} \times \pi r^2$
27. Area of the triangle $= \frac{1}{2} b\, h$
28. Area of equilateral triangle $= \frac{\sqrt{3}}{4} a^2$
29. Area of the circle $= \pi r^2$
30. Area of regular hexagon $= 6\frac{\sqrt{3}}{4} a^2$

MULTIPLE CHOICE QUESTIONS

1). Number of tangents we can draw to a circle is..... ( )
A) 0 B) 1 C) 2 D) infinitely many

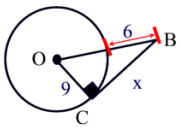
2). Number of tangents we can draw to a circle from a point away from it is..... ( )
A) 0 B) 1 C) 2 D) infinitely many

3). The angle between a tangent to a circle and the radius drawn at the point of contact is..... ( )
A) 60^0 B) 30^0 C) 45^0 D) 90^0

4). From a point Q, the length of the tangent to a circle is 24 *cm*. and the distance of Q from the centre is 25 cm. The radius of the circle is.....cm. ( )
A) 7 B) 12 C) 15 D) 24.5

5). If AP and AQ are the two tangents a circle with centre O so that $\angle POQ = 110$, then $\angle PAQ =$..... ( )
A) 60^0 B) 70^0 C) 80^0 D) 90^0

6). AP and AQ are the two tangents a circle with centre O and $AP = x^2 + 5, AQ = 21$ then $x =$..... ( )
A) 21 B) 8 C) 16 D) 4

7). 

In the adjacent figure the value of $x =$..... ( )
A) 15 B) 14 C) 12 D)9

8). PT is a tangent to a circle with centre O. If OT = 6 cm, and OP = 10 cm, then tangent PT =.....cm. ( )
A) 6 B) 8 C) 10 D) 12

9). O is the centre of two concentric circles of radii 3 cm and 5 cm. PQ is a chord of outer circle which touches the inner circle. The length of chord PQ is ( )
A) 4 B) 6 C) 8 D) 10

10). Quadrilateral PQRS is circumscribed, touching the circle at A, B, C and D in clockwise direction. If AP = 5 cm, QR = 7 cm and CR = 3 cm, then length PQ =.....cm. ( )
A) 8 B) 9 C) 13 D) 14

MATCH THE FOLLOWING

1.	No. of tangents to a circle	( )	A.	Parallel
2.	No. of tangents at any point lying on the circle	( )	B.	Perpendicular
3.	No. of tangents from a point outside the circle	( )	C.	1
4.	At the point of contact radius and tangent are	( )	D.	2

5. Tangents drawn at the end points of a diameter of a circle are ( ) E. infinite

Fill in the blanks

1). A tangent to a circle intersects it in ..... point (s).

2). A line intersecting a circle in two points is called a.....

3). A circle can have ..... parallel tangents at the most.

4). The common point of a tangent to a circle and the circle is called.....

5). We can draw.....tangents to a given circle.

6). Tangents to a circle at the end points of a diameter are.....

7). The lengths of tangents drawn from an external point to a circle are.....

8). The centre of a circle lies on the.....between two tangents drawn from a point outside it.

9). If tangent PA and PB from a point P to a circle with centre O are inclined to each other at an angle of 50^0, then $\angle OAB =$ .....

10).The parallelogram circumscribing a circle is a.....

Very short answer questions (1 Mark Questions)

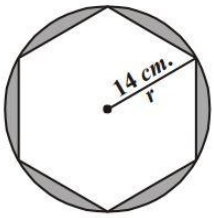
1). Find the area of sector, whose radius is 7 *cm*. with an angle 60^0.
2). The length of the minute hand of a clock is 14 *cm*. Find the area swept by the minute hand in 10 minutes.
3). Find the length of the tangent way from a point 17cm away from the centre of the circle of radius 8cm?

Short answer questions (2 Marks Questions)

1). A tangent PQ at a point P of a circle of radius 5 cm meets a line through the centre O at a point Q so that $OQ = 12$ cm. Find length of PQ.
2). If a circle touches all the four sides of a quadrilateral ABCD at points PQRS. Then show that $AB + CD = BC + DA$.
3). Prove that the parallelogram circumscribing a circle is a rhombus.
4). A car has two wipers which do not overlap. Each wiper has a blade of length 25 *cm*. sweeping through an angle of 115^0. Find the total area cleaned at each sweep of the blades. (Use $\pi = \frac{22}{7}$).

Essay type questions (4 Marks Questions)

1). Prove that the lengths of tangents drawn from an external point to a circle are equal.
2). Draw a pair of tangents to a circle of radius 5cm which are inclined to each other at an angle 60^0.
3). Draw a circle of radius 6cm. From a point 10 cm away from its centre, construct the pair of tangents to the circle and measure their lengths.
4). A chord of a circle of radius 12 *cm*. subtends an angle of 120^0 at the centre. Find the area of the corresponding minor segment of the circle (use $\pi = 3.14$ and $\sqrt{3} = 1.732$).
5). A round table top has six equal designs as shown in the figure. If the radius of the table top is 14 *cm*. Find the cost of making the designs with paint at the rate of ₹ 5 per cm^2. (use $\sqrt{3} = 1.732$)



Chapter -10: MENSURATION

CONCEPTS

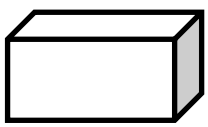
1. 2-D objects or 2-D figures: The figures which have length and breadth are called 2-D objects or 2-D figures.
2. 3-D objects or 3-D figures: The figures which have length and breadth and height are called 3-D objects or 3-D figures.
3. Some of 3-D figures are:-

i) **Prism.**
ii) **Pyramid.**
iii) **Cylinder.**
iv) **Cone.**
v) **Sphere.**
vi) **Hemi – sphere.**

4. **Prism: -** A prism is a polyhedron with two identical ends such that the lines joining the corresponding vertices of the two ends are parallels.
5. **Right Prism: -** A prism whose bases are perpendicular to the lateral edges and all lateral faces are rectangles, is called a right prism.
6. Prism is named according to the shape of its base.
7. **Types of Prisms.**
   i) **Triangular prism.**
   ii) **Cuboid.**
   iii) **Cube.**
   iv) **Pentagonal prism.**
   v) **Hexagonal prism. Etc.**
8. A prism whose base is triangle is called triangular prism.
9. A prism whose base is rectangle is called cuboid.
10. A prism whose base is square is called cube.
11. **Right pyramid: -** A solid object where one end is a regular polygon, the other end is a vertex and the lateral surfaces are triangles is called right pyramid.
12. The volume of a pyramid is 1/3rd volume of a right prism if both have the same base and same height.
13. **Cylinder:** -A solid object where two ends are circles and the lateral surface is curved surface is called a cylinder.
14. Right Cylinder: - If the line joining the centres of the circular bases of a cylinder is perpendicular to the base, then it is called Right cylinder.
15. If the heights of two cylinders are equal, their curved surfaces are in the ratio of their radii.
16. If the heights of two cylinders are equal, their volumes are in the ratio of the squares of their radii.
17. If the base radii of two cylinders are equal, their curved surface areas and volumes are in the ratio of their heights.
18. If the curved surface areas of two cylinders are equal, then their radii and heights are in inverse ratio.
19. If the volumes of two cylinders are equal, then the ratio of the squares of their radii in the inverse ratio of their heights and the ratio of their heights is in the inverse ratio of the squares of their radii.
20. The cross section by a vertical plane of a cylinder is a rectangle.
21. **Cone: -** An object with a vertex and a circular base and curved surface as lateral surface is called a cone.
22. Right circular cone: - if a perpendicular drawn from the vertex of the cone passes through the Centre of the base, then it is called Right circular cone.
23. Some examples of cone are ice-cream, buffoon's cap, circular tent, paddy heap, sand heap.
24. Volume of the cone is exactly $\frac{1}{3}$ of the volume of cylinder.
25. If the radii of the base of two cones are equal then their volumes are in the ratio of their heights.
26. If the radii of the base of two cones are equal then their curved surface areas are in the ratio of their slant heights.
27. If the heights of two cones are equal, their volumes are in the ratio of the squares of their radii.
28. If the lateral surface areas of two cones are equal then their radii and slant heights are in the inverse ratio.
29. If the volumes of two cones are equal, then their heights are in the inverse ratio of the squares of their radii.
30. **Sphere:** - A set of points in space equidistant from a fixed point in space is called sphere.
31. **Centre of sphere:** - A fixed point from which every point on the sphere is at the same distance is called centre of sphere.
32. The surface areas of two spheres are in the ratio of the squares of their radii.
33. **Hemi – sphere**: - A plane through the centre of a sphere divides it into two equal parts, each of which is called a hemisphere.

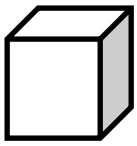
Formulae

1. **Cuboid :**
   a. Lateral surface area $= 2h(l + b)$
   b. Surface area $= 2(lb + bh + lh)$
   c. Volume $= lbh$



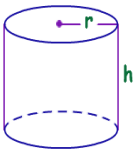
d. Length of diagonal $= \sqrt{l^2 + b^2 + h^2}$ where *l*, *b*, *h* are length, breadth and thickness of the cuboid.

2. **Cube :**



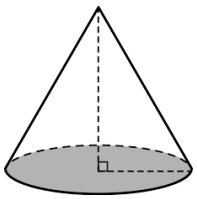
(a) Lateral surface area $= 4a^2$
(b) Surface area $= 6a^2$
(c) Volume $= a^3$
(d) Length of diagonal $= \sqrt{3}a$ where, a is the edge of the cube.

3. **Cylinder :** r = radius, h = height



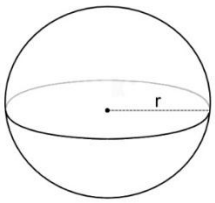
a. Area of curved surface $= 2\pi rh$
b. Total surface area $= 2\pi rh + 2\pi r^2 = 2\pi r(r + h)$
c. Volume $= \pi r^2 h$
d. Curved surface area of hollow cylinder $= 2\pi h(R + r)$
e. Total surface area of hollow cylinder $= 2\pi h\,(R + r) + 2\pi(R^2 - r^2)$

4. **Cone:** r = radius, h = height, l = slant height.



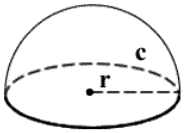
(a) Curved surface area $= \pi rl = \pi r\sqrt{h^2 + r^2}$
(b) Total surface area $= \pi r^2 + \pi rl = \pi r\,(r + l)$
(c) Volume $= 1/3\,\pi r^2 h$

5. **Sphere :** *r* = radius



a. Surface area $= 4\pi r^2$
b. Volume $= \frac{4}{3}\pi r^3$

6. **Hemisphere (solid) :** r = radius



(a) Curved surface area $= 2\pi r^2$
(b) Total surface area $= 3\pi r^2$
(c) Volume $= \frac{2}{3}\pi r^3$

MULTIPLE CHOICE QUESTIONS

1). The ratio of the volumes of two spheres is $8 : 27$. The ratio between their surface areas is..... ( )
A) $2:3$ B) $4:9$ C) $9:4$ D) $3:2$

2). If two solid hemispheres of same base radius r are joined together along their bases, then the curved surface area of the new solid is..... ( )
A) $3\pi r^2$ B) $4\pi r^2$ C) $6\pi r^2$ D) $8\pi r^2$

3). If a cone is cut into two parts by a horizontal plane passing through the mid-points of its axis, the ratio of the volumes of the upper part and the cone is ( )
A) $1:2$ B) $1:4$ C) $1:6$ D) $1:8$

4). A cone, a hemisphere and a cylinder stand on equal bases and have the same height. The ratio of their volumes is..... ( )
A) $1:3:2$ B) $3:2:1$ C) $2:3:1$ D) $1:2:3$

5). Two cubes have their volumes in the ratio $1:27$. The ratio of their surface areas are..... ( )
A) $1:3$ B) $1:9$ C) $1:27$ D) $1:6$

6). The radii of the bases of a cylinder and a cone are in the ratio of $3:4$ and It heights are in the ratio $2:3$. The ratio of their volumes are..... ( )
A) $3:4$ B) $2:3$ C) $8:9$ D) $9:8$

7). If the radius of base of a cylinder is doubled and the height remains unchanged, its curved surface area becomes..... ( )
A) Double B) Trible C) Half D) Two thirds

8). A solid sphere of radius r is melted and recast into the shape of a solid cone of height r, then the radius of the base of the cone is..... ( )
A) r B) $2r$ C) $3r$ D) $\frac{r}{2}$

9). A cylindrical pencil sharpened at one edge is the combination of .....
A) a cone and a cylinder B) frustum of a cone and a cylinder

C) a hemisphere and a cylinder D) two cylinders

10). Total surface area of a cube is 216 cm^2, its volume is ……..cm^3 ( )

A) 6 B) 16 C) 216 D) 64

MATCH THE FOLLOWING

	Polynomial			Order
1.	Lateral surface area of a cube	( )	A.	$6a^2$
2.	Lateral surface area of a cuboid	( )	B.	$4a^2$
3.	Volume of cube	( )	C.	lbh
4.	Volume of cubiod	( )	D.	a^3
5.	Total surface area of cube	( )	E.	$lb + bh + lh$

1.	curved surface area of sphere	( )	A.	$2\pi rh$
2.	curved surface area of cone	( )	B.	$\pi r\,(r\ +\ l)$
3.	curved surface area of cylinder	( )	C.	$2\pi r^2$
4.	curved surface area of hemisphere	( )	D.	πrl
5.	Total surface area of cone	( )	E.	$4\pi r^2$

Fill in the blanks

1) If the radius of the cylinder is doubled keeping the lateral surface area same, then its height is……
2) The volume of the right circular cylinder of height 21cm and radius of base being 5cm is……
3) If the edge of the cube is doubled then its volume increases ……..times.
4) If the sphere just fits into the cube, then the ratio of their volumes is……
5) The ratio of volume and surface area of sphere of a unit radius is……
6) The cube is enclosed in a sphere of diameter 2cm. the volume of the cube is……..
7) If each side of a cube is increased by half its side, then its surface area is increased by……..%.
8) The volume of the cylinder whose radius is 7 cm and height is 12 cm is……..
9) The curved surface area of cone, if radius of the base is 10 cm and slant height 28 cm is……
10) The volume of the cone whose base area is 154 sq. cm and height 12 cm is……
11) The volume of the sphere whose radius is 21 cm is……..

Very short answer questions (1 mark questions)

1) Find the ratio of the volumes of two circular cones. If $r_1 : r_2 = 3 : 5$ and $h_1 : h_2 = 2 : 1$?
2) A garden roller has a circumference of 4 m. find the no. of revolutions it makes in moving 40 m?
3) The surface area of a cube is 1734 sq. cm. Find its volume?
4) The radius of the base of a cone is 5 cm and its height is 12 cm. find the curved surface area of the cone?
5) Find the slant height of a cone of radius 21 cm and height 28 cm?

6) Find the curved surface area and the total surface area of a hemisphere of radius 10.5 cm?

Short answer questions (2 marks questions)

1). 2 cubes each of volume $64cm^3$ are joined end to end. Find the surface area of the resulting cuboid.
2). Find the volume of right circular cone with radius 6 *cm*. and height 7cm.
3). The radius of a conical tent is 7 meters and its height is 10 meters. Calculate the length of canvas used in making the tent if width of canvas is 2m. Use $\pi = \frac{22}{7}$.
4). A sphere, a cylinder and a cone are of the same radius and same height. Find the ratio of their curved surface.
5). A company wanted to manufacture 1000 hemispherical basins from a thin steel sheet. If the radius of hemispherical basin is 21*cm*. find the required area of steel sheet to manufacture the above hemispherical basins?
6). Find the volume and surface area of a sphere of radius 21cm. $\left(\text{Use } \pi = \frac{22}{7}\right)$.
7). Find the volume and the total surface area of a hemisphere of radius 3.5 cm. $\left(\text{ Use } \pi = \frac{22}{7}\right)$.
8). A cylinder and cone have bases of equal radii and are of equal heights. Show that their volumes are in the ratio of 3:1.
9). A heap of rice is in the form of a cone of diameter 12 *m*. and height 8 *m*. Find its volume? How much canvas cloth is required to cover the heap? $(\text{ Use } \pi = 3.14)$
10). The curved surface area of a cone is 4070 cm^2 and its diameter is 70 *cm*. What is its slant height?
11). Surface area of a sphere and cube are equal. Then find the ratio of their volumes.
12). Find the volume of the largest right circular cone that can be cut out of a cube whose edge is 7 *cm*.
13). A cone of height 24cm and radius of base 6cm is made up of modeling clay. A child reshapes it in the form of a sphere. Find the radius of the sphere.
14). A metallic sphere of radius 4.2 *cm*. is melted and recast into the shape of a cylinder of radius 6cm. Find the height of the cylinder.
15). The heights of two right circular cones are in the ratio $1:2$ and the perimeters of their bases are in the ratio $3:4$. Find the ratio of their volumes?

Essay type questions (4 marks questions)

1). A right circular cylinder has base radius 14cm and height 21cm. Find: (i) Area of base or area of each end (ii) Curved surface area (iii) Total surface area and (iv) Volume of the right circular cylinder?
2). A self-help group wants to manufacture joker's caps (conical caps) of 3*cm*. radius and 4 *cm*, height. If the available colour paper sheet is 1000 *cm*2, than how many caps can be manufactured from that paper sheet?
3). A wooden toy rocket is in the shape of a cone mounted on a cylinder as shown in the adjacent figure. The height of the entire rocked is 26 cm, while the height of the conical part is 6cm. The base of the conical position has a diameter of 5cm, while the base diameter of the cylindrical portion is 3cm. If the conical portion is to be painted orange and the cylindrical portion is to be painted yellow, find the area of the rocket painted with each of these color. $(\text{ Use } \pi = 3.14)$.
4). A toy is in the form of a cone mounted on a hemisphere. The diameter of the base and the height of the cone are 6 cm and 4 cm respectively. Determine the surface area of the toy. $(\text{ Use } \pi = 3.14)$.
5). A medicine capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends. The length of the capsule is 14 *cm*. and the width is 5 *mm*. Find its surface area.
6). A sphere, a cylinder and a cone have the same radius. Find the ratio of their curved surface areas.
7). A solid toy is in the form of a right circular cylinder with hemispherical shape at one end and a cone at the other end. Their common diameter is 4.2 cm and the height of the cylindrical and conical portions are 12cm and 7cm respectively. Find the volume of the solid toy. $\left(\text{ Use } \pi = \frac{22}{7}\right)$.
8). Spherical Marbles of diameter 1.4 *cm*. are dropped into a cylindrical beaker of diameter 7 *cm*., which contains some water. Find the number of marbles that should be dropped in to the beaker, so that water level rises by 5.6 *cm*.
9). The diameter of the internal and external surfaces of a hollow hemispherical shell is 6 *cm*. and 10 *cm*. respectively. It is melted and recast into a solid cylinder of diameter 14*cm*. Find the height of the cylinder.
10). A hemispherical bowl of internal radius 15 *cm*. contains a liquid. The liquid is to be filled into cylindrical bottles of diameter 5 *cm*. and height 6 *cm*. How many bottles are necessary to empty the bowl?

11). How many spherical balls can be made out of a solid cube of lead whose edge measures 44 cm and each ball being 4*cm* in diameter?

12). A women self-help group (DWACRA) is supplied a rectangular solid (cuboid shape) of wax with diameters 66 *cm*., 42 *cm*., 21 *cm*., to prepare cylindrical candles each 4.2 *cm*. in diameter and 2.8 *cm*. of height. Find the number of candles.

13). A 20m deep well with 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.

14). How many silver coins, 1.75 *cm*. in diameter and thickness 2*mm*, need to be melted to form a cuboid of dimensions $5.5\ cm \times\ 10\ cm. \times\ 3.5\ cm$?

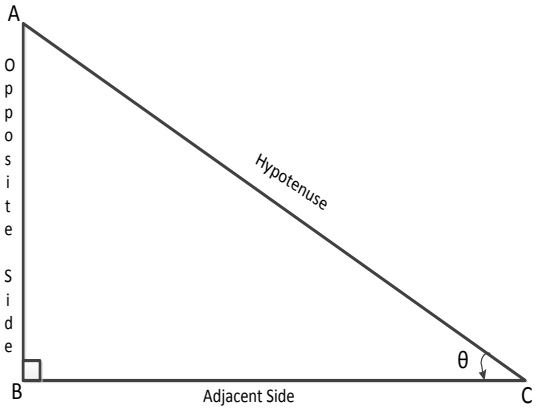
Chapter -11: TRIGONOMETRY

CONCEPTS

1. The word trigonometry is derived from the Greek words "tri", "gonia", and "metron".
2. Hipparchus established the relationships between the sides and angles of a triangle.
3. **Angle:** The union of two rays having a common end point is called an angle.
4. **Acute angle:** Any angle measuring between 0^0 and $90^0$is called an acute angle.
5. **Right angle:** An angle measuring exactly $90^0$is called and right angle.
6. **Obtuse angle:** Any angle whose measurement exceeds $90^0$is called an obtuse angle.
7. If a ray rotates in the clockwise, the sign of the angle is taken by convention, as negative measurement.
8. If a ray rotates in the anti-clockwise, the sign of the angle is taken by convention, as positive measurement.
9. Length of the arc $l = r\theta$. (Here θ should be in radians)
10. The angle made a regular polygon with n sides at the centre is $\theta = \frac{360^0}{n}$.
11. The side of a regular polygon inscribed in a circle is $a = 2sin\left(\frac{\theta}{2}\right)r$.
12. $-1 \leq sin\,\theta \leq 1$.
13. $-1 \leq cos\,\theta \leq 1$.
14. $tan\theta$ does not have any maximum or minimum values.
15. The range of values of tan θ is $-\infty < tan\,\theta < \infty$.
16. $(a+b)^2 = a^2 + b^2 + 2ab$.
17. $(a-b)^2 = a^2 + b^2 - 2ab$.
18. $(a+b)(a-b) = a^2 - b^2$
19. $(a+b)^3 = \begin{Bmatrix} a^3 + 3a^2b + 3ab^2 + b^3 \\ a^3 + b^3 + 3ab(a+b) \end{Bmatrix}$.
20. $(a-b)^3 = \begin{Bmatrix} a^3 - 3a^2b + 3ab^2 - b^3 \\ a^3 - b^3 - 3ab(a-b) \end{Bmatrix}$.
21. $a^3 + b^3 = \begin{Bmatrix} (a+b)(a^2 - ab + b^2) \\ (a+b)^3 - 3ab(a+b) \end{Bmatrix}$.
22. $a^3 - b^3 = \begin{Bmatrix} (a-b)(a^2 + ab + b^2) \\ (a-b)^3 - 3ab(a-b) \end{Bmatrix}$

I. Trigonometric ratios

1. $sin\theta = \frac{side\ opposite\ to\ \theta}{hypotenuse}$.
2. $cos\theta = \frac{side\ adjacent\ to\ \theta}{hypotenuse}$.
3. $tan\theta = \frac{side\ opposite\ to\ \theta}{side\ adjacent\ to\ \theta}$.
4. $cosec\theta = \frac{hypotenuse}{side\ opposite\ to\ \theta}$.
5. $sec\theta = \frac{hypotenuse}{side\ adjacent\ to\ \theta}$.
6. $cot\theta = \frac{side\ adjacent\ to\ \theta}{side\ opposite\ to\ \theta}$.



II. Trigonometric reciprocal ratios

1. $\boxed{sin\theta = \frac{1}{cosec\theta}}$, $\boxed{cosec\theta = \frac{1}{sin\theta}}$, $\boxed{sin\theta \times cosec\theta = 1}$
2. $\boxed{cos\theta = \frac{1}{sec\theta}}$, $\boxed{sec\theta = \frac{1}{cos\theta}}$, $\boxed{cos\theta \times sec\theta = 1}$
3. $tan\theta = \frac{sin\theta}{cos\theta}$, $\boxed{tan\theta = \frac{1}{cot\theta}}$, $\boxed{cot\theta = \frac{1}{tan\theta}}$.
4. $cot\theta = \frac{cos\theta}{sin\theta}$, $tan\theta \times cot\theta = 1$.

III. Values of trigonometric ratios as θ varies from 0^0 to 90^0

	$\sqrt{\frac{0}{4}}$	$\sqrt{\frac{1}{4}}$	$\sqrt{\frac{2}{4}}$	$\sqrt{\frac{3}{4}}$	$\sqrt{\frac{4}{4}}$
	0^0	30^0	0^0	0^0	0^0
$sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Un defined
$csc\theta$	Un defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Un defined
$cot\theta$	Un defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

IV. Compound angles formulae

1. $\sin(A + B) = sinAcosB + cosAsinB$.
2. $\sin(A - B) = sinAcosB - cosAsinB$.
3. $\cos(A + B) = cosAcosB - sinAsinB$.
4. $\cos(A - B) = cosAcosB + sinAsinB$.
5. $tan(A + B) = \frac{tanA+tanB}{1-tanAtanB}$.
6. $tan(A - B) = \frac{tanA-tanB}{1+tanAtanB}$.

V. Multiple and Sub multiple angle formulae

1. $\sin 2A = 2sinAcosA = \frac{2tanA}{1+tan^2A}$.
2. $sinA = 2sin\frac{A}{2}cos\frac{A}{2} = \frac{2tan\frac{A}{2}}{1+tan^2\frac{A}{2}}$.
3. $cos2A = \begin{Bmatrix} cos^2A - sin^2A \\ 2cos^2A - 1 \\ 1 - 2sin^2A \\ \frac{1-tan^2A}{1+tan^2A} \end{Bmatrix}$.

4. $cosA = \begin{Bmatrix} cos^2\frac{A}{2} - sin^2\frac{A}{2} \\ 2cos^2\frac{A}{2} - 1 \\ 1 - 2sin^2\frac{A}{2} \\ \frac{1-tan^2\frac{A}{2}}{1+tan^2\frac{A}{2}} \end{Bmatrix}$.
5. $tan2A = \frac{2tanA}{1-tan^2A}$.
6. $tanA = \frac{2tan\frac{A}{2}}{1-tan^2\frac{A}{2}}$.
7. $cot2A = \frac{cot^2A-1}{2cotA}$.

VI. Trigonometric identities

1. $\boxed{sin^2\theta + cos^2\theta = 1}$
2. $sin^2\theta = 1 - cos^2\theta$, $sin\theta = \sqrt{1 - cos^2\theta}$.
3. $cos^2\theta = 1 - sin^2\theta$, $cos\theta = \sqrt{1 - sin^2\theta}$.
4. $\boxed{sec^2\theta - tan^2\theta = 1}$, $sec^2\theta = 1 + tan^2\theta$, $tan^2\theta = sec^2\theta - 1$
5. $sec\theta + tan\theta = \frac{1}{sec\theta - tan\theta}$.
6. if $sec\theta + tan\theta = p$ then $-tan\theta = \frac{1}{p}$. If $sec\theta - tan\theta = p$ then $sec\theta + tan\theta = \frac{1}{p}$.
7. $\boxed{cosec^2\theta - cot^2\theta = 1.}$
8. $cosec^2\theta = 1 + cot^2\theta$, $cot^2\theta = cosec^2\theta - 1$.
9. if $cosec\theta + cot\theta = p$ then $cosec\theta - cot\theta = \frac{1}{p}$. If $cosec\theta - cot\theta = p$ then $cosec\theta + cot\theta = \frac{1}{p}$.

VII. Signs of Trigonometric functions.

ALL SLIVER TEA CUPS

1. 2nd quadrant $[Q_2]$ 2. $90 + \theta$ 3. $180 - \theta$ 4. [**S**]**LIVER** → [***s***]***in, cosec*** Positive	1. 1st quadrant $[Q_1]$ 2. $90 - \theta$ 3. $360 + \theta$ 4. [A]LL → [**A**]**LL** Positive
1. 3rd quadrant $[Q_3]$ 2. $180 + \theta$ 3. $270 - \theta$ 4. [T]EA → [***t***]***an, cot*** Positive	1. 4th quadrant $[Q_4]$ 2. $270 + \theta$ 3. $360 - \theta$ 4. [C]ups → [***c***]***os, sec*** Positive

1. For 90 and 270 $sin \rightleftarrows cos$, $sec \rightleftarrows csc, tan \rightleftarrows cot$.
2. For 180 and 360 $sin \rightleftarrows sin, cos \rightleftarrows cos$ $tan \rightleftarrows tan$.
3. $sin(90^0 - \theta) = cos\theta$. $sin(-\theta) = -sin\theta$
4. $cos(90^0 - \theta) = sin\theta$. $cos(-\theta) = cos\theta$
5. $tan(90^0 - \theta) = cot\theta$. $tan(-\theta) = -tan\,\theta$.
6. $cot(90^0 - \theta) = tan\theta$. $cot(-\theta) = -cot\,\theta$.
7. $sec(90^0 - \theta) = cosec\theta$. $sec(-\theta) = sec\,\theta$.
8. $cosec(90^0 - \theta) = sec\theta$. $cosec(-\theta) = -cosec\theta$.

MULTIPLE CHOICE QUESTIONS

1). $sin\,45^0 + cos45^0$ ( )

A) $\frac{1}{\sqrt{2}}$ B) $\frac{1}{2}$ C) $\sqrt{2}$ D) 0

2). $\frac{2\,tan30^0}{1+tan^2 45^0}$ =..... ( )

A) $sin60^0$ B) $cos60^0$ C) $tan60^0$ D) $sin30^0$

3). $\frac{1-tan^2 45^0}{1+tan^2 45^0}$ =..... ( )

A) $tan90^0$ B) 1 C) $sin45^0$ D) 0

4). $\frac{2\,tan30^0}{1-tan^2 30^0}$ =..... ( )

A) $cos60^0$ B) $sin60^0$ C) $tan60^0$ D) $sin30^0$

5). $Sin(90^0 - A)$ =..... ( )

A) $SinA$ B)$-SinA$ C) $CosA$ D) $-cosA$

6). $sin15^0 sec75^0$ ..... ( )

A) 0 B) 1 C) -1 D) Infinite

7). $sec\theta + tan\theta = p$, Then $sec\theta - tan\theta$ = ... ( )

A) p B) $-p$ C) $\frac{1}{p}$ D) $-\frac{1}{p}$

8). If $a = btan\,\theta$, then $\frac{asin\theta+bcos\theta}{asin\theta-bcos\theta}$ = ... ( )

A) $\frac{a-b}{a+b}$ B) $\frac{a+b}{a-b}$ C) $\frac{a^2-b^2}{a^2+b^2}$ D) $\frac{a^2+b^2}{a^2-b^2}$

9). $\frac{1-sin^2 45}{1+sin^2 45}$ =..... ( )

A) $sin^2 45^0$ B) $sin^2 30^0$ C) $tan^2 45^0$ D) $tan^2 30^0$

10). If $x = sec\theta + tan\,\theta$, then $sec\theta$ =..... ( )

A) $\frac{x^2-1}{2x}$ B) $\frac{x^2+1}{2x}$ C) $\frac{x^2+1}{x}$ D) $\frac{x^2-1}{x}$

MATCH THE FOLLOWING

1.	Maximum value of $sin\theta$ is	( )	A.	-1
2.	Minimum value of $cos\theta$ is	( )	B.	1
3.	$\frac{1+tan^2\theta}{1+cot^2\theta}$	( )	C.	$2sin\theta$
4.	$\sqrt{(1+sin\theta)(1-sin\theta)}$	( )	D.	$tan^2\theta$
5.	$\frac{cosA}{cotA} + sinA$ =.....	( )	E.	$cos\theta$

Fill in the blanks

1). In $\Delta ABC, \angle B = 90^0, \angle CAB = 30^0, AC = 10cm$, then BC =.....

2). $Sin\,\theta.Cosec\,\theta + Cos\,\theta\,.Sec\,\theta + Tan\,\theta.Cot\,\theta$ =.....

3). If $sin\theta = \frac{3}{5}$ $(\theta < 90^0)$ then $\cos(\theta)$ =.....

4). If $sin\theta = \frac{5}{13}$ then $\cos(90 - \theta)$ =.....

5). If $cos\theta = \frac{\sqrt{3}}{2}$ then $sin\,\theta$ =.....

6). If $tan\theta = \frac{3}{4}$ then $sin\,\theta$ =.....

7). If $sin\theta = \frac{8}{6}$ then $cosec\theta$ =.....

8). If $cos\theta = \frac{3}{5}$ then $\sin\theta$ =.....

9). If $4tan\theta = 3$ then $sin\,\theta$ =.....

10). If $tan\theta = \frac{5}{2}$ then $cos\,\theta$ =.....

11). $\frac{cosec\theta}{cot\theta}$ =.....

12). $\frac{sec\theta}{cosec\theta}$ =.....

13). $tan\theta.cos\theta.cosec\theta$ =.....

14). $(Sec\,\theta + Tan\theta)\,(1 - Sin\,\theta).Sec\,\theta$ = ...

15). $sin\theta.cot\theta$ =.....

16). $cos\theta \times tan\theta$ =.....

17). $tan\theta \times \ldots\ldots\ldots\ldots\ldots = sin\theta$

18). $sin\theta cosec\theta$ =.....

19). If $tan\theta = 1$ then $cos^2\theta - sin^2\theta$ =.....

20). If $sin\theta = cos\theta$ then $tan\theta$ =.....

21). If $tan\theta = \frac{a}{b}$ then $sin\theta$ =.....

22). If $cot\theta = \frac{3}{4}$ then $cosec\theta$ =.....

23). $tan30^0 + tan45^0$ =.....

24). $tan90^0 - cot90^0$ =.....

25). $tan0^0 - cot90^0$ =.....

26). $cos360^0$ =.....

27). If $sin\theta = \frac{1}{\sqrt{2}}$ then $sin2\theta$ = ...

28). $\frac{sin2\theta}{2sin\theta}$ =.....

29). $sin150^0 \times cos120^0$ =.....

30). $sin90^0 \times cos0^0 \times tan45^0$ =.....

31). $tan^245^0 + cot^245^0$ =.....

32). $sin^225^0 + cos^225^0$ =.....

33). $sin^245^0 + cos^245^0$ =.....

34). $sin^260^0 + cos^260^0$ =.....

35). $sin^247^0 + sin^243^0$ =.....

36). $sin^29^0 + sin^281^0$ =.....

37). $cos^240^0 + cos^250^0$ =.....

38). $tan^250^0 - sec^250^0$ =.....

39). $cosec^236^0 - tan^254^0$ =.....

40). $tan^230^0 + tan^260^0$ =.....

41). $\frac{sin^4\theta - cos^4\theta}{sin^2\theta - cos^2\theta}$ =.....

42). If $sin\theta = cos\theta$, then value of θ is.....

43). $\sqrt{sin^2\theta + cos^2\theta + tan^2\theta}$ =.....

44). $\frac{sin^281^0 + sin^29^0}{tan^245}$ =.....

45). $\frac{\sqrt{sec^2\theta - 1}}{sec\theta}$ =.....

46). $\frac{cosec^2\theta}{cot\theta} - cot\theta$ =.....

47). Value of $tan\theta$ in $sec\theta$ is.....

48). Value of $sin\theta$ in $sec\theta$ is.....

49). If $tan\theta$ is not defined then θ =.....

50). $sin180^0 \times sin179^0 \times sin178^0 \times \ldots \times sin1^0$ =.....

51). $cos180^0 \times cos179^0 \times cos178^0 \times \ldots \times cos1^0$ =.....

52). $tan5^0 \times tan25^0 \times tan45^0 \times tan65^0 \times tan85^0$ =.....

53). $cos(A + B)$ =.....

54). $cos2A$ =.....

55). If $sin(A - B) = \frac{1}{2}, cos(A + B) = \frac{1}{2}$ then $\angle A$ =.....

56). If $tan(A - B) = \frac{1}{\sqrt{3}}$, $sin\,A = \frac{1}{\sqrt{2}}$ then B =.....

57). If $tan(A + B) = \sqrt{3}$, $tan\,A = 1$ then B =.....

58). If $tan(15 + B) = \frac{1}{\sqrt{3}}$ then B =.....

59). If $sec\theta + tan\theta = m$, then $sec\theta - tan\theta$ =.....

60). If $sec\theta - tan\theta = p$, then $sec\theta + tan\theta$ = ...

61). If $sec\theta - tan\theta = 2$, then $sec\theta + tan\theta$ =.....

62). If $sec\theta + tan\theta = \frac{1}{x}$, then $sec\theta - tan\theta =$.....
63). If $sec\theta + tan\theta = \frac{1}{2}$, then $sec\theta - tan\theta =$.....
64). If $cosec\theta + cot\theta = p$, then $cosec\theta - cot\theta =$.....
65). If $cosec\theta - cot\theta = 4$, then $cosec\theta + cot\theta =$.....
66). $cos\frac{\pi}{3} =$.....
67). $sec\frac{\pi}{3} =$.....
68). $tan60^0 =$.....
69). $tan135^0 =$.....
70). $tan15^0 =$.....
71). $tan75^0 =$.....
72). $tan120^0 =$.....
73). $cos90^0 - sin90^0 =$.....
74). $cos0^0 - sin90^0 =$.....
75). $sin90^0 cos0^0 tan45^0 =$.....
76). If $sin30^0 = \frac{1}{2}$, then $cos60^0 =$.....
77). If $sin30^0 = cos\text{A}$ then $\text{A} =$.....
78). $cos360^0 =$.....
79). $sin420^0 =$.....
80). $tan2\text{A} =$.....$(\text{A} = 22^0.30')$
81). If $\tan(\text{A} + \text{B}) = \sqrt{3},\ tan\text{A} = 1$, then$\angle\text{B} =$.....
82). If $tan\theta > 0$ then the value of θ.....
83). If $cos0^0 + \sqrt{2}sin45^0 + sinA = 3$ then $\text{A} =$.....
84). $sec(-60^0) =$.....
85). $\sec(90 - \theta) =$.....
86). $\sin(90 + \theta) =$.....
87). $\sin(180 + \theta) =$.....
88). $\tan(90 + \theta) =$.....
89). If $sin(90 - \theta) = 1$ then $\theta =$.....
90). If $sin2\theta = cos3\theta$ then $cot5\theta =$.....
91). If $sin\theta = cos2\theta$ then $cot3\theta =$.....
92). $\frac{sin18^0}{cos72^0} =$.....
93). If $cos\theta = \frac{12}{13}$ then $sin(90 + \theta) =$.....
94). $sin75^0 =$.....
95). $cos105^0 =$.....
96). $sin420^0 =$.....
97). $cos420^0$.....
98). $sin240^0$.....
99). $cos240^0 =$.....
100). $sin720^0 =$.....
101). $cos720^0 =$.....
102). $sin(-\theta) =$.....
103). $cos(-\theta) =$.....
104). $tan(-\theta) =$.....
105). $tan(90 - \theta) =$.....
106). $cos(90 + \theta) =$.....
107). $tan(270 + \theta) =$.....
108). $sin(180 + \theta) =$.....
109). $tan(270 + \theta) =$.....
110). $sin(360 + \theta) =$ .....
111). $cos(90 - \theta) =$.....
112). $sin(180 - \theta) =$.....
113). $tan(270 - \theta) =$.....
114). $sin(360 - \theta) =$ .....
115). $sec(-60^0) =$.....

116). $sin(-60^0)$ =.....

117). $\begin{vmatrix} \tan\theta & \sec\theta \\ \sec\theta & \tan\theta \end{vmatrix}$ =.....

118). $\begin{vmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{vmatrix}$ =.....

Very short answer questions (1 mark questions)

1). In a triangle PQR with right angle at Q, the value of angle P is x, PQ $=$ 7 cm and QR $=$ 24 cm, then find $sinx$ and $cosx$.

2). If $cos\ 7A = sin(A - 6^0)$, where 7A is an acute angle, find the value of A.

3). If sin A $=$ sin B, then prove that A $+$ B $= 90^0$.

4). If $tan\ 2A = cot(A - 18^0)$, where 2A is an acute angle. Find the value of A.

5). Show that $\frac{1}{cos\theta} - cos\theta = tan\theta\ .sin\theta$.

Short answer questions (2 marks questions)

1). In a triangle XYZ, ∠Y is right angle, XZ = 17 m and YZ = 15 cm, then find (i) sinX (ii) cosY (iii) tanX.

2). If 3 $tan\ A = 4$, then find $sinA$ and $cosA$.

3). In ΔABC, right angle is at B, AB = 5 cm and $\angle ACB = 30^0$. Determine the lengths of the sides BC and AC.

4). If $\sin(A - B) = \frac{1}{2}, \cos(A + B) = \frac{1}{2}, 0^0 < A + B < 90^0, A > B$, find A and B.

5). Evaluate $\frac{sec^2 60^0 - tan^2 60^0}{sin^2 30^0 + cos^2 30^0}$.

6). If A, B and C are interior angles of triangle ABC, then show that $sin\frac{B+C}{2} = cos\frac{A}{2}$.

7). Show that $cot\ \theta + tan\ \theta = sec\ \theta cosec\theta$.

8). Evaluate $(1 + tan\ \theta + sec\ \theta)\ (1 + cot\theta - cosec\ \theta)$.

9). Simplify $secA(1 - sinA)\ (secA + tanA)$

10). Prove that $(sinA + cosecA)^2 + (cosA + secA)^2 = 7 + tan^2A + cot^2A$.

Essay type questions (4 marks questions)

1). If $tan\ A = \frac{3}{4}$, then find the other trigonometric ratio of angle A.

2). If ∠A and ∠P are acute angles such that sin A = sin P then prove that ∠A = ∠P.

3). Given $cot\ \theta = \frac{7}{8}$, then evaluate (i) $\frac{(1+sin\theta)(1-sin\theta)}{(1+cos\theta)(1-cos\theta)}$ (ii) $\frac{1+sin\theta}{cos\theta}$.

4). A chord in a circle of radius 6cm is making an angle 60^0 at the centre. Find the length of the chord.

5). Evaluate $sin60^0 cos30^0 + sin30^0 co60^0$. What is the value of $sin(60^0 + 30^0)$? What can you conclude?

6). Show that (i) $tan\ 48^0\ tan\ 16^0\ tan42^0\ tan74^0 = 1$ (ii) $cos36^0 cos54^0 - sin36^0\ sin54^0 = 0$.

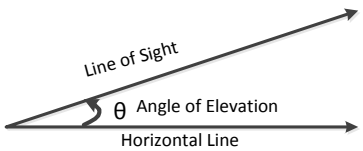
7). Prove that $\sqrt{\frac{1+cos\theta}{1-cos\theta}} = cosec\theta + cot\theta$.

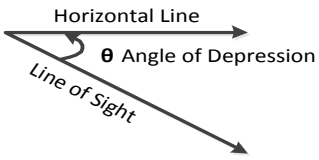
8). If $cosec\theta + cot\theta = k$, then show that $cos\theta = \frac{k^2-1}{k^2+1}$.

Chapter -12: APPLICATION OF TRIGONOMETRY

CONCEPTS

1. **Line of sight:** An imaginary line from the eye to a perceived object.
2. **Horizontal line:** The line parallel to earth is called horizontal line.
3. **Angle of elevation:** The Angle between the horizontal line and line of sight is called angle of elevation.
4. **Angle of depression:** The Angle between line of sight and the horizontal line is called angle of depression.





MULTIPLE CHOICE QUESTIONS

1). An airplane is flying at a height of 2 km above the ground. The distance along the ground from the airplane to the airport is $2\sqrt{3}$ km. What is the angle of depression from the airplane to the airport? ( )

A) 60^0 B) 30^0 C) 0^0 D) 90^0

2). The length of the shadow of a man is equal to the height of man. The angle of elevation is…… ( )

A) 60^0 B) 30^0 C) 45^0 D) 90^0

3). The tops of two poles of height 10m and 18m are connected with wire. If wire makes an angle of 30^0 with horizontal plane, then length of wire is……. ( )

A) 10m B) 12m C) 16m D) 4m

4). The ratio of the length of a current pole to its shadow is $1:\sqrt{3}$. The angle of elevation made by the sun is…….. ( )

A) 60^0 B) 30^0 C) 45^0 D) 90^0

5). The ratio of the length of a current pole to its shadow is $1:\frac{1}{\sqrt{3}}$. The angle of elevation made by the sun is…….. ( )

A) 60^0 B) 30^0 C) 45^0 D) 90^0

6). If the shadow of a tree is $\sqrt{3}$ times the height of the tree, then find the angle of elevation made by the sun is……. ( )

A) 60^0 B) 30^0 C) 45^0 D) 90^0

7). A pole 10m high casts a shadow of 10m long on the ground, then the sun's elevation is…… ( )

A) 60^0 B) 30^0 C) 45^0 D) 90^0

Fill in the blanks

1). The line drawn from the eye of an observer to a point on the object being viewed by the observer is called…….

2). The angle formed by the line of sight with the horizontal when it is above the horizontal level is called…….

3). The angle formed by the line of sight with the horizontal when it is below the horizontal level is called…….

4). The height or length of an object or the distance between two distant objects can be determined with the help of……

Very short answer questions (1 mark questions)

1). A tower stands vertically on the ground. From a point which is 15 meter away from the foot of the tower, the angle of elevation of the top of the tower is 45^0. What is the height of the tower?

2). Length of the shadow of a 15 meter high pole is $5\sqrt{3}$ meters at 7 o'clock in the morning. Then, what is the angle of elevation of the Sun rays with the ground at the time?

Short answer questions (2 marks questions)

1). A boy observed the top of an electric pole to be at an angle of elevation of 60^0 when the observation point is 8 meters away from the foot of the pole. Find the height of the pole?

2). A contractor wants to set up a slide for the children to play in the park. He wants to set it up at the height of 2 m and by making an angle of 30^0 with the ground. What should be the length of the slide?

3). A boat has to cross a river. It crosses the river by making an angle of 60^0 with the bank of the river due to the stream of the river and travels a distance of 600m to reach the another side of the river. What is the width of the river?

Essay type questions (4 marks questions)

1). A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground by making 30^0 angles with the ground. The distance between the foot of the tree and the top of the tree on the ground is 6m. Find the height of the tree before falling down.

2). Two men on either side of a temple of 30 meter height observe it at the angles of elevation 30^0 and 60^0 respectively. Find the distance between the two men.

3). A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression 30^0. The car is approaching the foot of the tower with a uniform speed. Six seconds later, the angle of depression of the car is found to be 60^0. Find the time taken by the car to reach the foot of the tower from this point.

4). A TV tower stands vertically on the side of a road. From a point on the other side directly opposite to the tower, the angle of elevation of the top of tower is 60^0. From another point 10 m away from this point, on the line joining this point to the foot of the tower, the angle of elevation of the top of the tower is 30^0. Find the height of the tower and the width of the road.

5). A statue stands on the top of a 2m tall pedestal. From a point on the ground, the angle of elevation of the top of the statue is $60^0$and from the same point, the angle of elevation of the top of the pedestal is 45^0. Find the height of the statue.

6). From the top of a building, the angle of elevation of the top of a cell tower is 60^0 and the angle of depression to its foot is 45^0. If distance of the building from the tower is 7m, then find the height of the tower.

7). The angle of elevation of the top of a building from the foot of the tower is 30^0 and the angle of elevation of the top of the tower from the foot of the building is 60^0. If the tower is 30 m high, find the height of the building.

8). Ganesh observes the top and foot of an opposite building from a window at first floor of his house which is at 8 meter height. The angles of elevation and depression of the top and the foot of the building are 60^0 and 30^0 respectively. Find the height of the building?

Chapter -13: PROBABILITY

CONCEPTS

1. **Probability:** Probability is the measure of the likeliness that an event will occur.
2. This definition of probability was given by Pierre Simon Laplace in 1795.
3. The Book “Games of Chance” was written by J. Cardan.
4. There are two types of approaches to the study of probability. These are
   (i) Experimental or empirical Probability.
   (ii) Theoretical Probality.
5. **Experimental probability**: The probability of an event occurring when an experiment was conducted is called Experimental probability.
6. **Experimental probability** $\mathrm{P(E)} = \frac{\text{Number of trials in which the event happened}}{\text{Total number of trials}}$.
7. **Theoretical probability:** The probability of an event is the ratio of the number of cases favourable to it, to the number of all cases possible when nothing leads us to expect that any one of these cases should occur more than any other, which renders them, for us, equally possible.
8. **Theoretical probability** $\mathrm{P(T)} = \frac{\text{Number of outcomes favourable to T}}{\text{Number of all possible outcomes of the experiment}}$.
9. **Random experiment:** An experiment whose outcome cannot be predicted with certainty is called random experiment.
10. **Experiment or Trial:** An action where the result is uncertain is called Experiment or Trail.
11. Tossing a coin, throwing dice, seeing what pizza people choose are all examples of experiments.
12. **Sample Space:** All the possible outcomes of an experiment is called Sample space.
13. Choosing a card from a deck. There are 52 cards in a deck (not including Jokers). So the Sample Space is all 52 possible cards.
14. **Sample Point:** One of the possible outcomes is called Sample point.
15. In Deck of Cards, the 5 of Clubs is a sample point, the King of Hearts is a sample point. Deck of Cards, the 5 of Clubs is a sample point; "King" is not a sample point. As there are 4 Kings that is 4 different sample points.
16. **Event:** A single result of an experiment is called event.
17. Getting a Tail when tossing a coin is an event. Rolling a "5" is an event.
18. An event can include one or more possible outcomes.
19. Choosing a "King" from a deck of cards (any of the 4 Kings) is an event.
20. Rolling an "even number" (2, 4 or 6) is also an event.
21. Elementary event: An event having only one outcome in an experiment is called an elementary event.

22. **Equally likely events:** Two or more events are said to be equally likely if each one of them has an equal chance of occurrence.
23. **Mutually Exclusive Events:** Two events are **mutually exclusive** if they cannot occur at the same time. An example is tossing a coin once, which can result in either heads or tails, but not both.
24. The sum of the probabilities of all the elementary events of an experiment is 1.
25. **Complement of an Event:** All outcomes that are not the event are called complement of the event.
26. Complement of the event E is denoted by $\overline{E}$.
27. For any event E, $P(E) + P(\overline{E}) = 1$
28. **Exhaustive events:** All the events are exhaustive events if their union is the sample space.
29. **Sure events or certain event:** A sure event is the one that contains the whole sample space.
30. The probability of a sure event (or certain event) is 1.
31. **Impossible event:** The event containing no outcomes is called impossible event.
32. The probability of an impossible event is 0.
33. The probability of an event E is a number $P(E)$ such that $0 \leq P(E) \leq 1$.
34. The pack or deck of playing cards consists of 52 cards, 26 of red colour and 26 of black colour. There are four suits each of 13 cards namely hearts (♥), spades (♠), diamonds (♦) and clubs (♣). Hearts and diamonds are red in colour and spades and clubs are black in colour. Each suit contains ace, king, queen, jack or knave, 10, 9, 8, 7, 6, 5, 4, 3, 2. There are 4 aces, 4 kings, 4 queens, 4 jacks, 4 tens, and so on in a pack.
35. **Face cards**: Kings, queens, and jacks are called face cards.

Formulae

1) **Experimental probability** $P(E) = \frac{\text{Number of trials in which the event happened}}{\text{Total number of trials}}$.

2) **Theoretical probability** $P(T) = \frac{\text{Number of outcomes favourable to T}}{\text{Number of all possible outcomes}}$.

3) $P(\overline{E}) = 1 - P(E)$.

MULTIPLE CHOICE QUESTIONS

1). A child has a die whose six faces show the letters 1, 2, 3, 4, 5 and 6. The die is thrown once. The probability of getting 2..... ( )

A) 1 B) $\frac{1}{6}$ C) 0 D) $\frac{2}{6}$

2). Which of the following cannot be the probability of an event ( )

A) 2.3 B) 15% C) 0.7 D) 1

3). A card is drawn from a well shuffled deck of 52 cards. Find the probability of getting an ace..... ( )

A) $\frac{1}{52}$ B) $\frac{1}{26}$ C) $\frac{1}{4}$ D) $\frac{1}{13}$

4). If E is an event then $P(E) + P(\overline{E})$ = ... ( )

A) 0 B) 1 C) -1 D) 2

5). If two coins are tossed simultaneously, then the probability of getting at least one head is ..... ( )

A) $\frac{1}{4}$ B) $\frac{2}{4}$ C) $\frac{3}{4}$ D) 1

6). Two coins are tossed together. The probability of getting head on both is ..... ( )

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{3}{4}$ D) 0

7). The probability that a leap year has 53 Sundays is ..... ( )

A) $\frac{1}{7}$ B) $\frac{2}{7}$ C) $\frac{3}{7}$ D) $\frac{4}{7}$

8). In a throw of a pair of dice, the probability of getting a doublet is..... ( )

A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) $\frac{1}{6}$ D) $\frac{5}{6}$

9). From a pack of 52 playing cards, a card is drawn at random. The probability, that the drawn card is not a face card is ..... ( )

A) $\frac{10}{13}$ B) $\frac{11}{13}$ C) $\frac{12}{13}$ D) $\frac{9}{13}$

10). The probability of getting a prime number in single throw of a dice is ( )

A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) $\frac{1}{6}$

11). The probability of drawing a green coloured ball from a bag containing 6 red and 5 black balls is ..... ( )

A) 0 B) 1 C) 0.5 D) 0.75

12). The probability of drawing a red coloured ball from a bag containing 3 red and 4 black balls is …… ( )

A) $\frac{1}{7}$ B) $\frac{2}{7}$ C) $\frac{3}{7}$ D) $\frac{4}{7}$

13). The probability of pulling a black face card out of a standard deck of cards is…… ( )

A) $\frac{3}{26}$ B) $\frac{6}{26}$ C) $\frac{1}{26}$ D) $\frac{1}{13}$

14). Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. The probability that the ticket drawn has a number which is a multiple of 3 or 5 is…… ( )

A) $\frac{7}{20}$ B) $\frac{1}{5}$ C) $\frac{9}{20}$ D) $\frac{11}{20}$

15). The probability of getting a sum 9 from two throws of a dice is…… ( )

A) $\frac{1}{9}$ B) $\frac{2}{9}$ C) $\frac{1}{3}$ D) $\frac{4}{9}$

MATCH THE FOLLOWING

1	The event containing no outcomes	( )	A)	Sample Space
2	Event that contains the whole sample space	( )	B)	Trial
3	A single result of an experiment	( )	C)	Event
4	All the possible outcomes of an experiment	( )	D)	Sure event
5	An action where the result is uncertain	( )	E)	Impossible event

Fill in the blanks

1. An event having only one outcome in an experiment is called an elementary event……
2. Complementary of getting a head is……
3. The probability of getting a number 7 in a single throw of a die……
4. The probability of an event which is impossible to occur is 0……
5. The probability of getting 6 or a number less than 6 in a single throw of a die is……
6. The probability of an event which is sure to occur is ……
7. Probability of an event E + Probability of the event 'not E' =……
8. The probability of an event that cannot happen is……
9. The sum of the probabilities of all the elementary events of an experiment is……
10. The probability of an event is greater than or equal to …… and less than or equal to……
11. If $P(E) = 0.05$, then the probability of 'not E' is……
12. The probability of drawing out a red king from a deck of cards is……
13. Three unbiased coins are tossed. The probability of getting at most two heads is……
14. A die is thrown once. The probability that the score is a factor of 6 is……
15. Each of the letters of the word MISSISSIPPI are written on separate pieces of paper that are then folded, put in a hat, and mixed thoroughly. One piece of paper is chosen from the hat. The probability it is an I……..

Very short answer questions (1 mark questions)

1). Why is tossing a coin considered to be a fair way of deciding which team should get the ball at the beginning of any game?

2). Can $\frac{7}{2}$ be the probability of an event? Explain.

3). Find the probability of getting a head when a coin is tossed once. Also find the probability of getting a tail.

4). What is the probability of the card drawn from a single deck will be a queen?

5). What is the probability of card drawn from a single deck that it is a face card?

6). Sangeeta and Reshma, play a tennis match. It is known that the probability of Sangeeta winning the match is 0.62. What is the probability of Reshma winning the match?

Short answer questions (2 marks questions)

1). Suppose we throw a die once. (i) What is the probability of getting a number greater than 4? (ii) What is the probability of getting a number less than or equal to 4?

2). One card is drawn from a well-shuffled deck of 52 cards. Calculate the probability that the card will be an ace, (ii) not be an ace.
3). What is the probability of card drawn from a single deck that it is not a face card?
4). A die is thrown once. Find the probability of getting (i) a prime number; (ii) a number lying between 2 and 6.
5). Harpreet tosses two different coins simultaneously. What is the probability that she gets at least one head?
6). A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is (i) red ? (ii) not red?
7). A game consists of tossing a one rupee coin 3 times and noting its outcome each time. Hanif wins if all the tosses give the same result i.e., three heads or three tails, and loses otherwise. Calculate the probability that Hanif will lose the game.
8). A dice is thrown twice. What is the probability that (i) 5 will not come up either time? (ii) 5 will come up at least once?
9). A card is drawn from a well shuffled pack of 52 cards. Find the probability of neither a spade nor a jack?

Essay type questions (4 marks questions)

1). Sarada and Hamida are friends. What is the probability that both will have (i) different birthdays? (ii) the same birthday? (Ignoring a leap year).
2). There are 40 students in Class X of a school of whom 25 are girls and 15 are boys. The class teacher has to select one student as a class representative. She writes the name of each student on a separate card, the cards being identical. Then she puts cards in a bag and stirs them thoroughly. She then draws one card from the bag. What is the probability that the name written on the card is the name of (i) a girl? (ii) a boy?
3). Rahim takes out all the heads from the cards: i. What is the probability of picking out an ace from the remaining pack. ii. Picking out a diamonds. iii. Picking out a card that is not a heart. iv. Picking out the Ace of hearts.
4). A box contains 3 blue, 2 white, and 4 red marbles. If a marble is drawn at random from the box, what is the probability that it will be (i) white? (ii) blue? (iii) red?
5). Two dice, one red and one white, are thrown at the same time. Write down all the possible outcomes. What is the probability that the sum of the two numbers appearing on the top of the dice is (i) 8? (ii) 13? (iii) less than or equal to 12?
6). A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out of the box at random. What is the probability that the marble taken out will be (i) red? (ii) white ? (iii) not green?
7). A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8, and these are equally likely outcomes. What is the probability that it will point at (i) 8? (ii) an odd number? (iii) a number greater than 2? (iv) a number less than 9?
8). A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears (i) a two-digit number (ii) a perfect square number (iii) a number divisible by 5.

Chapter -14: STATICS

CONCEPTS

1. **Statistics:** Statistics is the study of the collection, organization, analysis, interpretation and presentation of data.
2. **Data:** Facts or information used usually to calculate, analyse, or plan something.
3. Types of data:
   i. Primary and secondary data.
   ii. Quantitative and Qualitative Data.
4. **Primary Data or Raw data:** Data observed or collected directly from first-hand experience.
5. **Secondary Data:** The data collected in the past or from other parties is called secondary data.
6. **Quantitative Data:** Qualitative data is a categorical measurement expressed not in terms of numbers, but rather by means of a natural language description Exe: colour: “red”, height: “tall”
7. Qualitative Data: quantitative data is a numerical measurement expressed in terms of numbers.
8. **Methods of data collection:**
   i. Experiments
   ii. Sample Surveys
   iii. Observational Studies
9. **Tally marks:** Tally marks are a quick way of keeping track of numbers in groups of five.
10. **Ungrouped frequency distribution table:** Representation of the data with actual observations with frequencies in a table is called ungrouped frequency distribution table.

11. **Grouped frequency distribution table:** Representation of the data into some intervals (classes) in a table is called grouped frequency distribution table.
12. **Frequency:** When the data is presented in a frequency table the number of items that fall in any particular class is called frequency of that class.
13. **Class limits:** The starting and end values of each class are called class limits.
14. **Upper boundary:** The average of the upper limit of a class and the lower limit of the succeeding class is called the upper boundary of that class.
15. **Lower boundary:** The average of the lower limit of a class and the upper limit of the preceeding class is called the lower boundary of that class.
16. **Class interval:** The difference between the upper and lower boundary of a class is called the class interval or size of the class.
17. **Non-overlapping or inclusive classes:** When the lower and the upper class limits are included, then they are called **inclusive classes**. For example: 10 - 19, 20 - 29..... etc.
18. **Overlapping or exclusive classes:** When the lower limit is included, but the upper limit is excluded, then they are called exclusive classes. For example: 10 - 20, 20 - 30.....etc.
19. **Types of measures:**
    i. Measures of dispersion.
    ii. Measures of central tendency.
20. **Types of measures of dispersion.**
    i. Range.
    ii. Variance.
    iii. Standard Deviation.
    iv. Quartiles.
    v. Inter Quartile Range.
    vi. Quantiles.
21. **Range:** The difference between the lowest and highest values is called range.
22. **Types Measures of central tendency.**
    i. Mean.
    ii. Median.
    iii. Mode.
    iv. Geometric Mean.
    v. Harmonic Mean.
23. Mean: Mean is the sum of observation of a data, divided by the number of observations.
24. Mean is denoted by $\bar{x}$.
25. Mean of raw data $\bar{x} = \frac{\text{Sum of observations}}{\text{Number of observations}} = \frac{\sum x_i}{n}$.
26. Mean of ungrouped frequency distribution $\bar{x} = \frac{\text{Sum of all observations}}{\text{Number of observations}} = \frac{\sum f_i x_i}{\sum f_i}$.
27. Mean of ungrouped frequency distribution by simple method $\bar{x} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1} f_i}$.
28. Mean of ungrouped frequency distribution by deviation method $\bar{x} = \text{A} + \frac{\sum f_i d_i}{\sum f_i}$.
29. **Assumed mean class:** The class with highest frequency of the data is called assumed mean class.
30. **Assumed mean:** The weight of the assumed mean class is called assumed mean.
31. Mean for grouped data:-
    i) Direct method $\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$
    ii) Assumed mean method $\bar{x} = a + \frac{\Sigma f_i d_i}{\Sigma f_i}$, where $d_i = x_i - a$
    iii) The step deviation method $\bar{x} = a + (\frac{\Sigma f_i u_i}{\Sigma f_i})$ x h, where $u_i = \frac{x_i - a}{h}$
32. **Mode:** The value of the observation which occurs most frequently is called mode.
33. **Unimodal:** If the data has one mode then it is called Unimodal.
34. **Bimodal:** If the data has two modes then it is called bimodal.
35. **Multi modal:** If the data has three are more modes then it is called multi modal.
36. A data is said to have no mode if no number is repeated.
37. **Modal class:** The class containing the highest frequency.
38. If x is added to each data value, then the mean, median and mode will also increase by x.
39. If each observation is multiplied by x, then the mean, median and mode will also be multiplied by x.

40. The mode for the grouped data can be found by using the formula

Mode = $l + \left(\frac{f_1 - f_o}{2f_1 - f_o - f_2}\right)$ x h, where

l = Lower limit of the modal class.

f_1 = Frequency of the modal class.

f_0 = Frequency of the proceeding class of the modal class.

f_2 = Frequency of the succeeding class of the modal class.

h = Size of the class interval.

41. **Median:** The middle observation of a given raw data is called median.

42. Median = $\left(\frac{n+1}{2}\right)^{th}$ observation in the ascending order of the data. $(when\ n = odd)$.

43. Median = $average\ of\ \left(\frac{n}{2}\right)^{th}\ and\ \left(\frac{n}{2}+1\right)^{th}$ observation in the ascending order of the data. $(when\ n = even)$.

44. **Median class:** The class which contains $\left(\frac{n}{2}\right)^{th}$ value of cumulative frequency of the given data is called Median class.

45. The median for the grouped data can be found by using the formula

Median $= l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times$ h , where

l = Lower limit of the median class.

n = Number of observations.

cf = Cumulative frequency of the class preceding the median class.

f = Frequency of median class.

h = Class size.

46. **Empirical Relation between Mean, Median and Mode is** $mode = 3median - 2mean$**.**

47. **Cumulative frequency curve:** A curve that represents the cumulative frequency distribution of grouped data is called an ogive or cumulative frequency curve.

48. There are two types of Ogives.

(i) Less than type ogive.

(ii) More than type ogive.

49. **Less than type ogive:** An ogive representing a cumulative frequency distribution of 'less than' type is called a less than ogive.

50. **More than type ogive:** An ogive representing a cumulative frequency distribution of 'more than' type is called a more than ogive.

51. The x-coordinate of the point of intersection of two Ogives gives the median of the grouped data.

MULTIPLE CHOICE QUESTIONS

1). The class mark of 10 and 25 is…….. ( )

A) 10 B) 25 C) 17.5 D) 15

2). TV9 is the most popular news channel watched by the people of AP. The measure used here is ( )

A) Mean B) median C) mode D) Harmonic Mean

3). The size of the class $10 - 20$ is…….. ( )

A) 10 B) 20 C) 15 D) 17.5

4). The mean of $x - 1, x$ and $x + 1$ is…….. ( )

A) $x - 1$ B) x C) $x + 1$ D) $3x$

5). Mode of $0, 1, 2, 2, 2, 3, 3, 4, 5, 6$ is…….. ( )

A) 1 B) 2 C) 3 D) 4

6). Extreme values in the data affect the…….. ( )

A) Mean B) median C) mode D) Harmonic Mean

7). In problems where individual observations are not important, and we wish to find out a 'typical' observation, the ……..is more appropriate. ( )

A) Mean B) median C) mode D) Harmonic Mean

8). The median of first 5 prime numbers is…….. ( )

A) 2 B) 3 C) 5 D) 7

9). Which of the following is not measure of central tendency? ( )

A) Mean B) median C) mode D) Range

10). The……of grouped data can be obtained graphically as the *x*-coordinate of the point of intersection of the two Ogives for the given data. ( )

A) Mean B) median C) mode D) Harmonic Mean

MATCH THE FOLLOWING

1.	Mean of Prime numbers between 10 and 20 is……	( )	F.	10
2.	Median of perfect squares between 1 and 101 is……	( )	G.	11.
3.	Mean of first 10 odd numbers is……	( )	H.	36
4.	Mean of first 10 even numbers is……	( )	I.	6
5.	Mean of first 11 natural numbers is……	( )	J.	15

Fill in the blanks

1) The lower limit of the class$10-19$ is……
2) $1-10, 11-20, 21-30$ are the classes. The lower limit of the class $11-20$ is……
3) In the frequency distribution with classes $1-5, 6-10,$ … …. the upper boundary of class $1-5$ is……
4) In the frequency distribution with classes $10-20, 20-30,$ … …. the class interval is……
5) Class mark =……
6) In the frequency distribution with classes $1-8, 9-16, 17-24$ the class interval is……
7) Upper bound is 30. Class interval is 10 then its lower bound is……
8) In the frequency distribution mid value of the class is 35 and its lower bound is 30, then its upper bound is…
9) The mid value of the class$1-10$ is……
10) The mid value of the class$10-19$ is……
11) Range of $20, 18, 37, 42, 3, 12, 15, 26$ is……
12) Range of $47,\ 6,\ 27,\ 18,\ 2,\ 25$ is……
13) Range of first 5 natural numbers is……
14) Range of first n natural numbers is……
15) Range of first 7 whole numbers is……
16) Range of first n whole numbers is……
17) Mid values are used in calculating……
18) ……..are used in calculating arithmetic mean.
19) Formula for mean in deviation method is……
20) Mean of $30, 20, 32, 16, 27$ is……
21) Mean of $2,\ 3,\ 3,\ 2,\ 3,\ 1,\ 0$ is……
22) Mean of$-3, -2, -1,\ 0,\ 1,\ 2,\ 3$ is……
23) Mean of $a-2, a, a+2$ is……
24) Mean of $a-d, a, a+d$ is……
25) Mean of $(a-b),\ (a+b)$ is……
26) Mean of $2,\ 3,\ 4,\ x$ is 7 then x is……
27) Mean of $12, 15, x\ 19, 25, 44$ is 7 then x is……
28) Mean of first n natural numbers is……
29) Mean of first 10 natural numbers is……
30) Mean of first n odd numbers is……
31) Mean of first n even numbers is……
32) Sum of 15 items is 420 then its mean is……
33) Mean of 10 numbers is 7 and 15 numbers is 12, then mean of the full data is……..
34) Mean of 11 items is 17.5. One value 15 is left over. Then the mean of remaining values is……..
35) The mean of a data is 9. If each observation is multiplied by 3 and then 1 is added to each result, then the mean of the new observations is……..
36) ……is influenced by maximum and minimum values.
37) ……is not influenced by maximum and minimum values.
38) Cumulative frequencies are used in computing ……
39) Median of $13,\ 23, 12, 18,\ 26, 19, 14$ is……
40) Median of $1.8,\ 4.0,\ 2.7,\ 1.2,\ 4.5,\ 2.3,\ 3.7$ is……
41) Median of $-3,\ -5,\ -8,\ 0,\ 3,\ 2,\ -10$ is……

42) Median of natural numbers from 1 to 9 is.....
43) Median of $1.3,\ 1.5,\ 1.25$ is.....
44) Median of $\frac{3}{4},\frac{1}{2},\ \frac{2}{3},\ \frac{1}{6},\ \frac{7}{12}$ is.....
45) If median of ascending order of $12,\ 15,\ x\ ,\ 19,\ 25$ is 18 then x is.....
46) Median of $2x, 10x, 4x, 3x, x\ \ (x > 0)$is.....
47) Median of $x+1,\ x+2,\ x+4,\ x+3,\ x+5$ is.....
48) Median of $15\frac{2}{3},\ 15.03,\ 15,\ 15\frac{1}{3},\ 15.3$ is.....
49) Median of $\frac{x}{3},\ \frac{x}{2},\ \frac{x}{4},\frac{2x}{9},\ x\ (x > 0)$ is 5, then $x =$.....
50) Formula of median for grouped data is.....
51) An observation with highest frequency is called .....of the data.
52) Data having unique mode is called.....
53) Data having two modes is called.....
54) Formula for mode for grouped data is.....
55) Mode of $4,\ 5,\ 6,\ 7,\ 8,\ 9,\ 6$ is.....
56) Mode of $20, 30, 20, 30, 40, 10, 50$ is.....
57) Mode of first n natural numbers is.....
58) Formula of mode for grouped data is.....
59) If the mode of $2,\ 3,\ 3,\ 2,\ 3,\ 1,\ p$ is p then $p =$.....
60) The empirical relation between mean median and mode is.....
61) If mean$= x$ and median$= y$ then mode=.....
62) The mean and the median of a unimodal grouped data are 32 and 29. Its mode is.....
63) The mean and the median of a unimodal grouped data are 12.5 and 12. Its mode is.....
64) The mean and the mode of a unimodal grouped data are 39 and 34.5. Its median is.....
65) Mode$= 66$, median$= 48$, then mean=.....
66) Mean-mode=3(.....).

Very short answer questions (1 mark questions)

1). Find the mode of $2, 2, 2, 3, 3, 3, 4, 4, 4, 5, 5, 5, 6, 6, 6$.
2). Change the distribution to a more than type distribution, and draw its ogive. Find the range of first n natural numbers.
3). Find the mean of $\frac{2}{5},\frac{5}{3},\ \frac{1}{3},\ \frac{5}{6}$ and $\frac{1}{6}$.
4). Find the mean of $17,\ 31,\ 12,\ 27,\ 15,\ 19$ and 23.
5). In an observation sum of 15 items is 420. Find its mean.
6). Find the mean of first n natural numbers.
7). Find the mean of $(a-b), (a+b)$.
8). Find the median of $1.8, 4.0, 2.7, 1.2, 4.5, 2.3$ and3.7.
9). The median of $\frac{x}{5},\ x,\ \frac{x}{4},\ \frac{x}{2}, and\ \frac{x}{3}\ \ (x > 0)$is 8. Find x.
10). The observations of an ungrouped data are $x_1,\ x_2,\ 2x_1$ and $x_1 < x_2 <\ 2x_1$. If the mean and median of the data are each equal to 6. Find the observations of the data.
11). If the mode of $9,\ 11,\ 13,\ p, 18,\ 19$ is p. Find p.
12). Write the empirical relation between mean median and mode.
13). Mean of a data is 39 and median is38. Find mode.
14). Mean$= x$ and median$= y$. Find mode.
15). The mean and the median of a unimodal grouped data are 48.5 and 46.25 respectively. Find its mode.

Short answer questions (2 marks questions)

1). The marks obtained in mathematics by 30 students of Class X of a certain school are given in table below. Find the mean of the marks obtained by the students.

Marks obtained (x_i)	10	20	36	40	50	56	60	70	72	80	88	92	95
No. of students (f_i)	1	1	3	4	3	2	4	4	1	1	2	3	1

2). Mean $\overline{x} = a\ + (\frac{\Sigma f_i u_i}{\Sigma f_i})$ x h, where $u_i = \frac{x_i - a}{h}$. Expand all terms.
3). Write the formula for median and expand all its terms.
4). Mode the formula for mode and expand all its terms.

5). The median of $\frac{x}{4}$, x, $\frac{x}{5}$, $\frac{x}{3}$, and $\frac{x}{2}$ $(x > 0)$is 5. Find x.

6). The mean and the median of a unimodal grouped data are 28.2 and 30.5 respectively. Find its mode.

7). The mean and the median of a unimodal grouped data are 28.2 and 30.5 respectively. Find its mode.

Essay type questions (4 marks questions)

1). The table below gives the percentage distribution of female teachers in the primary schools of rural areas of various states and union territories (U.T.) of India. Find the mean percentage of female teachers using suitable method.

Percentage of female teachers	15-25	25-35	35-45	45-55	55-65	65-75	75-85
Number of States/U.T	6	11	7	4	4	2	1

2). The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is 18. Find the missing frequency f.

Daily pocket allowance (in Rs)	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Number of children	7	6	9	13	f	5	4

3). A survey conducted on 20 households in a locality by a group of students resulted in the following frequency table for the number of family members in a household.

Family size	1-3	3-5	5-7	7-9	9-11
Number of families	7	8	2	2	1

4). The marks distribution of 30 students in a mathematics examination is given in the adjacent table. Find the mode of this data. Also compare and interpret the mode and the mean.

Class interval	10-25	25-40	40-55	55-70	70-85	85-100
Number of students	2	3	7	6	6	6

5). The following distribution gives the state-wise, teacher-student ratio in higher secondary schools of India. Find the mode and mean of this data. Interpret the two measures.

Number of students	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55
Number of states	3	8	9	10	3	0	0	2

6). The median of the following data is 525. Find the values of x and$y$, if the total frequency is 100.

C. I	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
Fr	2	5	x	12	17	20	y	9	7	4

7). The lengths of 40 leaves of a plant are measured correct to the nearest millimeter, and the data obtained is represented in the following table. Find the median length of the leaves.

Length in(mm)	118-126	127-135	136-144	145-153	154-162	163-171	172-180
Number of leaves	3	5	9	12	5	4	2

8). The following distribution gives the daily income of 50 workers of a factory. Daily income (in Rs).

Daily income (in Rs)	100-120	120-140	140-160	160-180	180-200
Number of workers	12	14	8	6	10

Convert the distribution above to a less than type cumulative frequency distribution, and draw its ogive.

9). The following table gives production yield per hectare of wheat of 100 farms of a village.

Production yield(in kg/ha)	50-55	55-60	60-65	65-70	70-75	75-80
Number of farms	2	8	12	24	38	16

CLASS 10TH UNIT PLAN (MATHEMATICS)					
MONTH	**NWD**	**CHAPTER**	**PAGES**	**REMARKS**	**REMARKS**
JUNE	15	1.Real Numbers	1 - 24		
JULY	25	2.Sets	25 - 46		
		3.Polynomials	47 - 72		
AUGUST	23	4.Pair of linear Equations in two variables	73 - 100		
		8.Similar Triangles	191 - 224		
SEPTEMBER	19	11.Trigonometry	269 - 293		
		12.Applications of Trigonometry	294 - 304		
OCTOBER	21	5.Quadratic Equations	101 - 124		
		14.Statistics	323 - 352		
NOVEMBER	23	6.Progressions	125 - 158		
		10.Mensuration	245 - 268		
		9.Tangents and Secants to a Circle	225 - 244		
DECEMBER	25	7.Coordinate Geometry	159 - 190		
		13.Probability	305 - 322		
JANUARY	21	Revision			
FEBRUARY	22	Revision			
MARCH	22	Revision			