SHIKSHA CLASSES

Sub. : Maths | **Answer Paper** | **Total Marks : 30**

Std. X (CBSE) | **10 : Circles**

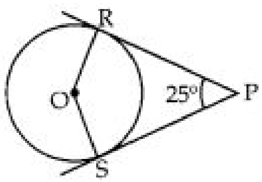
Section : A (Each 1 Mark)

Multiple choice Questions (MCQs).

Q.1 : The distance between two parallel tangents of a circle of radius 4 cm is

Ans : d) 8 cm

Q.2 : In the given figure, if $\angle RPS = 25°$, the value of $\angle ROS$ is.



Ans : d) 155°

Q.3 : The length of tangents drawn from an external point to the circle

Ans : a) are equal

Q.4 : A tangent is drawn from a point at a distance of 17 cm of circle C(0, r) of radius 8 cm. The length of its tangent is

Ans : c) 15 cm

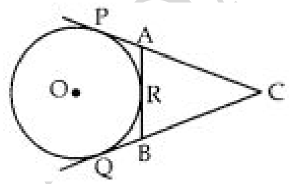
Q.5 : Tangents from an external point to a circle are

Ans : a) equal

Q.6 : The tangents drawn at the extremities of the diameter of a circle are

Ans : b) parallel

Q.7 : In given figure, CP and CQ are tangents to a circle with centre O. ARB is another tangent touching the circle at R. If CP = 11 cm and BC = 6 cm then the length of BR is

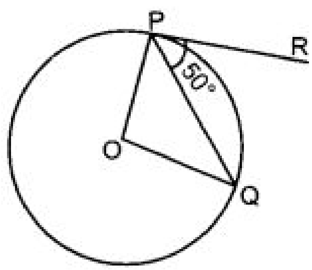


Ans : b) 5 cm

Q.8 : From a point P which is at a distance of 13 cm from the centre O of a circle of radius 5 cm, the pair of tangents PQ and PR to the circle are drawn. Then the area of the quadrilateral PQOR is

Ans : a) 60 cm^2

Q.9 : In the figure if O is centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, then $\angle POQ$ is equal to



Ans : a) 100°

For question number 10 to 11 two statements are given one labeled Assertion and other labeled Reason select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below

Q.10 : Assertion: AB and CD are two parallel chords of a circle whose diameter is AC. Then AB $\neq$ CD.

Reason : Perpendicular from the centre of a circle does not bisects the chord.

Ans : d) both assertion and reason are wrong.

Q.11 : Assertion: Perpendicular bisectors of two chords of a circle intersect at its centre.

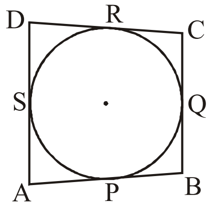
Reason: A line drawn through the centre of a circle to bisect a chord is perpendicular to the chord.

Ans : b) Assertion and Reason both are correct but Reason is not the correct explanation of Assertion.

Section : B (Each 2 Marks)

Q.12 : A circle touches all the four sides of a quadrilateral ABCD. Prove that AB + CD = BC + DA

Ans : Since tangents drawn from an exterior point to a circle are equal in length.



$\therefore$ AP = AS (from A) ..... (i)

BP = BQ (from B) ..... (ii)

CR = CQ (from C) .....(iii)

and DR = DS (from D) .....(iv)

Adding (i), (ii), (iii) and (iv), we get

AP+BP+CR+DR = (AS+DS) + (BQ+CQ)

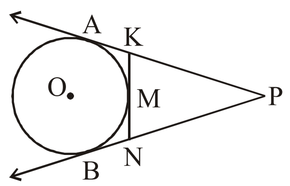
(AP+BP) + (CR+DR) = (AS+DS)+(BQ+CQ)

AB + CD = AD + BC

Hence, AB + CD = BC + AD

Q.13 : PA and PB are tangents from P to the circle with centre 'O'. At point M, a tangent is drawn cutting PA at K and PB at N. Prove that KN = AK + BN.

Ans : We know that the tangents drawn from an external point to a circle are equal in length.



$\therefore$ PA = PB (from P) ..... (i)

KA = KM (from K) ..... (ii)

and NB = NM (from N) ..... (iii)

Adding (ii) and (iii), we get

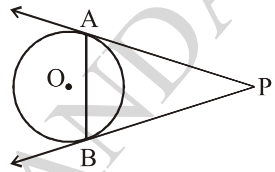
KA + NB = KM + NM

$\Rightarrow$ AK + BN = KN

OR

If PA and PB are tangents from an outside point P. Such that PA = 10 cm and ∠APB = 60°. Find the length of chord AB.

Ans : Since tangents from an external point are equal in length, therefore PA = PB



ΔPAB is isosceles

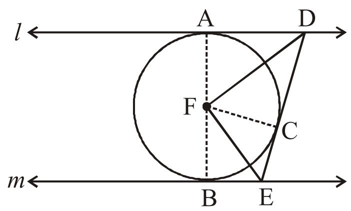
$\Rightarrow$ ∠PAB = ∠PBA = 60°

$\Rightarrow$ ΔPAB is equilateral

Hence, AB = 10 cm.

Section : C (Each 3 Marks)

Q.14 : In figure, *l* and *m* are two parallel tangents at A and B. The tangent at C makes an intercept DE between *l* and *m*. Prove that ∠DFE = 90°.



Ans : Since tangents drawn from an external point to a circle are equal.

Therefore, DA = DC

Thus, in ΔADF and ΔDFC, we have

DA = DC

DF = DF (common)

AF = CF (Radii of the same circle)

So, By SSS-criterion of congruence, we have

ΔADF ≅ ΔCDF

$\Rightarrow$ ∠ADF = ∠CDF ..... (c.p.c.t.)

$\Rightarrow$ ∠ADC = 2∠CDF...... (i)

Similarly, we can prove that

$\angle BEF = \angle CEF$

$\angle CEB = 2\angle CEF$ .... (ii)

Now, $\angle ADC + \angle CEB = 180°$

[$\because$ Sum of the interior angles on same side.]

$\Rightarrow 2\angle CDF + 2\angle CEF = 180°$ (from (i) & (ii))

$\Rightarrow \angle CDF + \angle CEF = 90°$ ..... (iii)

In ΔDFE, $\angle DFE + \angle CDF + \angle CEF = 180°$ (Sum of angles of a triangle)

$\Rightarrow \angle DFE + 90 = 180$ .... From (iii)

$\Rightarrow \angle DFE = 90°$

Hence proved.

Q.15 : The radii of two concentric circles are 13 cm and 8 cm. AB is a diameter of the bigger circle. BD is a tangent to the smaller circle touching it at D. Find the length AD.

Ans : Produce BD to meet the bigger circle at E. Join AE. Then

$\angle AEB = 90°$ (Angle in a semicircle)

$OD \perp BE$ (BE is a tangent)

and $BD = DE$ ($\because$ BE is a chord of the circle and $OD \perp BE$)

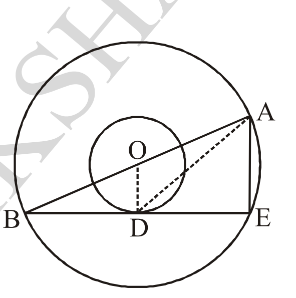
$\therefore OD \parallel AE$ ($\because \angle AEB = \angle ODB = 90°$)

In ΔAEB, O and D are mid points of AB and BE.

Therefore, by mid-point theorem, we have

$$OD = \frac{1}{2} AE$$

$\Rightarrow AE = 2 \times 8 = 16$ ($\because$ OD = 8 cm)



In ΔODB, we have

$OB^2 = OD^2 + BD^2$ (By Pythagoras)

$13^2 = 8^2 + BD^2$

$BD^2 = 169 - 64 = 105$

$BD = \sqrt{105}$ cm

$DE = \sqrt{105}$ cm

In ΔAED we have

$AD^2 = AE^2 + ED^2$ (By P.T.)

$AD^2 = 16^2 + (\sqrt{105})^2$

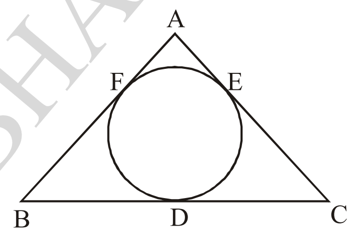
$= 256 + 105 = 361$

AD = 19 cm

OR

In figure, the incircle of ΔABC touches the sides BC, CA and AB at D, E and F respectively.

Show that AF + BD + CE = AE + BF + CD = $\frac{1}{2}$ (Perimeter of ΔABC)



Ans : Since lengths of the tangents from an exterior point to a circle are equal

$\therefore$ AF = AE (from A) ...... (i)

BD = BF (from B) ..... (ii)

and CE = CD (from C) ...... (iii)

Adding equations (i), (ii) and (iii), we get

AF + BD + CE = AE + BF + CD

Now perimeter of ΔABC = AB + BC + AC

$\Rightarrow$ Perimeter of ΔABC = (AF + FB) + (BD + DC) + (AE + EC)

$\Rightarrow$ Perimeter of ΔABC = 2AF + 2BD + 2CE (From (i), (ii) and (iii))

$\Rightarrow AF + BD + CE = \frac{1}{2}$ (Perimeter of ΔABC)

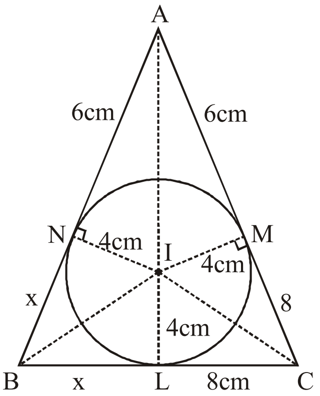
Hence, AF + BD + CE = AE + BF + CD

$= \frac{1}{2}$ (Perimeter of ΔABC)

Section - D(Each 5 Marks)

Q.16 : The radius of the incircle of a triangle is 4 cm and the segments into which one side is divided by the point of contact are 6 cm and 8 cm. Determine the other two sides of a the triangle.

Ans.:



Let I be the incentre of ΔABC such that in-radius = IL = IM = IN = 4 cm

Also, AM = 6 cm, CM = 8 cm

Let BL = BN = x

We have

AM = 6 cm and AM = AN

$\therefore$ AN = 6 cm

Similarly CL = CM = 8 cm

$\therefore$ a = BC = BL + LC = (x + 8)

b = AC = AM + CM = 6 + 8 = 14 cm

and c = AB = AN + BN = 6 + x = (x + 6) cm

$\therefore$ 2S = a + b + c (Semi perimeter = S)

$\Rightarrow$ 2S = x + 8 + 14 + x + 6

$\Rightarrow$ S = x + 14

Now, Area of ΔABC

$$= \sqrt{S(S-a)(S-b)(S-c)}$$

$$= \sqrt{(x+14)(x+14-x-8)(x+14-14)(x+14-x-6)}$$

$$= \sqrt{(x+14)\times(6)\times(8)\times x}$$

$$= \sqrt{48x(x+14)} \quad ...... (i)$$

Also

Area of ΔABC = Area of ΔIBC + Area of ΔICA + Area of ΔIAB

$$= \frac{1}{2}\times BC\times IL + \frac{1}{2}\times CA\times IM + \frac{1}{2}\times AB\times IN$$

$$= \frac{1}{2}\times(x+8)\times 4 + \frac{1}{2}\times 14\times 4 + \frac{1}{2}\times(x+6)\times 4$$

$= 4x + 56\ cm^2$ .... (ii)

From (i) and (ii)

$$\sqrt{48x(x+14)} = 4x + 56$$

$\Rightarrow 48x\ (x + 14) = (4x + 56)^2$

$\Rightarrow 48x\ (x + 14) = 16\ (x + 14)^2$

$\Rightarrow 3x\ (x + 14) = (x + 14)^2$

$\Rightarrow 3x = x + 14$

$\Rightarrow 2x = 14$

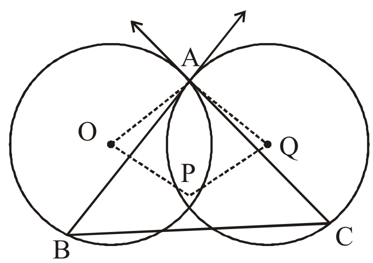
$\Rightarrow x = 7$ cm

$\therefore$ BC = x + 8 = 7 + 8 = 15 cm

AB = x + 6 = 7 + 6 = 13 cm

OR

Let A be one point of intersection of two intersecting circles with centres O and Q. The tangents at A to the two circles meet the circles again at B and C respectively. Let the point P be located so that AOPQ is a parallelogram. Prove that P is the circumcentre of the triangle ABC.



Ans : In order to prove that P is the circumcentre of ΔABC, it is sufficient to show that P is the point of intersection of perpendicular bisectors of the sides of ΔABC, i.e. OP and PQ are perpendicular bisectors of sides

AB and AC respectively.

Now AC is tangent at A to the circle with centre at 'O' and OA is its radius.

$\therefore$ OA $\perp$ AC

$\Rightarrow$ PQ $\perp$ AC ($\because$ OAQP is ||gm $\therefore$ OA || PQ)

$\Rightarrow$ PQ is the perpendicular bisector of AC

($\because$ Q is centre of the circle)

Similarly, BA is the tangent to the circle at A and AQ is its radius through A.

$\therefore$ BA $\perp$ AQ

$\therefore$ BA $\perp$ OP ($\because$ AQPO is ||gm $\therefore$ OP || AQ)

OP is the perpendicular bisector of AB

Thus, P is the point of intersection of perpendicular bisectors of PQ and PO of sides AC and AB respectively.

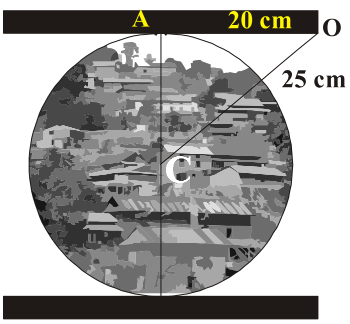
Hence, P is the circumcentre of ΔABC.

Section : E

Q..17 : Case study :

People of village want to construct a road nearest to the circular village Khamkar. The road cannot pass through the village. But the people want the road should be at the shortest distance from the centre of the village. Suppose the road start from point O which is outside the circular village and touch the boundary of the cirular village at point A such that OA = 20 cm. And also the straight distance of the point O from the centre C of the village is 25 cm.

i) Find the shortest distance of the road from the centre of the village. 1



Ans : The shortest distance of the road from centre of the village = AC

So, By Pythagoras theorem

$AC^2 = OC^2 - OA^2$

$\Rightarrow AC^2 = (25)^2 - (20)^2$

$= 625 - 400$

$\Rightarrow AC = \sqrt{225}$

$\Rightarrow AC = 15$ cm.

Hence, the shortest distance = 15 cm.

ii) Which method should be applied to find the shortest distance? 1

Ans : The 'Pythagoras theorem' Should be applied to find the shortest distance.

iii) If a point is inside the circle, how many tangents can be drawn from that point. 2

Ans : There is no any tangent can be drawn from the point inside the circle.

OR

If two circles are externally and they do not touch, then find the number of common tangents.

Ans : If two circles are externaly and they do not touch, then we can draw. 4 common tangents.

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