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CLASS : 10th
SUB : Maths
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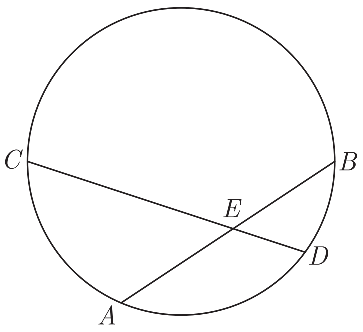
CHAPTER 10

Circles

1. OBJECTIVE QUESTIONS

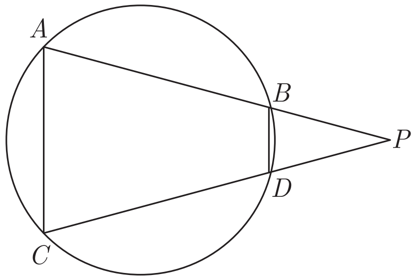
1. Two chords AB and CD of a circle intersect at E such that $AE = 2.4\text{ cm}$, $BE = 3.2\text{ cm}$ and $CE = 1.6\text{ cm}$. The length of DE is
(a) 1.6 cm (b) 3.2 cm
(c) 4.8 cm (d) 6.4 cm

Ans : (c) 4.8 cm



Apply the rule,
$$AE \times EB = CE \times ED$$
$$2.4 \times 3.2 = 1.6 \times ED$$
$$ED = 4.8\text{ cm}$$

2. In the figure below (not to scale), $AB = CD$ and $\overline{AB}$ and $\overline{CD}$ are produced to meet at the point p.



If $\angle BAC = 70°$, then $\angle P$ is
(a) 30° (b) 40°
(c) 45° (d) 50°

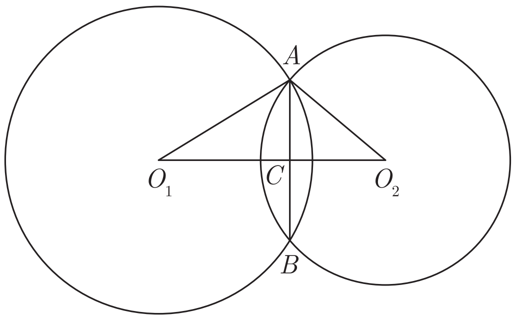
Ans : (b) 40°
Exterior angle of a cyclic quadrilateral is equal to its interior opposite angle.
$$\angle BAC = \angle DCA \text{ and proceed}$$

3. If a regular hexagon is inscribed in a circle of radius r, then its perimeter is
(a) $3r$ (b) $6r$
(c) $9r$ (d) $12r$

Ans : (b) $6r$
Side of the regular hexagon inscribed in a circle of radius r is also r, the perimeter is $6r$.

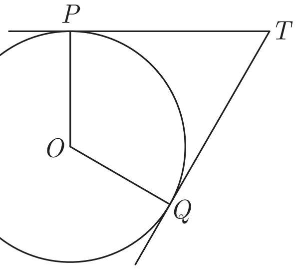
4. Two circles of radii 20 cm and 37 cm intersect in A and B. If O_1 and O_2 are their centres and $AB = 24\text{ cm}$, then the distance O_1O_2 is equal to
(a) 44 cm (b) 51 cm
(c) 40.5 cm (d) 45 cm

Ans : (b) 51 cm



C is the mid-point of AB so that
$$AC = 12$$
$$AO_1 = 37$$
and
$$AO_2 = 20$$
$$CO_1 = \sqrt{37^2 - 12^2} = 35$$
$$CO_2 = \sqrt{20^2 - 12^2} = 16$$
$$O_1O_2 = 35 + 16 = 51$$

5. In the adjoining figure, TP and TQ are the two tangents to a circle with centre O. If $\angle POQ = 110°$, then $\angle PTQ$ is



(a) 60° (b) 70°
(c) 80° (d) 90°

Ans : (b) 70°
$OP \perp PT, OQ \perp QT$.

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In quad. $OPTQ$,

$\angle POQ + \angle OPT + \angle PTQ + \angle OQT = 360°]$

$$110° + 90° + \angle PTQ + 90° = 360°$$

$$\angle PTQ = 70°$$

6. In two concentric circles, if chords are drawn in the outer circle which touch the inner circle, then

(a) all chords are of different lengths.

(b) all chords are of same length.

(c) only parallel chords are of same length.

(d) only perpendicular chords are of same length.

Ans : (b) all chords are of same length.

7. Number of tangents to a circle which are parallel to a secant, is

(a) 3 (b) 2

(c) 1 (d) infinite

Ans : (b) 2

Only two tangents are parallel to a secant.

8. AB and CD are two common tangents to circles which touch each other at a point C. If D lies on AB such that $CD = 4$ cm then AB is

(a) 12 cm (b) 8 cm

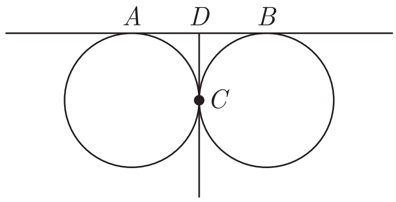
(c) 4 cm (d) 6 cm

Ans : (b) 8 cm

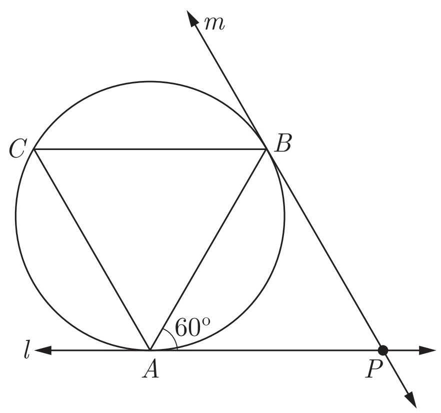
$$AD = CD \text{ and } BD = CD$$

$$AB = AD + BD = CD + CD$$

$$= 2CD = 2 \times 4 = 8 \text{ cm}$$



9. In the diagram below, if l and m are two tangents and AB is a chord making an angle of $60°$ with the tangent l, then the angle between l and m is



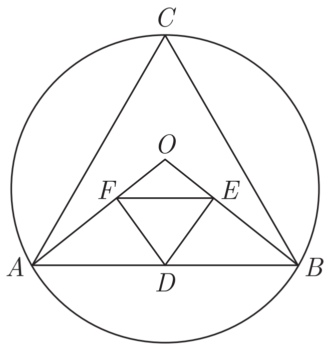
(a) 45° (b) 30°

(c) 60° (d) 90°

Ans : (c) 60°

Tangents drawn to a circle from an external point are equal.

10. In the diagram, O is the centre of the circle and D, E and F and mid points of AB, BO and OA respectively. If $\angle DEF = 30°$, then $\angle ACB$ is



(a) 30° (b) 60°

(c) 90° (d) 120°

Ans : (b) 60°

1. $ADEF$ ia a parallelogram.
2.

$$\angle FAD = 30° \text{ and}$$

$$\angle OAD = \angle OBA$$

(angles opposite to equal sides)

11. An equation of the circle with centre at (0, 0) and radius r is

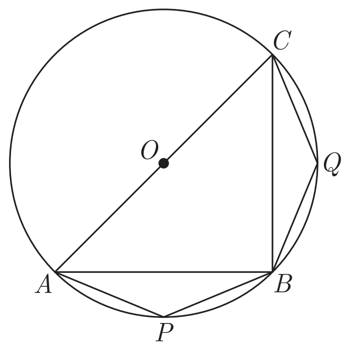
(a) $x^2 + y^2 = r^2$ (b) $x^2 - y^2 = r^2$

(c) $x - y = r$ (d) $x^2 + r^2 = y^2$

Ans : (a) $x^2 + y^2 = r^2$

Here, $h = k = 0$. Therefore, the equation of the circle is $x^2 + y^2 = r^2$.

12. In the below diagram, O is the centre of the circle, AC is the diameter and if $\angle APB = 120°$, then $\angle BQC$ is



(a) 30° (b) 150°

(c) 90° (d) 120°

Ans : (b) 150°

1. $APBC$ is a cyclic quadrilateral.
2. $\angle ABC$ is a angle in a semi circle.
3. $ABQC$ is a cyclic quadrilateral.

13. If the equation of a circle is $(4a-3)x^2+ay^2+6x-2y+2=0$, then its centre is

(a) $(3,-1)$ (b) (3, 1)

(c) $(-3,1)$ (d) None of these

Ans : (c) $(-3,1)$

Since the given equation represents a circle, therefore,

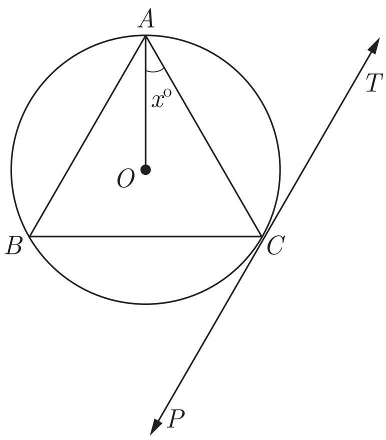
$$4a-3 = a \text{ i.e., } a=1$$

(coefficients of x^2 and y^2 must be equal)

$$x^2+y^2+6x-2y+2 = 0$$

The coordinates of centre are $(-3,1)$.

14. In the adjoining figure, PT is a tangent at point C of the circle. O is the circumcentre of ΔABC. If $\angle ACP = 118°$, then the measure of $\angle x$ is



(a) 28° (b) 32°

(c) 42° (d) 38°

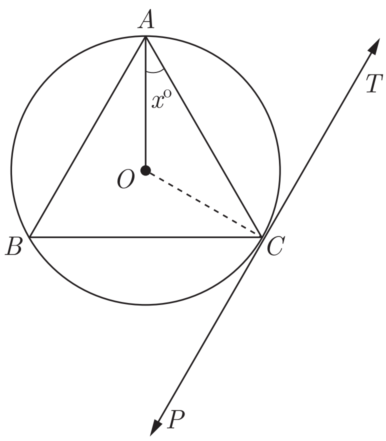
Ans : (a) 28°

Join OC as shown in the below figure.

OC is the radius and PT is the tangent to circle at point C.

$$OC \perp PT$$

$$\angle OCP = 90°$$



Given, $\angle ACP = 118°$

$$\angle ACO = \angle ACP - \angle OCP$$

$$= 118° - 90°$$

$$\angle ACO = 28°$$

Sicne O is the circumcentre, thus $OA = OC$ (radius)

$$\angle OAC = \angle OCA$$

$$x = 28°$$

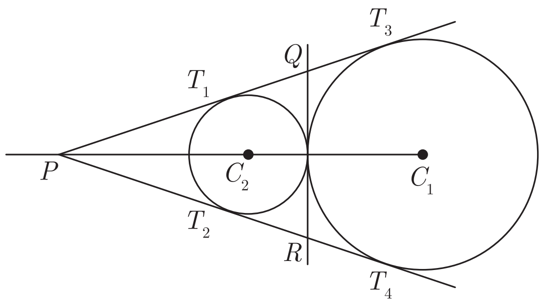
15. The common tangents to the circles $x^2+y^2+2x=0$ and $x^2+y^2-6x=0$ form a triangle which is

(a) equilateral (b) isosceles

(c) right angled (d) None of these

Ans : (b) isosceles

The central of the first circle is $C_1(-2,0)$ and radius $=2$. The centre of the second circle is $C_2(6,0)$ and radius $=6$. Clearly, the distance between the centres of the given circles is equal to the sum of their radii. So, two circles touch each other extenally.



We have, $PT_1 = PT_2$

and $PT_3 = PT_4$

$$T_1T_3 = T_2T_4$$

$$T_1Q = T_2R$$

$$PT_1 + T_1Q = PT_1 + T_2R$$

$$PT_1 + T_1Q = PT_2 + T_2R$$

$$PQ = QR$$

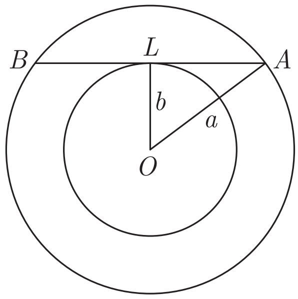
So, ΔPQR is isosceles.

16. Two concentric circles of radii a and b where $a > b$, are given the length of a chord of the larger circle which touches the other circle is

(a) $\sqrt{a^2+b^2}$ (b) $2\sqrt{a^2+b^2}$

(c) $\sqrt{a^2-b^2}$ (d) $2\sqrt{a^2-b^2}$

Ans : (d) $2\sqrt{a^2-b^2}$



In ΔOAL,

$$OA^2 = OL^2 + AL^2$$

$$a^2 = OL^2 + b^2$$

$$OL = \sqrt{a^2-b^2}$$

$$\text{Length of chord} = 2AL = 2\sqrt{a^2-b^2}$$

17. The equation of the circle which passes through the point (4, 5) and has its centre at (2, 2) is
(a) $(x-2)+(y-2)=13$
(b) $(x-2)^2+(y-2)^2=13$
(c) $(x)^2+(y)^2=13$
(d) $(x-4)^2+(y-5)^2=13$

Ans : (b) $(x-2)^2+(y-2)^2=13$

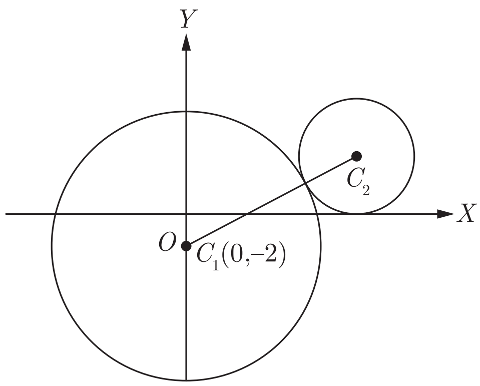
As the circle is passing through the point (4, 5) and its centre is (2, 2) so its radius is

$$\sqrt{(4-2)^2+(5-2)^2} = \sqrt{13}$$

Therefore, the required equation is

$$(x-2)^2+(y-2)^2 = 13$$

18. In the given figure, the equation of the larger circle is $x^2+y^2+4y-5=0$ and the distance between centres is 4. Then the equation of smaller circle is



(a) $(x-\sqrt{7})^2+(y-1)^2=1$
(b) $(x+\sqrt{7})^2+(y-1)^2=1$
(c) $x^2+y^2=2\sqrt{7}\,x+2y$
(d) None of these

Ans : (a) $(x-\sqrt{7})^2+(y-1)^2=1$

We have, $x^2+y^2+4y-5 = 0$

Its centre is $C_1(0,-2)$,

$$r_1 = \sqrt{4+5}=3$$

Let $C_2(h,k)$ be the centre of the smaller circle and its radius r_2.

Then, $C_1C_2 = 4$

$$\sqrt{h^2+(k+2)^2} = 3+r_2=4 \quad ...(1)$$

$$r_2 = 1$$

But, $k = r_2 = 1$ [it touches x-axis]

From eq. (1), $4 = \sqrt{h^2+(1+2)^2}$

$$16 = h^2+9$$

$$h^2 = 7$$

$$h = \pm\sqrt{7}$$

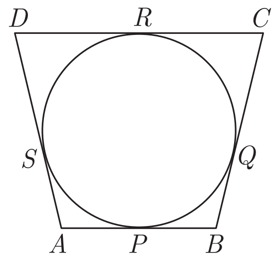
Since, $h > 0$

$$h = \sqrt{7}$$

Hence, required circle is,

$$(x-\sqrt{7})^2+(y-1)^2 = 1$$

19. In the given figure, a circle touches all the four sides of quadrilateral $ABCD$ with $AB=6$ cm, $BC=7$ cm and $CD=4$ cm, then length of AD is:

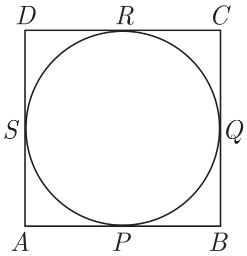


(a) 3 cm (b) 4 cm
(c) 5 cm (d) 6 cm

Ans : (a) 3 cm

We know that four sides of a quadrilateral $ABCD$ are tangent to a circle.

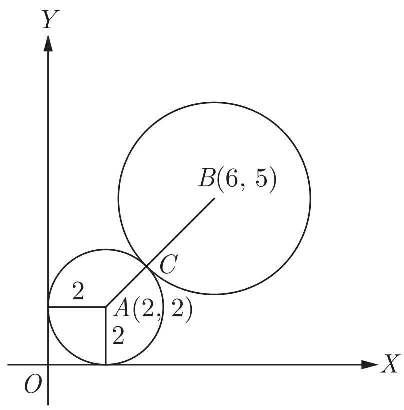
$$AB+CD = BC+AD$$



$$6+4 = 7+AD$$

$$AD = 10-7$$

$$= 3 \text{ cm}$$



[the two circles touch each other externally]

The equation of the required circle is,

$$(x-6)^2+(y-5)^2 = 3^2$$

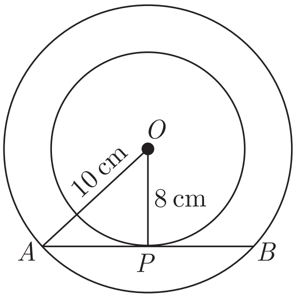
or $x^2+y^2-12x-10y+52 = 0$

20. Two concentric circles are of radii 10 cm and 8 cm, then the length of the chord of the larger circle which touches the smaller circle is:
(a) 6 cm (b) 12 cm
(c) 18 cm (d) 9 cm

Ans : (b) 12 cm

Let O be the centre of the concentric circles of radii 10 cm and 8 cm, respectively. Let AB be a chord of the larger circle touching the smaller circles at P.

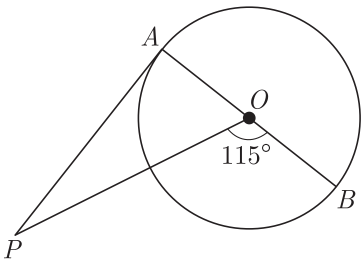
Then, $AP = PB$ and $OP \perp AB$



Applying Pythagoras theorem in ΔOPA,

$$OA^2 \quad OP^2 + AP^2$$
$$100 = 64 + AP^2$$
$$AP^2 = 36$$
$$AP = 6 \text{ cm}$$
$$AB = 2AP$$
$$= 2 \times 6$$
$$= 12 \text{ cm}$$

21. In the given figure, PA is a tangent from an external point P to a circle with centre O. If $\angle POB = 115°$, then perimeter of $\angle APO$ is:



(a) 25° (b) 20°
(c) 30° (d) 65°

Ans : (a) 25°

Here, $\angle OAP = 90°$

[Tangent at a point to a circle is perpendicular to the radius]

Now, $\angle AOP + \angle BOP = 180°$

$$\angle AOP + 115° = 180°$$
$$\angle AOP = (180° - 115°)$$
$$= 65°$$

And also,

$$\angle OAP + \angle AOP + \angle APO = 180°$$

[angle sum property of triangle]

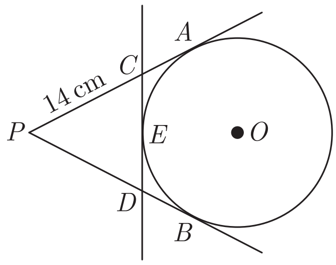
$$90° + 65° + \angle APO = 180°$$
$$155° + \angle APO = 180°$$
$$\angle APO = 180° - 155°$$
$$= 25°$$

22. From an external point P, tangents PA and PB are drawn to a circle with centre O. If CD is the tangent to the circle at a point E and $PA = 14$ cm, the perimeter of ΔPCD is:

(a) 14 cm (b) 21 cm
(c) 28 cm (d) 35 cm

Ans : (c) 28 cm

We have, $PA = PB = 14$ cm



Also, CD is tangent at point E on the circle.

So, CA and CE are tangent to the circle from point C.

Therefore, $CA = CE$,

Similarly, $DB = DE$

Now, perimeter of ΔPCD

$$= PC + CD + PD$$
$$= PC + CE + ED + PD$$
$$= PC + CA + PD + DB$$

[$CA = CE$ and $DE = DB$]

$$= PA + PB$$
$$= 14 + 14$$
$$= 28 \text{ cm}$$

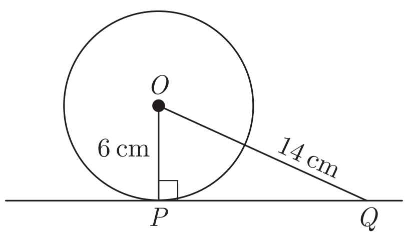
23. A tangent PQ at a point P of a circle of radius 6 cm meets a line through the centre O. If CD is the tangent to the circle at a point E and $PA = 14$ cm, then perimeter of ΔPCD is:

(a) $4\sqrt{10}$ cm (b) $6\sqrt{10}$ cm
(c) $5\sqrt{10}$ cm (d) $7\sqrt{10}$ cm

Ans : (a) $4\sqrt{10}$ cm

Here, $OP = 6$ cm

and $OQ = 14$ cm



We know the tangent at any point of a circle is perpendicular to the radius through the point of contact.

So, $OP \perp PQ$

Now, in right angled ΔOPQ,

$$OQ^2 = OP^2 + PQ^2 \quad \text{[by Pythagoras theorem]}$$

$$(14)^2 = (6)^2 + PQ^2$$
$$PQ^2 = 196 - 36$$
$$PQ^2 = 160$$
$$PQ = \sqrt{16 \times 10}$$
$$= 4\sqrt{10} \text{ cm}$$

24. Tangents AP and AQ are drawn to circle with centre O from an external point A, then $\angle PAQ$ is equal to:

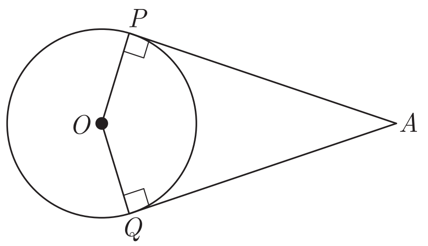
(a) $2\angle OPQ$ (b) $\frac{\angle OPQ}{2}$

(c) $\frac{\angle OPQ}{3}$ (d) $\frac{\angle OPQ}{4}$

Ans : (a) $2\angle OPQ$

Here, $AP = AQ$

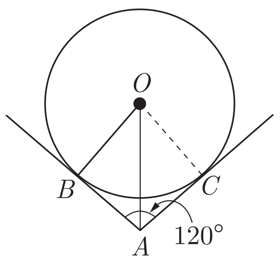
$$\angle APQ = AQP = x \text{ (say)}$$



In ΔAPQ, $\angle PAQ = 180° - (\angle APQ + \angle AQP)$

$$= 180° - (x + x)$$
$$= 180° - 2x$$
$$OP \perp AP$$
$$\angle OPA = 90°$$
$$\angle OPQ + \angle APQ = 90°$$
$$\angle OPQ + x = 90°$$
$$\angle OPQ = 90° - x$$
$$\angle PAQ = 2\angle OPQ$$

25. In the given figure, two tangents AB and AC are drawn to a circle with centre O such that $\angle BAC = 120°$, then OA is equal to that:



(a) $2AB$ (b) $3AB$

(c) $4AB$ (d) $5AB$

Ans : (a) $2AB$

In ΔOAB and ΔOAC, we have,

$$\angle OBA = \angle OCA = 90°$$

$OA = OA$ [common]

and $OB = OC$ [radii of circle]

So, by RHS congruence criterion,

$$\Delta OBA \cong \Delta OCA$$
$$\angle OAB = \angle OAC$$
$$= \frac{1}{2} \times 120° = 60°$$

In ΔOBA, we have,

$$\cos 60° = \frac{AB}{OA}$$
$$\frac{1}{2} = \frac{AB}{OA}$$
$$OA = 2AB$$

26. A circle of radius 2 lies in the first quadrant and touches both the axes of coordinates. The equation of the circle with centre at (6, 5) and touching the above circle externally is

(a) $x^2 + y^2 + 12x - 10y + 52 = 0$

(b) $x^2 + y^2 - 12x + 10y + 52 = 0$

(c) $x^2 + y^2 - 12x - 10y + 52 = 0$

(d) None of these

Ans : (c) $x^2 + y^2 - 12x - 10y + 52 = 0$

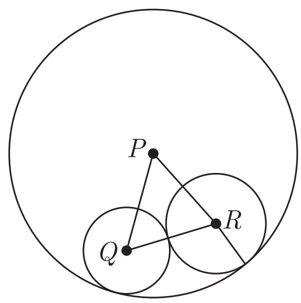
Given, $AC = 2$

$$A \equiv (2, 2)$$

Let, $B \equiv (6, 5)$

$$AB = \sqrt{(2-6)^2 + (2-5)^2} = 5$$
$$BC = AB - AC = 5 - 2 = 3$$

27. In the given figure, three circles with centres P, Q and R are drawn, such that the circles with centres Q and R touch each other externally and they touch the circle with centre P, internally. If $PQ = 10$ cm, $PR = 8$ cm and $QR = 12$ cm, then the diameter of the largest circle is:



(a) 30 cm (b) 20 cm

(c) 10 cm (d) None of these

Ans : (a) 30 cm

Let radii of the circles with centres P, Q and R are p, q and r, respectively.

Then, $PQ = p - q = 10$ [given] ...(1)

$PR = p - r = 8$ [given] ...(2)

and $QR = q + r = 12$ [given] ...(3)

Adding Eqs. (2) and (3), we get,

$p + q = 20$ ...(4)

Adding Eqs. (1) and (4), we get,

$$2p = 30$$

Hence, diameter of the largest circle

$$= 2p = 30 \text{ cm}$$

2. FILL IN THE BLANK

1. The lengths of the two tangents from an external point to a circle are ....
   Ans : parallel

2. A line that intersects a circle in one point only is called ....
   Ans : tangent

3. The tangents drawn at the ends of a diameter of a circle are ....
   Ans : two

4. A tangent of a circle touches it at .... point(s).
   Ans : one

5. Tangent is perpendicular to the .... through the point of contact.
   Ans : radius

6. A line intersecting a circle at two points is called a ....
   Ans : secant

7. A circle can have .... parallel tangents at the most.
   Ans : two

8. .... is the Latin word from which the word tangent has been derived.
   Ans : Tangere

9. The common point of a tangent to a circle and the circle is called ....
   Ans : point of contact

10. There is no tangent to a circle passing through a point lying .... the circle.
    Ans : inside

11. The tangent to a circle is .... to the radius through the point of contact.
    Ans : perpendicular

12. There are exactly two tangents to a circle passing through a point lying .... the circle.
    Ans : outside equal

13. Length of two tangents drawn from an external point are ....
    Ans : equal

3. TRUE/FALSE

1. The tangent to the circumcircle of an isosceles triangle ABC at A, in which $AB = AC$, is parallel to BC.
   Ans : True

2. A line drawn from the centre of a circle to a chord always bisects it.
   Ans : False

3. If angle between two tangents drawn from a point P to a circle of radius a and centre O is 90°, then $OP = a\sqrt{2}$.
   Ans : True

4. Line joining the centers of two intersecting circles always bisect their common chord.
   Ans : True

5. In a circle, two chords PQ and RS bisect each other. Then $PRQS$ is a rectangles.
   Ans : True

6. A tangent to a circle is a line that intersects the circle in only one point.
   Ans : True

7. The length of tangent from an external point P on a circle with centre O is always less than OP.
   Ans : True

8. The angle between two tangents to a circle may be 0°.
   Ans : False

9. The tangent to a circle is a special case of the secant.
   Ans : True

10. If angle between two tangents drawn from a point P to a circle of radius a and centre O is 90°, then $OP = a\sqrt{3}$.
    Ans : False

11. The perpendicular at the point of contact to the tangent to a circle does not pass through the centre.
    Ans : False

12. The length of tangent from an external point on a circle is always greater than the radius of the circle.
    Ans : True

13. A circle can have at the most two parallel tangents.
    Ans : True

14. If a chord AB subtends an angle of 60° at the centre of a circle, then angle between the tangents at A and B is also 60°.
    Ans : False

15. If P is a point on a circle with centre C, then the line drawn through P and perpendicular to CP is the tangent to the circle at the point P.
    Ans : True

16. If a number of circles touch a given line segment PQ at a point A, then theri centres lie on the perpendicular

bisector of PQ.
Ans : False

17. The centre of the circle lies on the bisector of the angle between the two tangents.
Ans : True

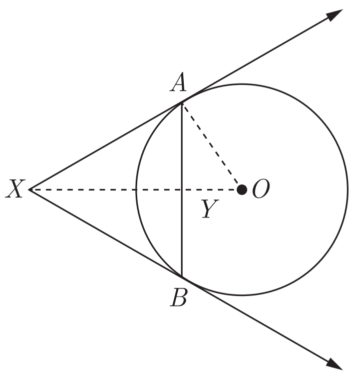
18. Two equal chords of a circle are always parallel.
Ans : False

19. AB is a diameter of a circle and AC is its chord such that $\angle BAC = 30°$. If the tangent at C intersects AB extended at D, then $BC = BD$.
Ans : True

4. MATCHING QUESTIONS

DIRECTION : Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in Column-I have to be matched with statements (p, q, r, s) in Column-II.

1. If AB is a chord of length 6 cm of a circle of radius 5 cm, the tangents at A and B intersect at a point X (figure), then match the columns.



	Column-I		Column-II
(A)	AY	(p)	4 cm
(B)	OY	(q)	3.75 cm
(C)	XA	(r)	5 cm
(D)	OA	(s)	3 cm

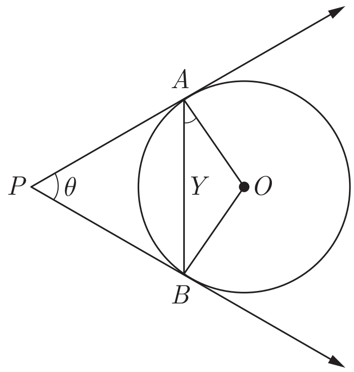
Ans : (A) – s, (B) – p, (C) – q, (D) – r

2.

	Column-I		Column-II
(A)	A line segment which join any two points on a circle.	(p)	Secant
(B)	A line which intersect the circle in two points.	(q)	Tangent
(C)	A line that intersects the circle at only one point.	(r)	Chord

Ans : (A) – r, (B) – p, (C) – q

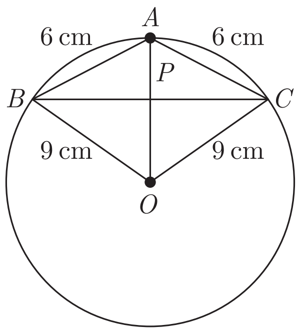
3. If two tangents PA and PB are drawn to a circle with center O from an external point P (figure), then match the column.



	Column-I		Column-II
(A)	$\angle PAB$	(p)	$90°$
(B)	$\angle OAP$	(q)	$q/2$
(C)	$\angle OAB$	(r)	$90 - \frac{q}{2}$
(D)	$\angle AOB$	(s)	$180° - \theta$

Ans : (A) – r, (B) – p, (C) – q, (D) – s

4. If an isosceles ΔABC in which $AB = AC = 6$ cm is inscribed in circle of radius 9 cm, then



	Column-I		Column-II
(A)	AP	(p)	$8\sqrt{2}$
(B)	CP	(q)	$4\sqrt{2}$
(C)	OB	(r)	2
(D)	Area of ΔABC	(s)	9

Ans : (A) – r, (B) – q, (C) – s, (D) – p

$$OP \perp BC$$

Let, $AP = x$

and $PB = CP = y$

On applying Pythagoras in ΔAPB and ΔOPB,

We have, $36 = y^2 + x^2$

and $81 = (9-x)^2 + y^2$

On solving these, we get

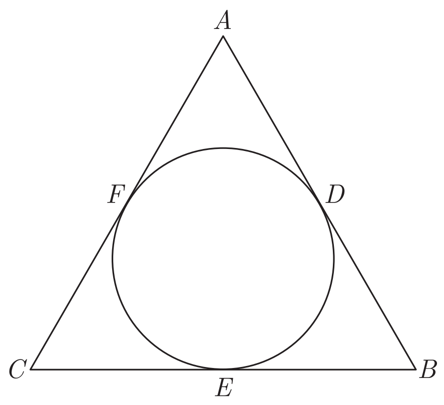
$$x = 2\text{ cm}$$

and $y = 4\sqrt{2}$ cm

$$\text{Area of } \Delta ABC = \frac{1}{2}(BC \times AP)$$

$$= \frac{1}{2} \times 8\sqrt{2} \times 2 = 8\sqrt{2}\text{ cm}^2$$

5. A circle is inscribed in a ΔABC having sides $AB = 8$ cm, $BC = 10$ cm and $CA = 12$ cm as shown in figure. Observe the diagram and match the columns.



	Column-I		Column-II
(A)	AD	(p)	15
(B)	BE	(q)	7 cm
(C)	CF	(r)	3 cm
(D)	$AD+BE+CF$	(s)	5 cm

Ans : (A) – s, (B) – r, (C) – q, (D) – p

$$AD = AF = x\text{ cm}$$

$$BD = BE = y\text{ cm}$$

$$CE = CF = z\text{ cm}$$

(tangents drawn from an exterior point to a circle are equal in length).

$$AB = 8\text{ cm}$$

$$AD + BD = 8$$

$$x + y = 8 \quad ...(1)$$

Similarly, $BE + CE = 10$

$$y + z = 10 \quad ...(2)$$

and $z + x = 12$ ...(3)

Adding equations (1) + (2) + (3),

$$x + y + z = 15 \quad ...(4)$$

Thus, on solving (1), (2), (3) and (4)

We get, $AD = x\text{ cm} = 5\text{ cm}$

$$BE = y\text{ cm} = 3\text{ cm}$$

$$CF = z\text{ cm} = 7\text{ cm}$$

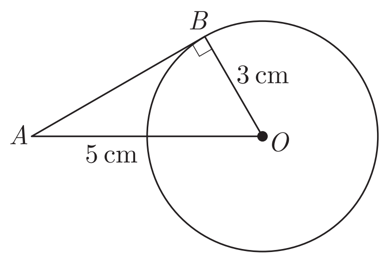
5. ASSERTION AND REASON

DIRECTION : In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

1. Assertion : If in a circle, the radius of the circle is 3 cm and distance of a point from the centre of a circle is 5 cm, then length of the tangent will be 4 cm.
Reason : (hypotenuse)^2 = (base)^2 + (height)^2

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).



$$(OA)^2 = (AB)^2 + (OB)^2$$

$$(AB) = \sqrt{25-9} = 4\text{ cm}$$

2. Assertion : The two tangents are drawn to a circle from an external point, than they subtend equal angles at the centre.
Reason : A parallelogram circumscribing a circle is a rhombus.

Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

From an external point the two tangents drawn subtend equal angles at the centre.
So A is true.
Also, a parallelogram circumscribing a circle is a rhombus, so R is also true but R is not correct explanation of A.

3. Assertion : If in a cyclic quadrilateral, one angel is 40°, then the opposite angle is 140°.
Reason : Sum of opposite angles in a cyclic quadrilateral is equal to 360°.

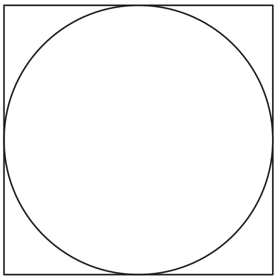
Ans : (c) Assertion (A) is true but reason (R) is false.

$$\text{Angle} + 40^\circ = 180^\circ$$

$$\text{Angle} = 180^\circ - 40^\circ = 140^\circ$$

4. Assertion : In the given figure, a quadrilateral $ABCD$ is drawn to circumscribe a given circle, as shown. Then

$$AB + BC = AD + DC.$$



Reason : In two concentric circles, the chord of the larger circle, which touches the smaller circle, is bisected at the point of contact.

Ans : (d) Assertion (A) is false but reason (R) is true.

We have two concentric circles (shown in fig. 8.17 b) O is the centre of concentric circles and AB is the tangent

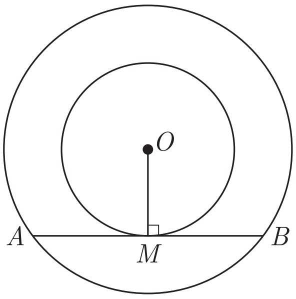
$$OM \perp AB$$

$$AM = MB$$

(Perpendicular from centre O to the chord AB bisect the chord AB)

So, A is incorrect but R is correct.

Hence, (d) is the correct option.



5. **Assertion :** PA and PB are two tangents to a circle with centre O. Such that $\angle AOB = 110°$, then $\angle APB = 90°$.
Reason : The length of two tangents drawn from an external point are equal.

Ans : (d) Assertion (A) is false but reason (R) is true.

We have, $OA \perp AP$

and $OB \perp PB$

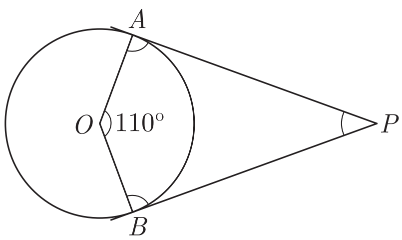
In quadrilateral, $OAPB$, we have

$$\angle OAP + \angle APB + \angle PBO + \angle AOB = 360°$$

$$90° + \angle APB + 90° + 110° = 360°$$

$$\angle APB = 70°$$

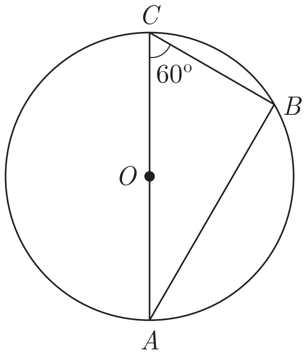
(Radius is perpendicular to the tangent at point of tangency)



6. **Assertion :** If length of a tangent from an external point to a circle is 8 cm, then length of the other tangent from the same point is 8 cm.
Reason : Length of the tangents drawn from an external point to a circle are equal.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

7. **Assertion :** In the given figure, O is the centre of a circle and AT is a tangents at point A, then $\angle BAT = 60°$.



Reason : A straight line can meet a circle at one point only.

Ans : (c) Assertion (A) is true but reason (R) is false.

We have, $\angle ABC = 90°$

(Angle in the semi-circle)

in ΔABC

$$\angle ABC + \angle ACB + \angle CAB = 180°$$

(Angle sum property of ΔABC)

$$\Rightarrow \quad 90° + 60° + \angle CAB = 180°$$

$$\Rightarrow \quad \angle CAB = 30°$$

Now, $OA \perp AT$

$$\angle BAT = 90° - 30° = 60°$$

So, A is correct but R is incorrect.

8. **Assertion :** Centre and radius of the circle $x^2 + y^2 - 6x + 4y - 36 = 0$ is $(3, -2)$ and 7 respectively.
Reason : Centre and radius of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is given as $(-g, -f)$ and $\sqrt{g^2 + f^2 - c}$ respectively.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

$$2g = -6$$

$$g = -3$$

$$2f = 4$$

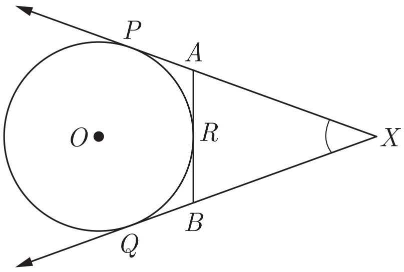
$$f = 2$$

$$\text{Centre} = (3, -2)$$

and $r = \sqrt{9 + 4 + 36} = \sqrt{49} = 7$

9. **Assertion :** In the given figure, $XA + AR = XB + BR$

, where XP, XQ and AB are tangents.



Reason : A tangent to the circle can be drawn from a point inside the circle.

Ans : (c) Assertion (A) is true but reason (R) is false.

We have, $XP = XQ$

$$XA + AP = XB + BQ$$

$$XA + AR = XB + BR$$

$$[PA = AR \text{ and } BQ = BR]$$

(The length of tangents drawn from in external point are equal)
So, A is correct but R is incorrect.

10. **Assertion :** Centre and radius of the circle $x^2 + y^2 - x + 2y - 3 = 0$ is $\left(\frac{1}{2}, -1\right)$ and $\frac{\sqrt{17}}{2}$ respectively.
Reason : The equation of a circle with radius r having centre (h, k) is given by $(x - h^2) + (y - k)^2 = r^2$.

Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

$$2g = -1$$

$$g = -\frac{1}{2}$$

and $2f = 2$

$$f = 1$$

11. **Assertion :** The circle $x^2 + y^2 + 2ax + c = 0$, $x^2 + y^2 + 2by + c = 0$ touch if $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c}$

Reason : The circles with centre C_1, C_2 and radii r_1, r_2 touch each other if $r_1 \pm r_2 = C_1C_2$.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Two circles touch each other,

$$C_1C_2 = r_1 \pm r_2$$

$$\sqrt{a^2 + b^2} = \sqrt{a^2 + c} = \sqrt{b^2 - c}$$

$$a^2 + b^2 = a^2 - c + b^2 - c + 2\sqrt{(a^2 - c)(b^2 - c)}$$

$$c^2 = (a^2 - 1)(b^2 - c)$$

$$a^2b^2 = (a^2 + b)^2 c$$

$$\frac{1}{c} = \frac{1}{a^2} + \frac{1}{b^2}$$

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