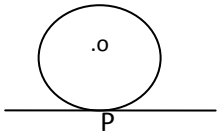
Circle

KEY POINTS

Tangent to a circle :

A tangent to a circle is a line that intersect the circle at only one point.



P= point of contact

- There is only one tangent at a point on a circle.
- There are exactly two tangents to a circle through appoint lying out side the circle.
- The tangent at any point of a circle is perpendicular to the radius through the point of contact.
- The length of tangents drown from an external point to a circle are equal.

(1 Mark Questions)

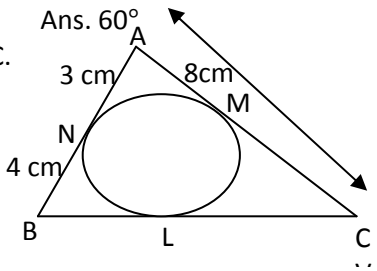
1. If radii of the two concentric circles are 15cm and 17cm , then find the length of each chord of one circle which is tangent to one other.

Ans. 16cm

2. If two tangents making an angle of 120^0 with each other , are drawn to a circle of radius 6cm, then find the angle between the two radii, which are drawn to the tangents.

Ans. 60°

3. In the adjoining figure ,Δ ABC is circumscribing a circle , then find the length of BC.



Ans. 9cm

4. PQ is a chord of a circle and R is point on the minor arc. If PT is a tangent at point P such that ∠QPT = 60° then find <PRQ.

Ans. 120°

5. If a tangent PQ at a point P of a circle of radius 5cm meets a line through the centre O at a point Q such that OQ = 12 cm then find the length of PQ.

Ans. $\sqrt{119}$cm

6. From a point P, two tangents PA and PB are drawn to a circle C(O,r) . If OP =2r ,then what is the type of Δ APB.

Ans. Equilateral triangle

7. If the angle between two radii of a circle is 130°,then find the angle between the tangents at the end of the radii.

Ans. 50°.

8. ABCD is a quadrilateral. A circle centred at O is inscribed in the quadrilateral. If AB = 7cm , BC = 4cm , CD = 5cm then find DA.

Ans. 8 cm

9. In a Δ ABC , AB = 8cm , ∠ABC = 90°. Then find the radius of the circle inscribed in the triangle.

Ans. 2cm

(Two Marks Questions)

1. Two tangents PA and PB are drawn from an external point P to a circle with centre O. Prove that OAPB is a cyclic quadrilateral.

2. If PA and PB are two tangents drawn to a circle with centre O , from an external point P such that PA=5cm and ∠APB = 60°, then find the length of the chord AB.

Ans. 5cm

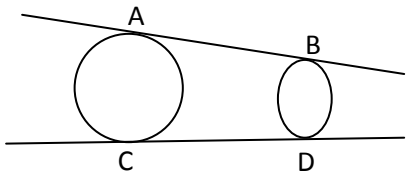
3. CP and CQ are tangents from an external point C to a circle with centre O .AB is another tangent which touches the circle at R and intersects PC and QC at A and B respectively . If CP = 11cm and BR = 4cm, then find the length of BC.

Ans. 7cm

4. If all the sides of a parallelogram touch a circle, show that the parallelogram is a rhombus.

5. Prove that the perpendicular at the point of contact to the tangent to a circle passes through the centre of the circle.

6. In adjacent figure; AB & CD are common tangents to two circles of unequal radii. Prove that AB=CD.



(Three Marks Questions)

1. If quadrilateral ABCD is drawn to circumscribe a circle then prove that AB+CD=AD+BC.

2. Prove that the angle between the two tangents to a circle drawn from an external point, is supplementary to the angle subtended by the line segment joining the points of contact to the centre.

3. AB is a chord of length 9.6cm of a circle with centre O and radius 6cm.If the tangents at A and B intersect at point P then find the length PA.

Ans. 8cm

4. The incircle of a ΔABC touches the sides BC, CA &AB at D,E and F respectively. If AB=AC, prove that BD=CD.

5. Prove that the intercept of a tangent between two parallel tangents to a circle subtends a right angle at the centre of the circle.

6. PQ and PR are two tangents drawn to a circle with centre O from an external point P. Prove that ∠QPR=2∠OQR.

(Four Marks Questions)

1. Prove that the length of tangents drawn from an external point to a circle are equal. Hence, find BC, if a circle is inscribed in a ΔABC touching AB,BC &CA at P,Q &R respectively, having AB=10cm, AR=7cm &RC=5cm.

   Ans. 8cm

2. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact. Using the above, do the following: If O is the centre of two concentric circles, AB is a chord of the larger circle touching the smaller circle at C, then prove that AC=BC.

3. A circle touches the side BC of a ΔABC at a point P and touches AB and AC when produced, at Q & R respectively. Show that AQ=1/2 (perimeter of ΔABC).

4. From an external point P, a tangent PT and a line segment PAB is drawn to circle with centre O, ON is perpendicular to the chord AB. Prove that $PA.PB=PN^2-AN^2$.

5. If AB is a chord of a circle with centre O, AOC is diameter and AT is the tangent at the point A, then prove that ∠BAT=∠ACB.

6. The tangent at a point C of a circle and diameter AB when extended intersect at P. If $\angle PCA=110^0$, find ∠CBA.

   Ans. 70^0

[Self Evaluation/HOTS Questions]

1. If PA and PB are tangents from an external point P to the circle with centre O, the find ∠AOP+∠OPA.

   Ans. 90^0

2. ABC is an isosceles triangle with AB=AC, circumscribed about a circle . Prove that the base is bisected by the point of contact.

3. AB is diameter of a circle with centre O. If PA is tangent from an external point P to the circle with $\angle POB=115^0$ then find ∠OPA.

   Ans. 25^0

4. PQ and PR are tangents from an external point P to a circle with centre . If $\angle RPQ=120^0$, Prove that OP=2PQ.

5. If the common tangents AB and CD to two circles C(O,r) and C'(O'r') intersect at E, then prove that AB=CD.

6. If a, b, c are the sides of a right triangle where c is the hypotenuse , then prove that radius r of the circle touches the sides of the triangle is given by r= (a+b-c)/2.

CONSTRUCTION

KEY POINTS

1. Division of line segment in the given ratio.
2. Construction of triangles:-
   a. When three sides are given.
   b. When two sides and included angle given.
   c. When two angles and one side given.
   d. Construction of right angled triangle.
3. Construction of triangle similar to given similar to given triangle as per given scale.
4. Construction of triangles to a circle.

LEVEL - I

1. Divide a line segment in given ratio.
2. Draw a line segment AB=8cm and divide it in the ratio 4:3.
3. Divide a line segment of 7cm internally in the ratio 2:3.
4. Draw a circle of radius 4 cm. Take a point P on it. Draw tangent to the given circle at P.
5. Construct an isosceles triangle whose base 7.5 cm and altitude is 4.2 cm.

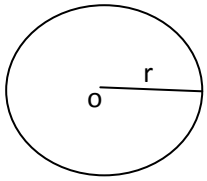
LEVEL –II

1. Construct a triangle of sides 4cm , 5cm and 6cm and then triangle similar to it whose side are 2/3 of corresponding sides of the first triangle.
2. Construct a triangle similar to a given ΔABC such that each of its sides is $2/3^{rd}$ of the corresponding sides of ΔABC. It is given that AB=4cm BC=5cm and AC=6cm also write the steps of construction.
3. Draw a right triangle ABC in which $\angle B=90^0$ AB=5cm, BC=4cm then construct another triangle ABC whose sides are 5/3 times the corresponding sides of ΔABC.
4. Draw a pair of tangents to a circle of radius 5cm which are inclined to each other at an angle of 60^0.
5. Draw a circle of radius 5cm from a point 8cm away from its centre construct the pair of tangents to the circle and measure their length.
6. Construct a triangle PQR in which QR=6cm $\angle Q=60^0$ and $\angle R=45^0$. Construct another triangle similar to ΔPQR such that its sides are 5/6 of the corresponding sides of ΔPQR.

AREAS RELATED TWO CIRCLES

KEY POINTS

1. Circle: The set of points which are at a constant distance of r units from a fixed point o is called a circle with centre o.



2. Circumference: The perimeter of a circle is called its circumference.

3. Secant: A line which intersects a circle at two points is called secant of the circle.

4. Arc: A continuous piece of circle is called and arc of the circle..

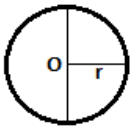
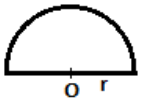
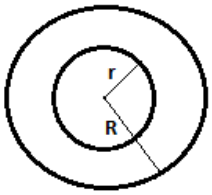
5. Central angle:- An angle subtended by an arc at the center of a circle is called its central angle.

6. Semi Circle: - A diameter divides a circle into two equal arc. Each of these two arcs is called a semi circle.

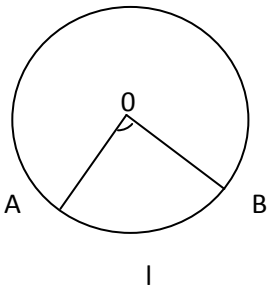
7. Segment :- A segment of a circle is the region bounded by an arc and a chord, including the arc and the chord.

8. Sector f of a circle: The region enclosed by and an arc of a circle and its two bounding radii is called a sector of the circle.

9. Quadrant:- One fourth of a circle disc is called a quadrant. The central ang of a quadrant is 90^0.

S.N	NAME	FIGURE	PERIMETER	AREA
1.	Circle		$2\pi r$ or πd	πr^2
2.	Semi- circle		πr + 2r	½ πr^2
3.	Ring (Shaded region)		2 $\pi(r$ + R)	π(R^2-r^2)
4.	Sector of a circle		l+2r=$\frac{\pi r\theta}{180^\circ} + 2r$	$\frac{\pi r^2\theta}{360^\circ}$ or $\frac{1}{2}lr$
5.	Segment of a circle		$\frac{\pi r\theta}{180^\circ}$+2r Sin$\frac{\theta}{2}$	$\frac{\pi r^2\theta}{360^\circ}$ - $\frac{1}{2}r^2\sin\theta$

a. Length of an arc AB= $\frac{\theta}{360}$ 2 πr



b. Area of major segment= Area of a circle – Area of minor segment

c. Distance moved by a wheel in
1 rotation=circumference of the wheel

d. Number of rotation in 1 minute

=Distance moved in 1 minute / circumference

LEVEL-I

1. If the perimeter of a circle is equal to that of square, then the ratio of their areas is
   i. 22/7
   ii. 14/11
   iii. 7/22
   iv. 11/14 [Ans-ii]

2. The area of the square that can be inscribed in a circle of 8 cm is
   i. 256 cm^2
   ii. 128 cm^2
   iii. 64√2 cm^2
   iv. 64 cm^2 [Ans-ii]

3. Area of a sector to circle of radius 36 cm is 54 πcm^2 . Find the length arc of the corresponding arc of the circle is
   i. 6 πcm
   ii. 3 πcm
   iii. 5 πcm
   iv. 8 πcm

   [Ans –ii]

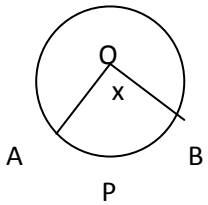
4. A wheel has diameter 84 cm. The number of complete revolution it will take to cover 792 m is.
   i. 100
   ii. 150
   iii. 200
   iv. 300 [Ans-iv]

5. The length of an arc of a circle with radius 12cm is 10 π cm. The central angle of this arc is .
   i. 120^0 [Ans-iv]
   ii. 60^0
   iii. 75^0
   iv. 150^0

6. The area of a quadrant of a circle whose circumference is 22 cm is
   i. 7/2 cm^2
   ii. 7 cm^2
   iii. 3 cm^2
   iv. 9.625 cm^2 [Ans-iv]

LEVEL-II

1. In figure ‘o’ is the centre of a circle. The area of sector OAPB is 5/18 of the area of the circle find x.
   [Ans 100]



2. If the diameter of a semicircular protractor is 14 cm, then find its perimeter . [Ans-36 cm]

3. The radius of two circle are 3 cm and 4 cm . Find the radius of a circle whose area is equal to the sum of the areas of the two circles.

[Ans: 5 cm]

4. The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes.

[Ans: 154/3 cm]

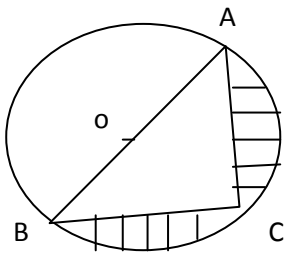
5. The radii of two circle are 3 cm and 4 cm . Find the radius of a circle whose area is equal to the sum of the areas of the two circles.

[Ans 5cm]

LEVEL-III

1. Find the area of the shaded region in the figure if AC=24 cm ,BC=10 cm and o is the center of the circle (use $\pi = 3.14$)

[Ans- 145.33 cm^2]

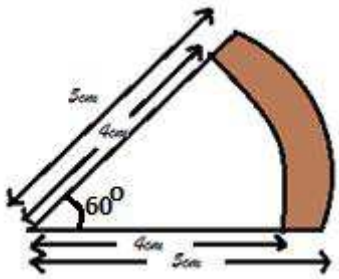


2. The inner circumference of a circular track is 440m. The track is 14m wide. Find the diameter of the outer circle of the track. [Take π =22/7]

[Ans-168]

3. Find the area of the shaded region.

[Ans: 4.71 cm^2]



4. A copper wire when bent in the form of a square encloses an area of 121 cm^2 . If the same wire is bent into the form of a circle, find the area of the circle (Use π=22/7)

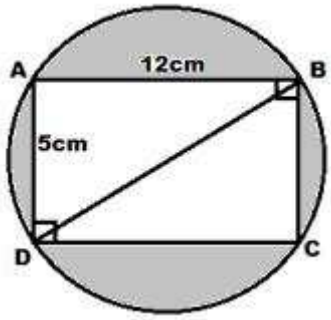
[Ans 154 cm^2]

5. A wire is looped in the form of a circle of radius 28cm. It is rebent into a square form. Determine the side of the square (use $\pi = 22/7$)

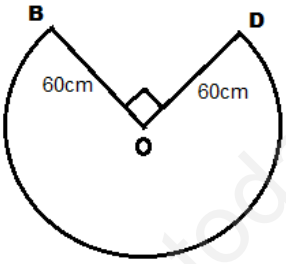
[Ans-44cm]

LEVEL-IV

1. In fig, find the area of the shaded region [use $\pi = 3.44$]



2. In fig find the shape of the top of a table in restaurant is that of a sector a circle with centre 0 and $\angle bod=90^0$. If OB=OD=60cm fnd
   i. The area of the top of the table [Ans 8478 cm^2]
   ii. The perimeter of the table top (Take $\pi = 3.44$) [Ans 402.60 cm]



3. An arc subtends an angle of 90^0 at the centre of the circle of radius 14 cm. Write the area of minor sector thus form in terms of π.

   [Ans 49π cm^2]

4. The length of a minor arc is 2/9 of the circumference of the circle. Write the measure of the angle subtended by the arc at the center of the circle.

   [Ans 80^0]

5. The area of an equilateral triangle is $49\sqrt{3}$ cm^2. Taking each angular point as center, circle are drawn with radius equal to half the length of the side of the triangle. Find the area of triangle not included in the circles. [Take π $\sqrt{3}$=1.73] [Ans 777cm^2]

SELF EVALUATION

1. Two circles touch externally the sum of the areas is 130 π cm^2 and distance between there center is 14 cm. Find the radius of circle.

2. Two circle touch internally. The sum of their areas is 116 π cm^2 and the distance between there centers is 6 cm. Find the radius of circles.

3. A pendulum swings through an angle of 30^0 and describes and arc 8.8 cm in length. Find length of pendulum.

4. What is the measure of the central angle of a circle?

5. The perimeter and area of a square are numerically equal. Find the area of the square.