1. If the perimeter of a semicircular protractor is 36 cm, then find its diameter \( 14 \text{ cm} \)

2. The perimeter of a sector of a circle is 66 cm and the radius of the circle is 12 cm. Find the corresponding length of the arc \( 42 \text{ cm} \)

3. The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand from 9 a.m. to 9:35 a.m. \( 1078\slash 3 \text{ cm}^2 \)

4. The perimeter of a certain sector of a circle is 6 cm. If the radius of the circle is 6 cm, find the area of the sector \( 24 \text{ cm}^2 \)

5. A chord of a circle of radius 14 cm subtends an angle of 120° at the centre. Find the area of the corresponding minor segment of the circle (use \( \pi = \frac{22}{7}, \sqrt{3} = 1.73 \)) \( 120.56 \text{ cm}^2 \)

6. Find the number of revolutions made by a circular wheel of area 1.54 \text{ m}^2 in rolling a distance of 176 m \( 40 \)

7. The circumference of a circle exceeds the diameter by 18.9 cm. Find the radius of the circle \( 4.41 \text{ cm} \)

8. \( AB \) is a diameter of the circle, \( AC = 6 \text{ cm}, BC = 8 \text{ cm} \). Find the area of the shaded region (use \( \pi = 3.14 \)) \( 54.5 \text{ cm}^2 \)

9. In a circular table cover of radius 70 cm, a design is formed leaving an equilateral triangle \( \triangle ABC \) in the middle as shown in the fig; Find the total area of the design \( 9042.25 \text{ cm}^2 \)

10. A paper is in the form of a rectangle \( ABCD \) in which \( AB = 20 \text{ cm}, BC = 14 \text{ cm} \). A semicircular portion with \( BC \) as diameter is cut off. Find the area of the remaining part (use \( \pi = \frac{22}{7} \)) \( 203 \text{ cm}^2 \)

11. Find the area of the shaded region in fig; if \( BC = BD = 8 \text{ cm}, AC = AD = 15 \text{ cm} \) and \( O \) is the centre of the circle (use \( \pi = \frac{22}{7} \)) \( 106.87 \text{ cm}^2 \)
12. In fig: a semi circle is drawn on AB as diameter, and O is centre. Semi circular flower beds are formed on AO and OB as diameters. If AB is 28 m, find the area of the shaded region (154 cm²)

13. In the given fig: ∆ABC is right angled at A. Semicircles are drawn on AB, AC and BC as diameters. It is given that AB = 3 cm, AC = 4 cm. Find the area of the shaded region (6 cm²)

14. The area of the shaded region between two concentric circle is 286 cm². If the difference of the radii of the two circle is 7 cm, find the sum of their radii (use π = 22/7) (13 cm)

15. In fig: find the area of the shaded region (38.28 m²)

16. In fig: ∆PQR is an equilateral triangle of side 8 cm and P, Q, R are centres of circular arcs, each of radius 4 cm. Find the area of the shaded region (π = 3.14, √3 = 1.732) (2.59 cm²)
17. In fig: AC=BD=7 cm and AB=CD=1.75 cm. Semi circles are drawn as shown in the fig. Find the area of the shaded region (use \( \pi = \frac{22}{7} \)) \((36.5 \text{ cm}^2)\)

![Diagram of shaded region]

18. In fig: ABC is a right angled triangle, \( \angle B = 90^\circ \), AB = 28 cm and BC = 21 cm. With AC as diameter, a semi circle is drawn and with BC as radius a quarter circle is drawn. Find the area of the shaded region \((428.75 \text{ cm}^2)\)

![Diagram of shaded region]

19. In the given fig: ABC is a triangle right angled at B, with AB = 14 cm and BC = 24 cm. With the vertices A, B and C as centres, arcs are drawn each of radius 7 cm. Find the area of the shaded region (use \( \pi = \frac{22}{7} \)) \((91 \text{ cm}^2)\)

![Diagram of shaded region]

20. Four cows are tethered at four corners of a square plot of side 50 m, so that they just can reach one another. What area will be left ungrazed? \((535.715 \text{ m}^2)\)

21. A chord AB of a circle of radius 14 cm makes an angle of 60 at the centre of the circle. Find the area of the minor segment \((17.89 \text{ cm}^2)\)
INTERNATIONAL INDIAN SCHOOL, DAMMAM (2015-16)
MATHMATICS WORKSHEET – SOME APPLICATIONS OF TRIGNOMETRY
CLASS X

1. A tower is $100\sqrt{3}$ m high. Find the angle of elevation of its top from a point 100m away from its foot.

2. The angles of elevation of the top of a tower from two points P and Q at distances of a and b, respectively, from the base and in the same straight line with it are complementary. Prove that the height of the tower is $\sqrt{ab}$.

3. An aeroplane at altitude of 1200 m finds that two ships are sailing towards it in the same direction. The angles of dispersion of the ships as observed from the aeroplane are $60^0$ and $30^0$ respectively. Find the distance between the two ships.

4. Two boats approach a light house in mid-sea from opposite directions. The angles of elevation of the top of the light house from two boats are $30^0$ and $45^0$ respectively. If the distance between two boats is 100 m, find the height of the light house.

5. A boy standing on a horizontal plane finds a bird flying at a distance of 100m from him at an elevation of $30^0$. A girl standing on the roof of 20 m high building, finds the angle of elevation of the same bird to be $45^0$. Both the boy and the girl are on opposite sides of the bird. Find the distance of the bird from the girl.

6. The angles of elevation and depression of the top and bottom of a light house from the top of a building, 60 m high are $30^0$ and $60^0$ respectively. Find

   (i) The difference between the heights of the light house and the building,
   (ii) Distance between the light house and the building.

7. From the top of a building 15 m high the angle of elevation of the top of a tower is found to be $30^0$. From the bottom of the same building, the angle of elevation of the top of the tower is found to be $60^0$. Find the height of the tower and the distance between the tower and the building.

8. From a window (60 metres high above the ground) of a house in a street, the angle of elevation and depression of the top and the foot of another house on opposite sides of street are $60^0$ and $45^0$ respectively. Show that the height of the opposite house is $60(1+\sqrt{3})$ metres.
9. The height of a pole is 12 m. Find the length of its shadow on the ground when the sun's altitude is 45°.

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

11. If the angle of elevation of a cloud from a point h metres above a lake is \( \alpha \) and the angle of depression of its reflection in the lake is \( \beta \), prove that the height of the cloud above the lake level is \( \frac{h(\tan \beta + \tan \alpha)}{\tan \beta - \tan \alpha} \).

12. The angle of elevation of a cloud from a point 60 m above a lake is 30° and the angle of depression of the reflection of cloud in the lake is 60°. Find the height of the cloud.

13. The angle of elevation of a jet plane from a point A on the ground is 60°. After flight of 15 seconds, the angle of elevation changes to 30°. If the jet is flying at a constant height of 1500 \( \sqrt{3} \) m, find the speed of the jet plane.

14. The length of a string between a kite and a point on the ground is 90 m. If the string makes an angle \( \theta \) with the ground level such that \( \tan \theta = 15/8 \), how high is the kite? Assume that there is no slack in the string.

15. The length of a shadow of a tower standing on level planes is found to be 2x metre longer when the sun's altitude is 30° than when it was 45°. Prove that the height of tower is \( x(\sqrt{3} + 1) \) metres.

16. From the window \( x \) metres high above the ground in a street, the angles of elevation and depression of the top and the bottom on the opposite side of the street are \( \alpha \) and \( \beta \) respectively. Show that the height of the opposite house is \( x(1 + \tan \alpha \cot \beta) \) metres.

17. An observer 1.5 m tall is 28.5 m away from a chimney. The angle of elevation of the top of the chimney from his eyes is 45°. Find the height of the chimney.

18. Two lamp-posts of equal height stand on either side of a roadway which is 150 m wide. From a point on the roadway somewhere between the two lamp-posts, the angle of elevation of the top of the lamp-post are 60° and 30° respectively. Find the height of the lamp-post and the position the position of the point.
19. A man on the desk of ship 12m above water level, observes that the angle of elevation of the top of a cliff is $60^0$ and the angle of depression of the base of the cliff is $30^0$. Find the distance of the cliff from the ship and the height of the cliff.

20. The shadow of a flag-staff is three times as long as the shadow of the flag-staff when the sun rays meet at the ground at an angle of $60^0$. Find the angle between the sun rays and the ground at the time of longer shadow.

21. An aeroplane when flying at a height of 4000m from the ground passes vertically above another aeroplane at an instant when the angles of elevation of the two planes from the same point on the ground are $60^0$ and $45^0$ respectively. Find the vertical distance between the aeroplanes at that instant.

22. The angle of elevation of a cloud from a point $h$ metres above a lake is $\theta$. The angle of depression of its reflection in the lake is $45^0$. Find the height of the cloud.
1. Show that points A (7,5), B (2,3) and C (6, –7) are the vertices of a right triangle.
2. What point on the x-axis is equidistant from (7,6) and (-3,4)?
3. Show that the points P (-\(\frac{3}{2}\), 3), Q(6, –2) and R(-3, 4) are collinear.
4. Show that the points A (5,6), B(1,5), C(2,1) and D(6,2) are the vertices of a square.
5. Find a point on the y-axis, which is equidistant from the point A (6,5) and B (-4,3).
6. Find the coordinates of a point R which divides the line segment joining the points P (-2,3) and Q (4,7) internally in the ratio \(\frac{4}{7}\).
7. Find the distance of the point (1,2) from the mid point of the line segment joining the points (6,8) and (2,4).
8. Find the ratio in which the line segment joining the points (6,4) and (1,-7) is divided by x-axis.
9. Find the area of the quadrilateral whose vertices are A (0,0), B (6,0), C (4,3) and D (0,3).
10. Find the area of the rhombus whose vertices taken in order are the points (3,0), (4,5), (-1,4) and (-2,-1).
11. For what value of p are the points (2,1), (p, -1) and (-1,3) collinear?
12. Determine k, so that the points are collinear:
   \((k, 2-2k), (-k+1, 2k)\) and \((-4-k, 6-2k)\).
13. Check whether the points (20,3), (19,8) and (2, -9) are all equidistant from the point (7,3).
14. Determine the ratio in which the line y - x + 2 = 0 divides the line segment joining the points (3, -1) and (8,9).
15. The line joining the points (2,1) and (5, -8) is trisected at the points P and Q. If point P lies on the line 2x - y + k = 0, find the value of k.
16. If \((1,2), (4,y), (x, 6), (3,5)\) are the vertices of a parallelogram, taken in order, find x and y.
17. Find the area of the triangle formed by joining the mid-points of the sides of triangle whose vertices are (0, -1), (2,1) and (0,3). Find the ratio of the area of the triangle formed to the area of the given triangle.
18. Show that the points (7,10), (-2,5) and (3, -4) are the vertices of an isosceles right triangle.
19. Name the type of the triangle formed by the points A (2,3), B (4,6) and C (6,9).
20. Find the area of the triangle formed by joining the mid-points of the sides of the triangle whose vertices are (0, -1), (2,1) and (0,3).
Q1 Solve by splitting the middle term

(1) $x^2 - 2x - 8 = 0$
(2) $3x^2 - 13x + 12 = 0$
(3) $x^2 + x - 2 = 0$
(4) $2x^2 + 5x + 3 = 0$
(5) $9x^2 - 34x - 8 = 0$

Q2. Solve by quadratic formula

(1) $10x - 7x = 3$
(2) $(x^2 - 1) / (x^2 + 1) = 4/6$
(3) $(3x^2 + 7)/(x^2 + 4) = 2$
(4) $x^2 - 4x - 21 = 0$
(5) $1/(x+5) = (1/3) - 1/(x-3)$
(6) $(4 - 3x)(2x + 3) = 5x$
(7) $(2x^2 + 2)/(x^2 - 2x) = 1/4$
(8) $14x + 5 - 3x^2 = 0$

Q3. Solve by completing the square

(1) $5x - 2 = 2x^2$
(2) $(x + 1)/(x - 1) - (x - 1)/(x + 1) = 5/6$
(3) $1/(x - 1) + 5/(x + 1) = 6/4$
(4) $4/(x + 4) - 1/(x + 1) = 2/(x + 2)$
(5) $15/(15 - x) = 3/(10$
(6) $x^2 - 7x - 60 = 0$

Q4. Solve the quadratic equation $9x^2 - 15x + 6 = 0$ by the method of completing the square

Q5. Find the roots of the quadratic equation:

$(1/3)x^2 - 11x + 1 = 0$

Q6. Samantha is 8 and two-thirds years older than Jason. The sum of their ages is 23 years. How old is Jason?

Q7. Ryan was born 6 and one-fourth years after Alexander. The sum of their ages is 66 and eleven-twelfth years. How old is Alexander?

Q8. Kayla would be one-half as old as Nathan if Kayla were four years older. Nathan is eight less than three times as old as Kayla. How old is Nathan?

Q9. Find two consecutive odd integers whose product is 99.

Q10. A certain number added to its square is 30. Find the number.

Q11. The square of a number exceeds the number by 72. Find the number.

Q12. Find two consecutive positive integers such that the square of the first decreased by 17 equals 4 times the second.

Q13. The ages of three family children can be expressed as consecutive integers. The square of the age of the
youngest child is 4 more than eight times the age of the oldest child. Find the ages of the three children.

Q14. The altitude of a triangle is 5 less than its base. The area of the triangle is 42 square inches. Find its base and altitude.

Q15. The speed of a boat in still water is 15 km/hr. It can go 30 km upstream and return downstream to the original point in 4 hrs 30 min. Find out the speed of the stream.

Q16. A train travels 180 km at a uniform speed. If the speed had been 9 km/hr more, it would have taken 1 hour less for the same journey. Find the speed of the train.

Q17. A plane left 30 minutes late than its scheduled time and in order to reach the destination 1500 km away in time it had to increase the speed by 250 km/h from the usual speed. Find its usual speed.

Q18. The age of father is equal to the square of the age of his son. The sum of the age of father and five times the age of the son is 66 years. Find their ages.

Q19. Two water taps together can fill a tank in 6 hrs. The tap of larger diameter takes 9 hrs less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

Q20. A takes 6 days less than the time taken by B to finish a piece of work. If both A and B together can finish it in 4 days, find the time taken by B to finish the work.

Q21. A two digit number is such that the product of its digits is 18. When 63 is subtracted from the number, the digits interchange their places. Find the number.

Q22. The speed of a boat in still water is 15 km/hr. It can go 30 km upstream and return downstream to the original point in 4 hrs 30 min. Find out the speed of the stream.
SURFACE AREAS AND VOLUMES

1. A solid is in the form of a right circular cone mounted on a hemisphere. The radius of the hemisphere is 3.5 cm and the height of the cone is 4 cm. The solid is placed in a cylindrical tub, full of water, in such a way that the whole solid is submerged in water. If the radius of the cylindrical tub is 5 cm and its height is 10.5 cm, find the volume of water left in the cylindrical tub.

2. A bucket of height 8 cm and made up of copper sheet is in the form of frustum of a right circular cone with radii of its lower and upper ends as 3 cm and 9 cm respectively. Calculate
   i) the height of the cone of which the bucket is a part
   ii) the volume of water which can be filled in the bucket
   iii) the area of copper sheet required to make the bucket

3. Two right circular cones X and Y are made X having 3 times the radius of Y and Y having half the Volume of X. Calculate the ratio of heights of X and Y.

4. A shuttlecock used for playing badminton has the shape of a frustum of a Cone mounted on a hemisphere. The external diameters of the frustum are 5 cm and 2 cm, and the height of the entire shuttlecock is 7cm. Find the external surface area.

5. A vessel in shape of a inverted cone is surmounted by a cylinder has a common radius of 7cm this was filled with liquid till it covered one third the height of the cylinder. If the height of each part is 9cm and the vessel is turned upside down. Find the volume of the liquid and to what height will it reach in the cylindrical part.

6. A cone of maximum size is carved out from a cube of edge 14 cm. Find the surface area of the cone and of the remaining solid left out after the cone carved out.

7. A solid metallic sphere of radius 10.5 cm is melted and recast into a number of smaller cones, each of radius 3.5 cm and height 3 cm. Find the number of cones so formed.

8. Three metallic solid cubes whose edges are 3 cm, 4 cm and 5 cm are melted and formed into a single cube. Find the edge of the cube so formed.

9. How many shots each having diameter 3 cm can be made from a cuboidal lead solid of dimensions 9cm × 11cm × 12cm?

10. A bucket is in the form of a frustum of a cone and holds 28.490 litres of water. The radii of the top and bottom are 28 cm and 21 cm, respectively. Find the height of the bucket.
11. A cone of radius 8 cm and height 12 cm is divided into two parts by a plane through the mid-point of its axis parallel to its base. Find the ratio of the volumes of two parts.

12. Two identical cubes each of volume 64 cm³ are joined together end to end. What is the surface area of the resulting cuboid?

13. From a solid cube of side 7 cm, a conical cavity of height 7 cm and radius 3 cm is hollowed out. Find the volume of the remaining solid.

14. Two cones with same base radius 8 cm and height 15 cm are joined together along their bases. Find the surface area of the shape so formed.

15. Marbles of diameter 1.4 cm are dropped into a cylindrical beaker of diameter 7 cm containing some water. Find the number of marbles that should be dropped into the beaker so that the water level rises by 5.6 cm.

16. How many spherical lead shots each of diameter 4.2 cm can be obtained from a solid rectangular lead piece with dimensions 66 cm, 42 cm and 21 cm.

17. How many spherical lead shots of diameter 4 cm can be made out of a solid cube of lead whose edge measures 44 cm.

18. A wall 24 m long, 0.4 m thick and 6 m high is constructed with the bricks each of dimensions 25 cm × 16 cm × 10 cm. If the mortar occupies 1/10th of the volume of the wall, then find the number of bricks used in constructing the wall.

19. Find the number of metallic circular disc with 1.5 cm base diameter and of height 0.2 cm to be melted to form a right circular cylinder of height 10 cm and diameter 4.5 cm.

20. A solid metallic hemisphere of radius 8 cm is melted and recast into a right circular cone of base radius 6 cm. Determine the height of the cone.

21. A rectangular water tank of base 11 m × 6 m contains water upto a height of 5 m. If the water in the tank is transferred to a cylindrical tank of radius 3.5 m, find the height of the water level in the tank.

22. How many cubic centimetre of iron is required to construct an open box whose external dimensions are 36 cm, 25 cm and 16.5 cm provided the thickness of the iron is 1.5 cm. If one cubic cm of iron weighs 7.5 g, find the weight of the box.

23. The barrel of a fountain pen, cylindrical in shape, is 7 cm long and 5 mm in diameter. A full barrel of ink in the pen is used up on writing 3300 words on an average. How many words can be written in a bottle of ink containing one fifth of a litre?

24. Water flows at the rate of 10m/minute through a cylindrical pipe 5 mm in diameter. How long would it take to fill a conical vessel whose diameter at the base is 40 cm and depth 24 cm?

25. A heap of rice is in the form of a cone of diameter 9 m and height 3.5 m. Find the volume of the rice. How much canvas cloth is required to just cover the heap?

26. A factory manufactures 120000 pencils daily. The pencils are cylindrical in shape each of length 25 cm and circumference of base as 1.5 cm. Determine the cost of colouring the curved surfaces of the pencils manufactured in one day at Rs 0.05 per dm².
1. The $n^{th}$ term of an AP is $6n+2$. Find its common difference.
2. Find the sum of first 22 terms of the AP $8, 3, -2, \ldots$
3. Which term of the AP $14, 11, 8, \ldots$ is $-1$?
4. The first and last terms of an AP are $1$ and $11$ respectively. If the sum of its terms is $36$, find the number of terms.
5. Find the $6^{th}$ term from the end of the AP:
   $17, 14, 11, \ldots, -40$.
6. Find the $12^{th}$ term of the AP with first term $9$ and common difference $10$.
7. Find the sum of all the natural numbers less than $100$ which are divisible by $6$.
8. In an AP, the first term is $-4$, the last term is $29$ and the sum of all its terms is $150$. Find its common difference.
9. Determine the $25^{th}$ term of an AP whose $9^{th}$ term is $-6$ and common difference is $5/4$.
10. In an AP, the $24^{th}$ term is twice the $10^{th}$ term. Prove that the $36^{th}$ term is twice the $16^{th}$ term.
11. The fifth term of an AP is $1$ where as its $31^{st}$ term is $-77$. Which term of the AP is $-17$?
12. If the sum of first $n$ terms of an AP is given by $S_n = 4n^2 - 3n$, find the $n^{th}$ term of the AP.
13. The sum of $n$ terms of an AP is $5n^2 - 3n$. Find the AP and also its $10^{th}$ term.
14. The sum of the $4^{th}$ and $8^{th}$ terms of an AP is $24$ and the sum of the $6^{th}$ and $10^{th}$ terms is $44$. Find the first 3 terms of the AP.
15. The first and last terms of an AP are $17$ and $350$ respectively. If the common difference is $9$, how many terms are there in the AP and what is their sum?
16. Find the sum of all multiples of $5$ lying between $101$ and $999$.
17. Find the $27^{th}$ and the $n^{th}$ terms of the sequence $5, 2, -1, -4, -7, \ldots$
18. Which term of the AP $5, 13, 21, \ldots$ is $181$?
19. Find the sum of first $10$ terms of the arithmetic progression $-0.5, -1.0, -1.5, \ldots$
20. The sum of $n$ terms of an AP is $4n^2 + 5n$. Find the AP.
1. A pair of dice is tossed once, find the probability of getting
   a) a total of 2
   b) a total of 5  c) an even number as the sum
   d) same number on each dice
2. One card is drawn from a well shuffled deck of 52 playing cards. Find the probability of getting
   a) A face card b) A black queen or a red king
   c) a king of red colour  d) the jack of hearts  e) a spade  f) either a king or a queen
   g) neither a king nor a queen
3. Cards marked with numbers 5,6,7,......................74 are placed in a bag and mixed thoroughly. One card is drawn at random from the bag. Find the probability that the number on the card is a perfect square.
4. Two coins are tossed simultaneously. Find the probability of getting
   a) two heads  b) at least one head  c) no head  d) one head  e) at most one head.
5. 17 cards numbered 1,2,3,........,16,17 are put in a box and mixed thoroughly. One person draws a card from the box. Find the probability that the number on the card is
   a) odd  b) prime  c) divisible by 3  d) divisible by 3 & 2 both.
6. Three unbiased coins are tossed together. Find the probability of getting
   a) one head  b) all heads  c) at least one head and one tail  d) at most two heads
7. In a single throw of two dice, find the probability of getting
   a) a doublet of odd numbers  b) getting a sum greater than 10  c) the sum as a prime number.
8. Malika and Deepika are friends. What is the probability that both have
   a) different birthdays  b) same birthday (ignoring a leap year)
9. What is the probability that a non leap year selected at random has 53 Sundays.
10. A bag contains 16 balls out of which x are green.
    a) If one ball is drawn at random, what is the probability that it will be a green ball.
    b) If 8 more green balls are put in the bag, the probability of drawing a green ball will be double that in the first case. Find x.
11. A letter is chosen at random from the given word. Find the probability that the letter is a vowel, if the word is MATHEMATICS.
12. If the probability of winning a game is 0.7, what is the probability of losing it.
13. Find the probability that the month February may have 5 Mondays in a
    a) a leap year  b) a non leap year
14. A bag contains 8 red balls, 12 green balls and some white and blue balls.
    a) If the probability of drawing a red ball is double that of a blue ball, find the number of blue balls in the bag.
    b) If the probability of drawing a green ball is three times the probability of drawing a white ball, find the number of white balls in the bag.
15. A die is thrown twice. What is the probability that
    a) 5 will come up either time
    b) 5 will come up at least once.
1. Find the length of tangent drawn from a point whose distance from centre of a circle is 25 cm. Given that radius of the circle is 7 cm (26 cm).

2. 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 = 13 cm. Find the length PQ (12 cm).

3. In ΔABC, AB = AC, if the interior circle of ΔABC touches the sides AB, BC and CA at D, E, F respectively. Prove that E bisects BC.

4. If angle between two tangents drawn from a point P to a circle of radius a and centre O is 60°, then prove that AP = a√3.

5. A circle is inscribed in ΔABC, with the sides AC, AB and BC are 8 cm, 10 cm and 12 cm respectively. Find the lengths of AD, BE and CF (3 cm, 7 cm, 5 cm).

6. In the given fig: if BC = 4.5 cm, find the length of AB (9 cm).

7. In the given fig: BOA is a diameter of a circle with centre O and the tangent at a point P meets BA extended at T. If ∠PBO = 30°, then find ∠PTA (30°).

8. PQ is a tangent drawn from a point P to a circle with centre O and QOR is a diameter of the circle such that ∠POR = 110°, find ∠OPQ (20°).

9. In fig: O is the centre of the circle, PQ is a tangent to the circle at A. If ∠PAB = 58°, find ∠ABQ and ∠AQB (26°, 128°).

10. In the given fig: ΔABC is a right-angled triangle, right-angled at A with AB = 6 cm and AC = 8 cm. A circle with centre O has been inscribed in the triangle. Find the radius of the circle (2 cm).

11. A circle touches the side BC of ΔABC at P and touches AB and AC produced at Q and R respectively. Prove that AQ = ½ (Perimeter of ABC).
12. $XP$, $XQ$ are tangent from $X$ to the circle with centre $O$. $R$ is a point on the circle. Prove that $XA + AR = XB + BR$.

13. Let $S$ denote the semi perimeter of triangle $ABC$ in which $BC = a$, $CA = b$, $AB = c$. If the triangle touches the sides $BC$, $CA$ and $AB$ at $D$, $E$, $F$ respectively, prove that $BD = s - b$.

14. Tangents $PA$ and $AQ$ are drawn to a circle with centre $O$ from an external point $A$. Prove that $\angle PAQ = 2 \angle OQP$.

15. In the figure: a circle inscribed in a quadrilateral $ABCD$ touching the sides $AB$, $BC$, $CD$ and $AD$ at $P$, $Q$, $R$, and $S$ respectively. If the radius of the circle is $10$ cm, $BC = 38$ cm, $PB = 27$ cm and $AD = CD$, find the length of $CD$. (21 cm)