

Question Bank
Mathematics Class X

Ch-1 Real Number

1. Express 2658 as a product of its prime factors.
2. If $7560 = 2^3 \cdot 3^p \cdot q^7$, find p and q.
3. Prove that $\sqrt{2} + \sqrt{3}$ is an irrational number.
4. Find HCF and LCM of 56 and 112 by prime factorization method
5. On a morning walk, three persons steps off together and their steps measure 40 cm, 42 cm, and 45 cm respectively. What is the minimum distance each should walk, so that each can cover the same distance in complete steps?
6. During a sale, colour pencils were being sold in the pack of 24 each and crayons in the pack of 32 each. If you want full packs of both and the same number of pencils and crayons, how many packets of each would you need to buy?
7. Find the number nearest to 110000 but greater than 1 lakh, which is exactly divisible by 8, 15, 21.
8. 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 the them being of the same subject.
9. State Fundamental Theorem of Arithmetic. Is it possible that HCF and LCM of two numbers be 24 and 540 respectively. Justify your answer.
10. Find the smallest number which when increased by 20 is exactly divisible by 90 and 144. Is LCM, a multiple of 144?
11. If the HCF of 1032 and 408 is expressible in the form $1032p - 408 \times 5$, find p.
12. The LCM of two numbers is 14 times their HCF. The sum of LCM and HCF is 600. If one of the number is 280. Find the other number.
13. What will be the least possible number of the planks, if three pieces of timber 42 m, 49 m, and 63 m long have to be divided into planks of the same length?
14. Explain why:
 - (i) $7 \cdot 11 \cdot 13 \cdot 15 + 15$ is a composite number
 - (ii) $11 \cdot 13 \cdot 17 + 17$ is a composite number.
 - (iii) $1 \cdot 2 \cdot 3 \cdot 5 \cdot 7 + 3 \cdot 7$ is a composite number.

15. Amit, Sunita and Sumit start preparing cards for all the persons in an old age home. In order to complete one card, they take 10, 16 and 20 minutes respectively. If they all started together, after what time will they begin preparing a new card together? A Mathematics Exhibition is being conducted in your School and one of your friends is making a model of a factor tree. He has some difficulty and asks for your help in completing a quiz for the audience.

Observe the following factor tree and answer the following:

1. What will be the value of x ?
2. What will be the value of y ?
3. According to Fundamental Theorem of Arithmetic 13915 is a
 - a) Composite number
 - b) Prime number
 - c) Neither prime nor composite
 - d) Even number
4. The prime factorisation of 13915 is
 - a) $5 \times 11^3 \times 13^2$
 - b) $5 \times 11^3 \times 23^2$
 - c) $5 \times 11^2 \times 23$
 - d) $5 \times 11^2 \times 13^2$

CH-2 Polynomial

1. Find the zeroes of the polynomial $x^2 - 3x - m(m + 3)$
2. Obtain zeroes of $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ and verify relation between its zeroes and coefficients.
3. Form a quadratic polynomial, whose one zero is 8 and the product of zeroes is -56.
4. -5 is one of the zeroes of $2x^2 + px - 15$, and zeroes of $p(x^2 + x) + k$ equal to each other. Find the value of k .
5. Find the value of k such that $3x^2 + 2kx + x - k - 5$ has the sum of zeroes as half of their product.
6. If zeroes of the polynomial $ax^2 + bx - c$, $a \neq 0$ are additive inverse of each other then what is the value of b ?
7. If α and β are zeroes of $x^2 - x - 2$ find a polynomial whose zeroes are $(2\alpha + 1)$ and $(2\beta + 1)$
8. If α, β are zeroes of the quadratic polynomial $2x^2 + 5x + k$ then find the value of ' k ' such that $(\alpha + \beta)^2 - \alpha \cdot \beta = 24$
9. If α, β are zeroes of the quadratic polynomial $x^2 - 5x - 5$ then form a polynomial whose zeroes are $(2\alpha + 3\beta)$ and $(3\alpha + 2\beta)$

10. What will be the number of zeroes of the polynomials whose graphs are parallel to (i) y-axis (ii) x-axis?

11. The below picture are few natural examples of parabolic shape which is represented by a quadratic polynomial. A parabolic arch is an arch in the shape of a parabola. In structures, their curve represents an efficient method of load, and so can be found in bridges and in architecture in a variety of forms.



1. In the standard form of quadratic polynomial, $ax^2 + bx + c$, a , b and c are

- a) All are real numbers.
- b) All are rational numbers.
- c) 'a' is a non zero real number and b and c are any real numbers.
- d) All are integers.

2. If the roots of the quadratic polynomial are equal, where the discriminant $D = b^2 - 4ac$ then

- a) $D > 0$
- b) $D < 0$
- c) $D \geq 0$
- d) $D = 0$

3. If α and β are the zeroes of the quadratic polynomial $2x^2 - x + 8k$, then k is $1/\alpha$

- a) 4
- b) $1/4$
- c) $-1/4$
- d) 2

4. The graph of $x^2 + 1 = 0$

- a) Intersects x-axis at two distinct points.
- b) Touches x-axis at a point.
- c) Neither touches nor intersects x-axis.
- d) Either touches or intersects x-axis.

5. If the sum of the roots is $-p$ and product of the roots is q , then the quadratic is

CH-3 Polynomial in two variables

1. Solve the pair of linear equations by substitution method $x - 7y + 42 = 0$ and $x - 3y - 6 = 0$

2. Ram is walking along the line joining (1, 4) and (0, 6). Rahim is walking along the line joining (3, 4) and (1, 0). Represent on graph and find the point where both of them cross each other

3. Given the linear equation $2x + 3y - 12 = 0$ write another linear equation in these variables, such that geometrical representation of the pair so formed is

(i) Parallel Lines (ii) Coincident Lines (iii) Intersecting lines.

3. The difference of two numbers is 66. If one number is four times the other, find the numbers.

4. For what value of k, the following system of equations will be inconsistent $kx + 3y = k - 3$ $12x + ky = k$

6. Solve graphically the pair of linear equations $3x - 4y + 3 = 0$ and $3x + 4y - 21 = 0$ Find the co-ordinates of vertices of triangular region formed by these lines and x-axis. Also calculate the area of this triangle.

7. A and B are two points 150 km apart on a highway. Two cars start with different speeds from A and B at same time. If they move in same direction, they meet in 15 hours. If they move in opposite direction, they meet in one hour. Find their speeds

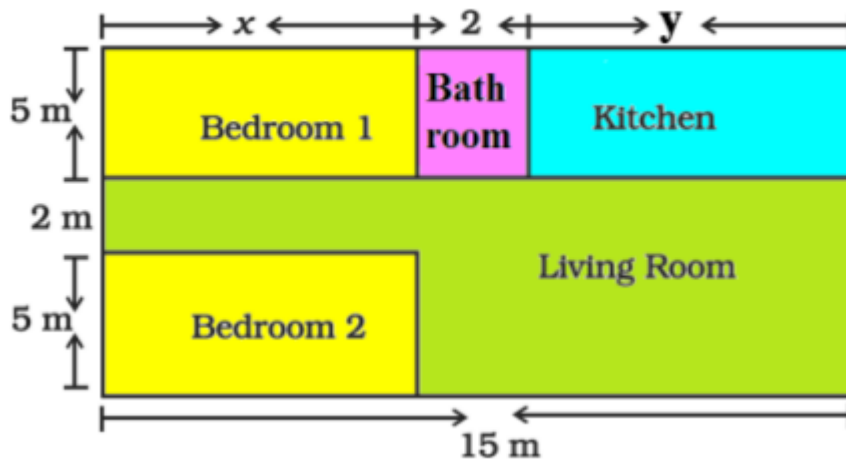
8. The ratio of incomes of two persons A and B is 3: 4 and the ratio of their expenditures is 5: 7. If their savings are 15,000 annually find their annual incomes.

8. Vijay had some bananas and he divided them into two lots A and B. He sold the first lot at the rate of 2 for 3 bananas and the second lot at the rate of 1 per banana and got a total of 400. If he had sold the first lot at the rate of 1 per banana and the second lot at the rate of 4 for 5 bananas, his total collection would have been 460. Find the total number of bananas he had.

9. A railway half ticket cost half the full fare but the reservation charges are the same on a half ticket as on a full ticket. One reserved first class ticket costs. 2530. One reserved first class ticket and one reserved first class half ticket from stations A to B costs 3810. Find the full first class fare from stations A to B and also the reservation charges for a ticket.

11. Determine graphically, the vertices of the triangle formed by the lines $y = x$, $3y = x$ and $x + y = 8$

Amit is planning to buy a house and the layout is given below. The design and the measurement has been made such that areas of two bedrooms and kitchen together is 95 sq.m.



Based on the above information, answer the following questions:

1. Form the pair of linear equations in two variables from this situation.
2. Find the length of the outer boundary of the layout.
3. Find the area of each bedroom and kitchen in the layout.
4. Find the area of living room in the layout.
5. Find the cost of laying tiles in kitchen at the rate of Rs. 50 per sq.m

Ch-4 Quadratic equation

1. a) If the roots of the quadratic equation $(b - c)x^2 + (c - a)x + (a - b) = 0$ are equal, Prove that $2b = a + c$
- b. If the equation $(1+m^2)n^2x^2+2mncx+(c^2 - a^2) = 0$ has equal roots, prove that $c^2 = a^2(1 + m^2)$
2. Check whether $x(x + 1) + 8 = (x + 2)(x - 2)$ is a quadratic equation.
3. Find the discriminant of $2x^2 - 4x + 3 = 0$ and state the nature of roots.
4. Solve by factorization: $x^2 - 3x - 10 = 0$
5. If one root of $2x^2 + px + 3 = 0$ is 1, find p.
6. The value of k is if $x = 3$ is one root of $x^2 - 2kx - 6 = 0$
7. If the discriminant of $3x^2 + 2x + a = 0$ is double the discriminant of $x^2 - 4x +$ then value of a is
8. If discriminant of $6x^2 - bx + 2 = 0$ is 1 then value of b is
8. If roots of $x^2 + kx + 12 = 0$ are in the ratio 1: 3 find k.
10. Find k if the quadratic equation has equal roots: $kx(x - 2) + 6 = 0$

11 Raj and Ajay are very close friends. Both the families decide to go to Ranikhet by their own cars. Raj's car travels at a speed of x km/h while Ajay's car travels 5 km/h faster than Raj's car. Raj took 4 hours more than Ajay to complete the journey of 400 km.

1. What will be the distance covered by Ajay's car in two hours?

- a) $2(x + 5)$ km
- b) $(x-5)$ km
- c) $2(x + 10)$ km
- d) $(2x + 5)$ km

2. Which of the following quadratic equation describe the speed of Raj's car?

- a) $x^2 - 5x - 500 = 0$
- b) $x^2 + 4x - 400 = 0$
- c) $x^2 + 5x - 500 = 0$
- d) $x^2 - 4x + 400 = 0$

3. What is the speed of Raj's car?

- a) 20 km/hour
- b) 15 km/hour
- c) 25 km/hour
- d) 10 km/hour

4. How much time took Ajay to travel 400 km?

- a) 20 hour
- b) 40 hour
- c) 25 hour
- d) 16 hour

CH-5 ARITHMETIC PROGRESSION

1. Find the sum of first 10 natural numbers.

2. What is the common difference of an A.P. $8\frac{1}{8}, 8\frac{2}{8}, 8\frac{3}{8}$ -----

3. If $k, 2k-1$ and $2k + 1$ are in A.P. then value of k is

4. The 10th term from the end of the A.P. 8, 10, 12,, 126 is

5. How many 2 digit number are there in between 6 and 102 which are divisible by

6. The sum of n terms of an A.P. is $n^2 + 3n$ Find its 20th term.

8. Find the five terms of an A.P. whose sum is $12\frac{1}{2}$ and first and last term ratio is 2:

9. Find the middle term of an A.P. 20,16,12,..... 176.

10. The sum of three numbers in A.P. is 24 and their product is 440. Find the numbers.

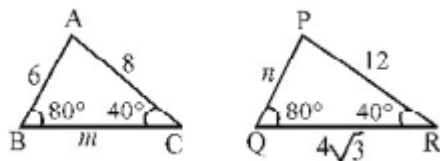
11. A man saved 16500 in ten years. In each year after the first he saved 100 more than he did in the preceding year. How much did he save in the first year?
12. The sum of first n terms of an A.P. is given by $S_{\{n\}} = 3n^2 + 2n$ Find the A.P.
13. In an A.P., the first term is 12 and the common difference is 6. If the last term of the A.P. is 252, then find its middle term.
14. The 17th term of an A.P. is 5 more than twice its 8th term. If the 11th term of the A.P. is 43, then find the n th term of the A.P.
15. India is competitive manufacturing location due to the low cost of manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16000 sets in 6th year and 22600 in 9th year.



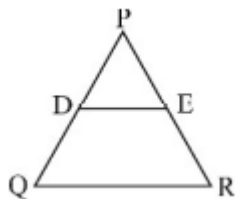
1. Find the production during first year.
2. Find the production during 8th year.
3. Find the production during first 3 years.
4. In which year, the production is Rs 29,200.
5. Find the difference of the production during 7th year and 4th year.

CH-6 Similar triangles

1. In the given figure, $\triangle ABC \sim \triangle PQR$, then find $(m + n)$



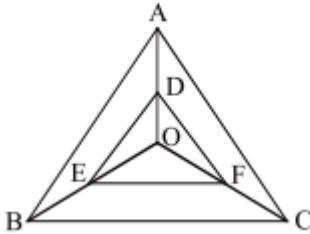
2. In the given figure, $DE \parallel QR$, $PQ = 5.6$ cm and $PD = 1.6$ cm. Find $PE : ER$.



2. If one diagonal of a trapezium divides the other diagonal in the ratio 1:3, prove that one of the parallel sides is three times the other.

3. E is a point on the side AD produced of a prallelogram ABCD and BE intersects CD at F. Show that $AB \times BC = AE \times CF$.

5. In the given figure, a point O inside $\triangle ABC$ is joined to its vertices. From a point D on AO, DE is drawn parallel to AB and from a point E on BO, EF is drawn parallel to BC. Prove that $DF \parallel AC$.



5. If three parallel lines are intersected by two transversals, then prove that the intercepts made by them on the transversals are proportional.

6. A street light bulb is fixed on a pole 6 m above the level of the street. If a woman of height 1.5 m casts a shadow of 3 m, find how far she is away from the base of the pole.

7. Two poles of height a metres and b metres are p metres apart. Prove that the height of the point of intersection of the lines joining the top of each pole to the foot of the opposite pole is given by $(ab)/(a + b)$ metres.

8. If $\triangle ABC$ and $\triangle DEF$ are similar triangles such that angle A = 45° and angle F = 56° then find the value of C.

9. If the ratio of the corresponding sides of two similar triangles is 2: 3, then find the ratio of their corresponding attitudes.

10. A scale drawing of an object is the same shape as the object but a different size. The scale of a drawing is a comparison of the length used on a drawing to the length it represents. The scale is written as a ratio. The ratio of two corresponding sides in similar figures is called the scale factor

Scale factor = length in image / corresponding length in object

If one shape can become another using resizing, then the shapes are similar. Hence, two shapes are similar when one can become the other after a resize, flip, slide or turn. In the photograph below showing the side view of a train engine. Scale factor is 1:200

This means that a length of 1 cm on the photograph above corresponds to a length of 200cm or 2 m, of the actual engine. The scale can also be written as the ratio of two lengths.

1. If the length of the model is 11cm, then the overall length of the engine in the photograph above, including the couplings (mechanism used to connect) is:

- a) 22cm b) 220cm c) 220m d) 22m

2. What will affect the similarity of any two polygons?

- a) They are flipped horizontally

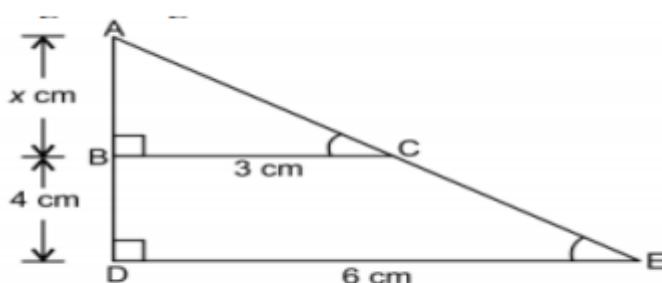
- b) They are dilated by a scale factor
- c) They are translated down
- d) They are not the mirror image of one another.

3. What is the actual width of the door if the width of the door in photograph is 0.35cm?

- a) 0.7m b) 0.7cm c) 0.07cm d) 0.07m

4. If two similar triangles have a scale factor 5:3 which statement regarding the two triangles is true?

- a) The ratio of their perimeters is 15:1
- b) Their altitudes have a ratio 25:15
- c) Their medians have a ratio 10:4
- d) Their angle bisectors have a ratio 11:5



5. Find the length of AB in the above fig

CH-7 Coordinate Geometry

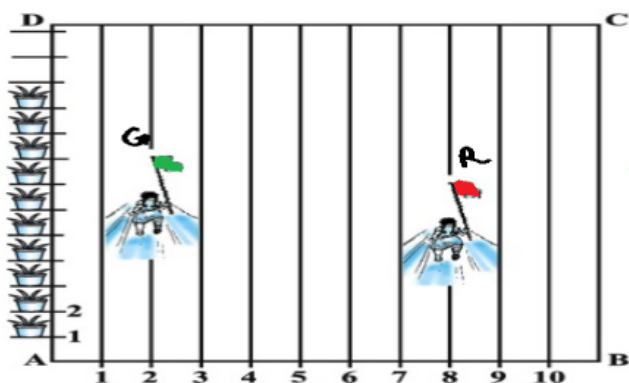
1. For what value of p , the points $(2, 1)$, $(p, -1)$ and $(1, 3)$ are collinear.
2. Three consecutive vertices of a parallelogram are $(-2, -1)$, $(1, 0)$ and $(4, 3)$. Find the co-ordinates of the fourth vertex.
3. Find the points of trisection of the line segment joining the points $(1, 2)$ and $(-3, 4)$.
4. A circle has its center at $(4, 4)$. If one end of a diameter is $(4, 0)$ then find the coordinates of the other end.
5. Find the ratio in which $P(4, m)$ divides the line segment joining the points $A(2, 3)$ and $B(6, -3)$. Hence find m .
6. Show that the points $(2, 3)$, $(8, 3)$ and $(6, 7)$ are the vertices of a right angled triangle.
7. Find the point on y -axis which is equidistant from the points $(5, -2)$ and $(-3, 2)$.

7. Find the ratio in which y-axis divides the line segment joining the points A(5,6) and B(-1,-4).

8. Find the co-ordinates of a centroid of a triangle whose vertices are (3,5), (-7, 4) and (10, -2).

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

11. In order to conduct Sports Day activities in your School, lines have been drawn with chalk powder at a distance of 1 m each, in a rectangular shaped ground ABCD, 100 flowerpots have been placed at a distance of 1 m from each other along AD, as shown in given figure below. Niharika runs $\frac{1}{4}$ th the distance AD on the 2nd line and posts a green flag. Preet runs $\frac{1}{5}$ th distance AD on the eighth line and posts a red flag.



1. Find the position of green flag
2. Find the position of red flag
3. What is the distance between both the flags?
4. If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag?
5. If Joy has to post a flag at one-fourth distance from green flag, in the line segment joining the green and red flags, then where should he post his flag?

Introduction to Trigonometry

1. If $\sin \theta + \cos \theta = \sqrt{2} \cos \theta$, show that $\cos \theta - \sin \theta = \sqrt{2} \sin \theta$.
2. Evaluate: $(\cos 0^\circ + \sin 45^\circ + \sin 30^\circ)(\sin 90^\circ - \cos 45^\circ + \cos 60^\circ)$.
3. If $7 \sin^2 \theta + 3 \cos^2 \theta = 4$, find $\tan \theta$.

4. If $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = 1/\sqrt{3}$, find A and B. ($0^\circ < A+B \leq 90^\circ$, $A > B$).
5. Prove: $(\sin \theta - \operatorname{cosec} \theta)(\cos \theta - \sec \theta) = 1/(\tan \theta + \cot \theta)$.
6. Prove: $(1 + \cot \theta - \operatorname{cosec} \theta)(1 + \tan \theta + \sec \theta) = 2$.
7. If $x = r \sin A \cos C$, $y = r \sin A \sin C$, $z = r \cos A$, prove that $x^2 + y^2 + z^2 = r^2$.
8. Evaluate without tables: $[\sin^2 25^\circ + \sin^2 65^\circ] / [\cos^2 24^\circ + \cos^2 66^\circ] + \sin^2 45^\circ$.
9. If $\operatorname{cosec} \theta - \sin \theta = m$ and $\sec \theta - \cos \theta = n$, prove that $m^2 n^2 (m^2 + n^2 + 3) = 1$.
10. If $\sin \theta + \cos \theta = p$ and $\sec \theta + \operatorname{cosec} \theta = q$, show that $q(p^2 - 1) = 2p$.
11. Prove: $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$.

Some Applications of Trigonometry

1. A vertical stick 12 m tall casts a shadow 8 m long. Find the angle of elevation of the sun.
2. A contractor plans to install two slides for children. A slide at 30° for under-5 children and a slide at 60° for older children. If the length of the slide is 3 m for under-5 children, find the height.
3. From a point P on the ground, the angle of elevation of the top of a 10m tall building is 30° . A flag is hoisted at the top and the angle of elevation of the top of the flag staff from P is 45° . Find the length of the flag staff.
4. A person standing on the bank of a river observes that the angle of elevation of a tree on the opposite bank is 60° . When he moves 40m away from the bank, the angle is 30° . Find the width of the river and height of the tree.
5. From the top of a building 15 m high, the angle of elevation of the top of a tower is found to be 30° . From the bottom, it is 60° . Find the height of the tower.

6. Two stations A and B are on the opposite sides of a hill. The angles of depression of A and B from the top of the hill are 30° and 60° respectively. If A is 50 m from the top, find AB.
7. The angle of elevation of a cloud from a point 60 m above the surface of water in a lake is 30° and the angle of depression of its shadow from the same point is 60° . Find the height of the cloud above the surface.
8. A man on the deck of a ship, 10 m above water level, observes the angle of elevation of a cliff as 45° and the angle of depression of its base as 30° . Calculate the distance of the cliff from the ship and the height of the cliff.
9. As observed from the top of a lighthouse, 100 m above sea level, the angles of depression of two ships are 30° and 45° . If the ships are on opposite sides of the lighthouse, find the distance between the ships.
10. A vertical tower stands on a horizontal plane and is surmounted by a flagstaff of height 7 m. From a point on the plane, the angle of elevation of the bottom of the flagstaff is 30° and the top is 45° . Find the height of the tower.
11. The angle of elevation of a jet fighter from point A on the ground is 60° . After 15 seconds, the angle of elevation changes to 30° . If the jet is flying at a speed of 720 km/h, find the constant height at which the jet is flying.

★ Case Study — Garden Design

A landscape architect is designing a circular garden of radius 7 m. A straight path is to be built from a gate at point P, which is 25 m from the centre O of the garden, touching the boundary of the garden at points A and B. The architect also plans a smaller circular fountain of radius 3 m inside, concentric with the garden.

1. Find the length of the tangent PA from P to the garden boundary.
2. What is the angle OAP? State the theorem used.
3. Prove that $PA = PB$ using the property of tangents from an external point.
4. Find the area of the quadrilateral OAPB formed by the two tangents and the two radii.

1. Prove that the tangent at any point of a circle is perpendicular to the radius.

2. Two concentric circles of radii 5 cm and 3 cm. Find the length of the chord of outer circle that is tangent to inner.
3. If PA and PB are tangents from P to a circle with center O such that $\angle APB = 50^\circ$, find $\angle OAB$.
4. Prove that the parallelogram circumscribing a circle is a rhombus.
5. Two tangents PA and PB are drawn from external point P. Prove that PA is perpendicular to OA and that $\angle APO = \angle BPO$.
6. PQ is a chord of length 8 cm of a circle of radius 5 cm. Tangents at P and Q intersect at T. Find TP.
7. ABC is a right-angle triangle with AB = 6 cm, BC = 8 cm. A circle with center O is inscribed in it. Find the radius of the circle.
8. In the figure, XP and XQ are two tangents from external X to a circle with center O. ARB is another tangent touching the circle at R. Prove that $XA + AR = XB + BR$. (U-Like)
9. Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the center. (RD Sharma)

Areas Related to Circles

1. The perimeter of a sector of a circle with radius 10.5 cm is 43 cm. Find the area of the sector.
2. The radius of a circle is 20 cm. Three more concentric circles are drawn inside it such that it is divided into 4 parts of equal area. Find the radius of the innermost circle.
3. A chord AB of a circle of radius 15 cm makes an angle of 60° at the center. Find the areas of the minor and major segments.
4. In a circle of radius 35 cm, an arc subtends an angle of 72° at the center. Find: (i) length of arc (ii) area of sector.
5. The perimeter of a certain sector of a circle of radius 5.6 m is 27.2 m. Find the area of the sector.
6. A round table cover has 6 equal designs as shown. The radius of the cover is 28 cm. Find the cost of making the designs at Rs. 0.35 per cm^2 (use $\sqrt{3} = 1.7$).

7. In the given figure, ABCD is a rectangle with $AB = 14$ cm and $BC = 7$ cm. Taking BC and AD as diameters, two semicircles are drawn. Find the area of the shaded region.
8. Find the area of the shaded region where a circular arc of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm as center.
9. Two circular pieces of equal radii and maximum area touching each other are cut out from a rectangle of dimensions 14 cm \times 7 cm. Find the area of the remaining piece of cardboard.
10. On a square piece of cardboard of side 14 cm, four circles of maximum size are drawn. Find the area of the cardboard not covered by the circles.
11. A park is of the shape of a circle of diameter 7 m. It is surrounded by a path of width 0.7 m. Find the expenditure of cementing the path at the rate of Rs. 110 per m^2 .

Surface Areas and Volumes

1. A vessel is in the form of a hollow hemisphere mounted on a hollow cylinder. The diameter of hemisphere is 14 cm and total height is 13 cm. Find the inner surface area.
2. A solid cube of side 12 cm is cut into 8 cubes of equal volume. Find the side of the new cube. Also find the ratio of their surface areas.
3. A hemispherical tank full of water is emptied by a pipe at the rate of $25/7$ liters per second. If diameter of tank is 3 m, how long will it take to empty the tank?
4. A solid metallic cuboid of dimensions 9 m \times 8 m \times 2 m is melted and recast into solid cubes of side 2 m. Find the number of cubes.
5. From a solid cylinder whose height is 2.4 cm and diameter is 1.4 cm, two conical holes of same diameter are drilled from each end. Height of each cone = 0.8 cm. Find volume of remaining solid.
6. A sphere of diameter 6 cm is dropped in a right circular cylindrical vessel partly filled with water. The diameter of cylinder is 12 cm. If sphere is completely submerged, by how much will the level of water rise?
7. A medicine capsule is in the shape of a cylinder with two hemispheres struck on each end. The length of the entire capsule is 14 mm and diameter of capsule is 5 mm. Find surface area.

8. A solid right circular cone of height 120 cm and radius 60 cm is placed in a right circular cylinder full of water of height 180 cm and radius 60 cm. Find the volume of water left in cylinder.
9. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank which is 10 m in diameter and 2 m deep. If water flows through the pipe at 3 km/h, in how much time will the tank be filled?
10. An oil funnel made of tin consists of a cylindrical portion 10 cm long attached to a frustum of a cone. The total height is 22 cm, diameter of cylindrical portion is 8 cm and diameter of top of funnel is 18 cm. Find area of tin required.
11. A solid consisting of a right cone standing on a hemisphere is placed upright in a right circular cylinder and water is poured to fill the cylinder. Find the volume of water in the cylinder if radius of cylinder = radius of hemisphere = radius of base of cone = 3 cm and height of cone = height of cylinder = 9 cm.

Statistics

1. Write the empirical relationship between mean, median and mode.
2. If mean = 45.83 and mode = 36, find median using empirical formula.
3. The marks obtained by 30 students in a class are: 10–25: 2, 25–40: 3, 40–55: 7, 55–70: 6, 70–85: 6, 85–100: 6. Find mean by step deviation method.
4. Find the missing frequency in the following distribution if $N = 100$ and median = 32: 0–10: 10, 10–20: ?, 20–30: 25, 30–40: 30, 40–50: ?, 50–60: 10.
5. The mean of the following frequency distribution is 18. Find the missing frequencies: 0–6: 6, 6–12: 8, 12–18: f_1 , 18–24: 9, 24–30: f_2 ; $N = 40$.
6. Find the mean, median and mode for the following data: 0–10: 5, 10–20: 8, 20–30: 15, 30–40: 20, 40–50: 14, 50–60: 8, 60–70: 5.
7. A life insurance agent found the following data about distribution of ages of 100 policy holders: 20–25: 2, 25–30: 4, 30–35: 18, 35–40: 21, 40–45: 33, 45–50: 11, 50–55: 3, 55–60: 6, 60–65: 2. Find the median age.
8. The following data gives distribution of heights of 100 students: 150–155: 15, 155–160: 13, 160–165: 10, 165–170: 8, 170–175: 9, 175–180: 6, 180+: 8. Calculate mode and mean by assumed mean method.

9. If the median of the distribution given below is 28.5, find values of x and y: 0–10: 5, 10–20: x, 20–30: 20, 30–40: 15, 40–50: y, 50–60: 5; N = 60.
10. Draw a 'more than ogive' for the following and find median: 100–120: 12, 120–140: 14, 140–160: 8, 160–180: 6, 180–200: 10.
11. The following frequency distribution gives the monthly consumption of an electricity of 68 consumers: 65–85: 4, 85–105: 5, 105–125: 13, 125–145: 20, 145–165: 14, 165–185: 8, 185–205: 4. Find the median, mean and mode.

Probability

1. One card is drawn from a well-shuffled deck. Find the probability that it is a face card.
2. A bag contains 5 red, 8 white and 7 black balls. A ball is drawn at random. Find P(not a black ball).
3. If $P(E) = 0.05$, what is the probability of 'not E'?
4. A box contains 90 discs numbered 1 to 90. One disc is drawn at random. Find P(prime number less than 23).
5. A card is drawn at random from a pack of 52 playing cards. Find the probability that the drawn card is neither an ace nor a king.
6. Two dice are thrown at the same time. Find the probability of getting:
(a) same number on both dice (b) different numbers on both.
7. Red queens and black jacks are removed from a pack of 52 cards. A card is then drawn at random from the remaining cards. Find the probability that the drawn card is: (a) a king (b) a red card (c) a spade (d) a queen.
8. A bag contains 6 red, 8 black and 4 white balls. A ball is drawn at random. What is the probability that ball drawn is (a) white, (b) not red, (c) black or white?
9. Cards bearing numbers 3 to 20 are placed in a bag and mixed well. A card is taken out of the bag at random. Find the probability of getting a card bearing:
(a) a prime number (b) a number divisible by 3 or 5.
10. A number x is selected at random from the numbers 1, 4, 9, 16 and another number y from 1, 2, 3, 4. Find the probability that the value of xy is more than 16.

- 11. A number is selected at random from 1 to 30. Find the probability that it is**
(a) a prime number (b) not divisible by 3 (c) not a perfect square
(d) divisible by 3 and 5.