

Exercise 10.1

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1. Fill in the blanks:

- (i) The common point of tangent and the circle is called _____.
- (ii) A circle may have _____ parallel tangent.
- (iii) A tangent to a circle intersects it in _____ point.
- (iv) A line intersecting a circle in two points is called a _____.
- (v) The angle between tangent at a point P on circle and radius through the point is _____.

Solution:

- (i) The common point of tangent and the circle is called point of contact.
- (ii) A circle may have two parallel tangent.
- (iii) A tangent to a circle intersects it in one point.
- (iv) A line intersecting a circle in two points is called a secant.
- (v) The angle between tangent at a point P on circle and radius through the point is 90° .

2. How many tangents can a circle have?

Solution:

A tangent is defined as a line intersecting the circle in one point. Since, there are infinite number of points on the circle, a circle can have many (infinite) tangents.

Exercise 10.2

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1. If PT is a tangent at T to a circle whose centre is O and OP = 17 cm, OT = 8 cm. Find the length of the tangent segment PT.

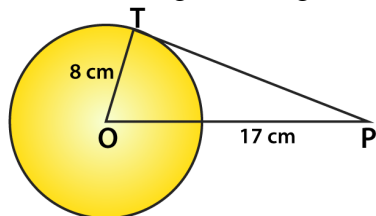
Solution:

Given,

OT = radius = 8 cm

OP = 17 cm

To find: PT = length of tangent = ?



Clearly, T is point of contact. And, we know that at point of contact tangent and radius are perpendicular.

∴ OTP is right angled triangle $\angle OTP = 90^\circ$, from Pythagoras theorem $OT^2 + PT^2 = OP^2$

$$8^2 + PT^2 = 17^2$$

$$8^2 + PT^2 = 17^2$$

$$PT = \sqrt{17^2 - 8^2}$$

$$= \sqrt{289 - 64}$$

$$= \sqrt{225}$$

∴ PT = length of tangent = 15 cm.

2. Find the length of a tangent drawn to a circle with radius 5cm, from a point 13 cm from the center of the circle.

Solution:

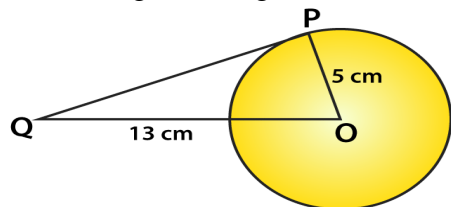
Consider a circle with centre O.

OP = radius = 5 cm. (given)

A tangent is drawn at point P, such that line through O intersects it at Q.

And, OQ = 13cm (given).

To find: Length of tangent PQ = ?



We know that tangent and radius are perpendicular to each other.

ΔOPQ is right angled triangle with $\angle OPQ = 90^\circ$

By Pythagoras theorem we have,

$$OQ^2 = OP^2 + PQ^2$$

$$\Rightarrow 13^2 = 5^2 + PQ^2$$

$$\Rightarrow PQ^2 = 169 - 25 = 144$$

$$\Rightarrow PQ = \sqrt{144}$$

$$= 12 \text{ cm}$$

Therefore, the length of tangent = 12 cm

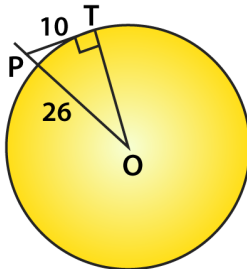
3. A point P is 26 cm away from O of circle and the length PT of the tangent drawn from P to the circle is 10 cm. Find the radius of the circle.

Solution:

Given, $OP = 26 \text{ cm}$

$PT = \text{length of tangent} = 10 \text{ cm}$

To find: radius = $OT = ?$



We know that,

At point of contact, radius and tangent are perpendicular $\angle OTP = 90^\circ$

So, ΔOTP is right angled triangle.

Then by Pythagoras theorem, we have

$$OP^2 = OT^2 + PT^2$$

$$26^2 = OT^2 + 10^2$$

$$OT^2 = 676 - 100$$

$$OT = \sqrt{576}$$

$$OT = 24 \text{ cm}$$

Thus, $OT = \text{length of tangent} = 24 \text{ cm}$

4. If from any point on the common chord of two intersecting circles, tangents be drawn to the circles, prove that they are equal.

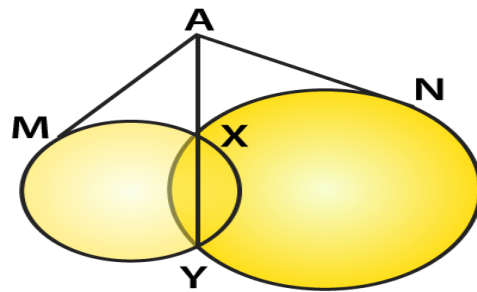
Solution:

Let the two circles intersect at points X and Y.

So, XY is the common chord.

Suppose 'A' is a point on the common chord and AM and AN be the tangents drawn A to the circle

Then it's required to prove that $AM = AN$.



In order to prove the above relation, following property has to be used.

"Let PT be a tangent to the circle from an external point P and a secant to the circle through P intersecting the circle at points A and B, then $PT^2 = PA \times PB$ "

Now AM is the tangent and AXY is a secant

$$\therefore AM^2 = AX \times AY \dots (i)$$

Similarly, AN is a tangent and AXY is a secant

$$\therefore AN^2 = AX \times AY \dots (ii)$$

From (i) & (ii), we have $AM^2 = AN^2$

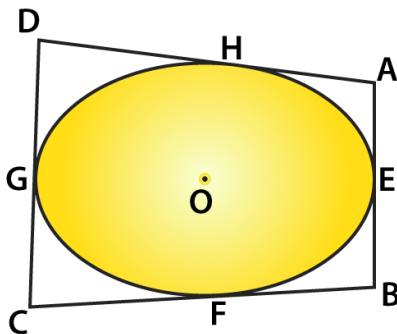
$$\therefore AM = AN$$

Therefore, tangents drawn from any point on the common chord of two intersecting circles are equal.

- Hence Proved

5. If the quadrilateral sides touch the circle, prove that sum of pair of opposite sides is equal to the sum of other pair.

Solution:



Consider a quadrilateral ABCD touching circle with centre O at points E, F, G and H as shown in figure. We know that,

The tangents drawn from same external points to the circle are equal in length.

Consider tangents:

1. From point A [AH & AE]

$$AH = AE \dots (i)$$

2. From point B [EB & BF]

$$BF = EB \dots (ii)$$

3. From point C [CF & GC]

$$FC = CG \dots (iii)$$

4. From point D [DG & DH]

$$DH = DG \dots (iv)$$

Adding (i), (ii), (iii), & (iv)

$$(AH + BF + FC + DH) = [(AC + CB) + (CG + DG)]$$

$$\Rightarrow (AH + DH) + (BF + FC) = (AE + EB) + (CG + DG)$$

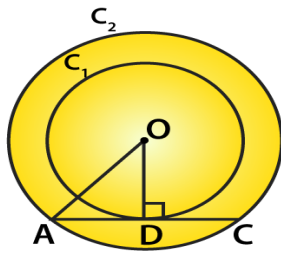
$$\Rightarrow AD + BC = AB + DC \text{ [from fig.]}$$

Therefore, the sum of one pair of opposite sides is equal to other.

- Hence Proved

6. Out of the two concentric circles, the radius of the outer circle is 5 cm and the chord AC of length 8 cm is a tangent to the inner circle. Find the radius of the inner circle.

Solution:



Let C_1 and C_2 be the two circles having same center O .

And, AC is a chord which touches the C_1 at point D

let's join OD .

So, $OD \perp AC$

$AD = DC = 4$ cm [perpendicular line OD bisects the chord]

Thus, in right angled $\triangle AOD$,

$$OA^2 = AD^2 + DO^2 \text{ [By Pythagoras theorem]}$$

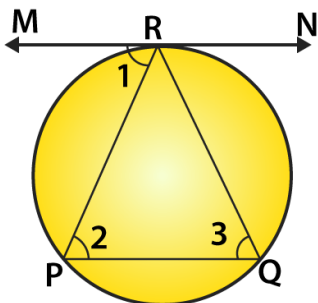
$$DO^2 = 5^2 - 4^2 = 25 - 16 = 9$$

$$DO = 3 \text{ cm}$$

Therefore, the radius of the inner circle $OD = 3$ cm.

7. A chord PQ of a circle is parallel to the tangent drawn at a point R of the circle. Prove that R bisects the arc PRQ .

Solution:



Given: Chord PQ is parallel tangent at R.
 To prove: R bisects the arc PRQ.

Proof:

Since $PQ \parallel$ tangent at R.

$$\angle 1 = \angle 2 \quad [\text{alternate interior angles}]$$

$$\angle 1 = \angle 3$$

[angle between tangent and chord is equal to angle made by chord in alternate segment]

So, $\angle 2 = \angle 3$

$$\Rightarrow PR = QR \quad [\text{sides opposite to equal angles are equal}]$$

Hence, clearly R bisects PQ.

8. Prove that a diameter AB of a circle bisects all those chords which are parallel to the tangent at the point A.

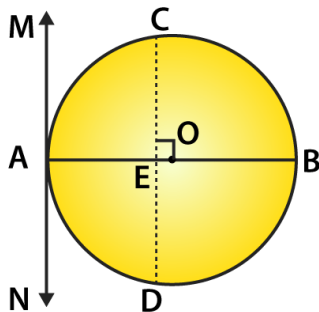
Solution:

Given,

AB is a diameter of the circle.

A tangent is drawn from point A.

Construction: Draw a chord CD parallel to the tangent MAN.



So now, CD is a chord of the circle and OA is a radius of the circle.

$$\angle MAO = 90^\circ$$

[Tangent at any point of a circle is perpendicular to the radius through the point of contact]

$$\angle CEO = \angle MAO \quad [\text{corresponding angles}]$$

$$\angle CEO = 90^\circ$$

Therefore, OE bisects CD.

[perpendicular from center of circle to chord bisects the chord]

Similarly, the diameter AB bisects all the chords which are parallel to the tangent at the point A.

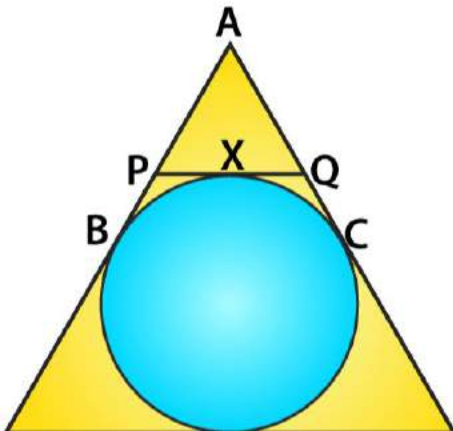
9. If AB, AC, PQ are the tangents in the figure, and AB = 5 cm, find the perimeter of $\triangle APQ$.

Solution:

Given,

AB, AC, PQ are tangents

And, AB = 5 cm



Perimeter of $\triangle APQ$,

$$\begin{aligned} \text{Perimeter} &= AP + AQ + PQ \\ &= AP + AQ + (PX + QX) \end{aligned}$$

We know that,

The two tangents drawn from external point to the circle are equal in length from point A,

So, $AB = AC = 5$ cm

From point P, $PX = PB$ [Tangents from an external point to the circle are equal.]

From point Q, $QX = QC$ [Tangents from an external point to the circle are equal.]

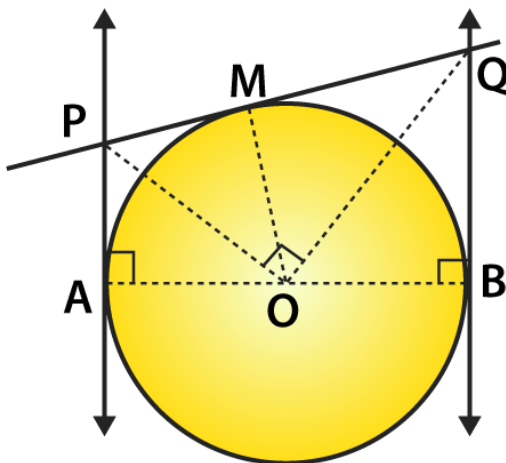
Thus,

$$\begin{aligned} \text{Perimeter (P)} &= AP + AQ + (PB + QC) \\ &= (AP + PB) + (AQ + QC) \\ &= AB + AC = 5 + 5 \\ &= 10 \text{ cm.} \end{aligned}$$

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

Solution:

Consider a circle with centre 'O' and has two parallel tangents through A & B at ends of diameter.



Let tangent through M intersect the parallel tangents at P and Q
Then, required to prove: $\angle POQ = 90^\circ$.

From fig. it is clear that ABQP is a quadrilateral

$\angle A + \angle B = 90^\circ + 90^\circ = 180^\circ$ [At point of contact tangent & radius are perpendicular]

$\angle A + \angle B + \angle P + \angle Q = 360^\circ$ [Angle sum property of a quadrilateral]

So,

$$\angle P + \angle Q = 360^\circ - 180^\circ = 180^\circ \dots (i)$$

At P & Q

$$\angle APO = \angle OPQ = 1/2 \angle P \dots (ii)$$

$$\angle BQO = \angle PQO = 1/2 \angle Q \dots (iii)$$

Using (ii) and (iii) in (i) \Rightarrow

$$2\angle OPQ + 2\angle PQO = 180^\circ$$

$$\angle OPQ + \angle PQO = 90^\circ \dots (iv)$$

In $\triangle OPQ$,

$$\angle OPQ + \angle PQO + \angle POQ = 180^\circ \text{ [Angle sum property]}$$

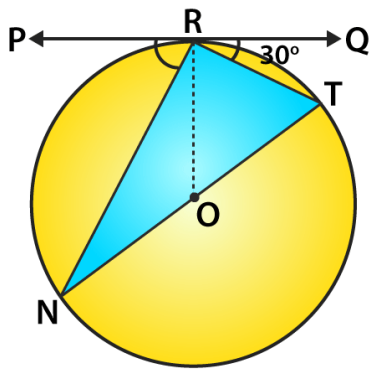
$$90^\circ + \angle POQ = 180^\circ \quad \text{[from (iv)]}$$

$$\angle POQ = 180^\circ - 90^\circ = 90^\circ$$

Hence, $\angle POQ = 90^\circ$

11. In Fig below, PQ is tangent at point R of the circle with center O. If $\angle TRQ = 30^\circ$, find $\angle PRS$.

Solution:



Given,

$$\angle TRQ = 30^\circ.$$

At point R, $OR \perp RQ$.

$$\text{So, } \angle ORQ = 90^\circ$$

$$\Rightarrow \angle TRQ + \angle ORT = 90^\circ$$

$$\Rightarrow \angle ORT = 90^\circ - 30^\circ = 60^\circ$$

It's seen that, ST is diameter,

$$\text{So, } \angle SRT = 90^\circ \text{ [} \because \text{ Angle in semicircle = } 90^\circ \text{]}$$

Then,

$$\angle ORT + \angle SRO = 90^\circ$$

$$\angle SRO + \angle PRS = 90^\circ$$

$$\therefore \angle PRS = 90^\circ - 30^\circ = 60^\circ$$

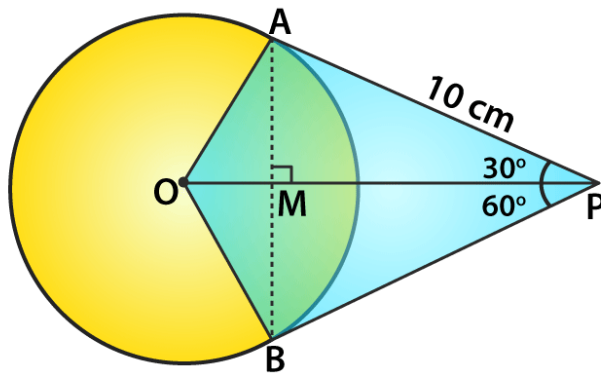
12. If PA and PB are tangents from an outside point P. such that PA = 10 cm and $\angle APB = 60^\circ$. Find the length of chord AB.

Solution:

Given,

AP = 10 cm and $\angle APB = 60^\circ$

Represented in the figure



We know that,

A line drawn from centre to point from where external tangents are drawn divides or bisects the angle made by tangents at that point

So, $\angle APO = \angle OPB = \frac{1}{2} \times 60^\circ = 30^\circ$

And, the chord AB will be bisected perpendicularly

$\therefore AB = 2AM$

In $\triangle AMP$,

$$\sin 30^\circ = \frac{\text{opp. side}}{\text{hypotenuse}} = \frac{AM}{AP}$$

$AM = AP \sin 30^\circ$

$AP/2 = 10/2 = 5\text{cm}$ [As $AB = 2AM$]

So, $AP = 2 AM = 10\text{ cm}$

And, $AB = 2 AM = 10\text{cm}$

Alternate method:

In $\triangle AMP$, $\angle AMP = 90^\circ$, $\angle APM = 30^\circ$

$\angle AMP + \angle APM + \angle MAP = 180^\circ$

$90^\circ + 30^\circ + \angle MAP = 180^\circ$

$\angle MAP = 60^\circ$

In $\triangle PAB$, $\angle MAP = \angle BAP = 60^\circ$, $\angle APB = 60^\circ$

We also get, $\angle PBA = 60^\circ$

$\therefore \triangle PAB$ is equilateral triangle

$AB = AP = 10\text{ cm}$

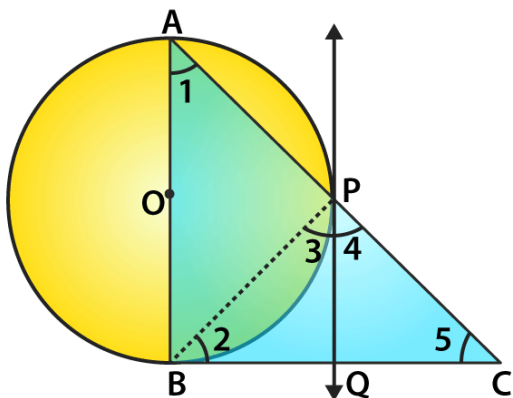
13. In a right triangle ABC in which $\angle B = 90^\circ$, a circle is drawn with AB as diameter intersecting the hypotenuse AC at P. Prove that the tangent to the circle at P bisects BC.

Solution:

Let O be the center of the given circle. Suppose, the tangent at P meets BC at Q.

Then join BP.

Required to prove: $BQ = QC$



Proof :

$\angle ABC = 90^\circ$ [tangent at any point of circle is perpendicular to radius through the point of contact]

In $\triangle ABC$, $\angle 1 + \angle 5 = 90^\circ$ [angle sum property, $\angle ABC = 90^\circ$]

And, $\angle 3 = \angle 1$

[angle between tangent and the chord equals angle made by the chord in alternate segment]

So,

$\angle 3 + \angle 5 = 90^\circ$ (i)

Also, $\angle APB = 90^\circ$ [angle in semi-circle]

$\angle 3 + \angle 4 = 90^\circ$ (ii) [$\angle APB + \angle BPC = 180^\circ$, linear pair]

From (i) and (ii), we get

$\angle 3 + \angle 5 = \angle 3 + \angle 4$

$\angle 5 = \angle 4$

$\Rightarrow PQ = QC$ [sides opposite to equal angles are equal]

Also, $QP = QB$

[tangents drawn from an internal point to a circle are equal]

$\Rightarrow QB = QC$

- Hence proved.

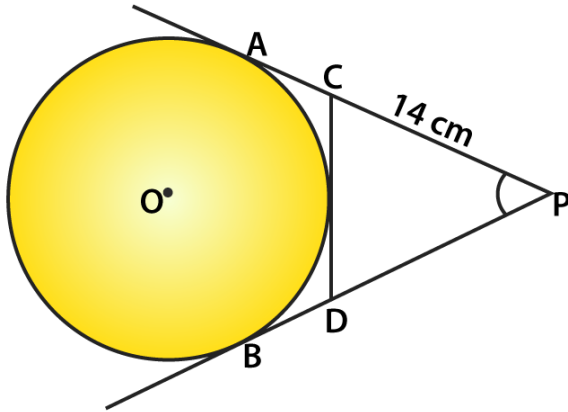
14. From an external point P, tangents PA and PB are drawn to a circle with centre O. If CD is the tangent to the circle at a point E and $PA = 14$ cm, find the perimeter of $\triangle PCD$.

Solution:

Given,

PA and PB are the tangents drawn from a point P outside the circle with centre O.

CD is another tangents to the circle at point E which intersects PA and PB at C and D respectively.



$$PA = 14 \text{ cm}$$

PA and PB are the tangents to the circle from P

$$\text{So, } PA = PB = 14 \text{ cm}$$

Now, CA and CE are the tangents from C to the circle.

$$CA = CE \dots(i)$$

Similarly, DB and DE are the tangents from D to the circle.

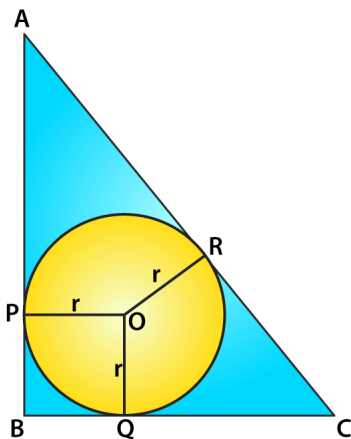
$$DB = DE \dots(ii)$$

Now, perimeter of $\triangle PCD$

$$\begin{aligned} &= PC + PD + CD \\ &= PC + PD + CE + DE \\ &= PC + CE + PD + DE \\ &= PC + CA + PD + DB \text{ \{From (i) and (ii)\}} \\ &= PA + PB \\ &= 14 + 14 \\ &= 28 \text{ cm} \end{aligned}$$

15. In the figure, ABC is a right triangle right-angled at B such that BC = 6 cm and AB = 8 cm. Find the radius of its incircle.

Solution:



Given,

In right $\triangle ABC$, $\angle B = 90^\circ$

And, $BC = 6$ cm, $AB = 8$ cm

Let r be the radius of incircle whose centre is O and touches the sides AB , BC and CA at P , Q and R respectively.

Since, AP and AR are the tangents to the circle $AP = AR$

Similarly, $CR = CQ$ and $BQ = BP$

OP and OQ are radii of the circle

$OP \perp AB$ and $OQ \perp BC$ and $\angle B = 90^\circ$ (given)

Hence, $BPOQ$ is a square

Thus, $BP = BQ = r$ (sides of a square are equal)

So,

$AR = AP = AB - BP = 8 - r$

and $CR = CQ = BC - BQ = 6 - r$

But $AC^2 = AB^2 + BC^2$ (By Pythagoras Theorem)

$$= (8)^2 + (6)^2 = 64 + 36 = 100 = (10)^2$$

So, $AC = 10$ cm

$\Rightarrow AR + CR = 10$

$\Rightarrow 8 - r + 6 - r = 10$

$\Rightarrow 14 - 2r = 10$

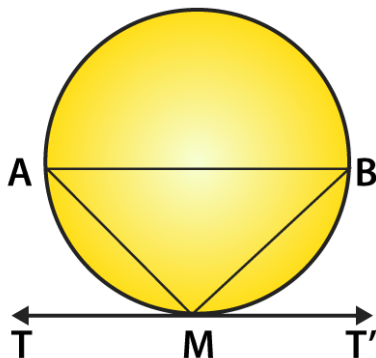
$\Rightarrow 2r = 14 - 10 = 4$

$\Rightarrow r = 2$

Therefore, the radius of the incircle = 2 cm

16. Prove that the tangent drawn at the mid-point of an arc of a circle is parallel to the chord joining the end points of the arc.

Solution:



Let mid-point of an arc AMB be M and TMT' be the tangent to the circle.

Now, join AB , AM and MB .

Since, arc $AM =$ arc MB

\Rightarrow Chord $AM =$ Chord MB

In $\triangle AMB$, $AM = MB$

$\Rightarrow \angle MAB = \angle MBA$ (i)

[equal sides corresponding to the equal angle]

Since, TMT' is a tangent line.

$$\angle AMT = \angle MBA$$

[angle in alternate segment are equal]

Thus, $\angle AMT = \angle MAB$ [from Eq. (i)]

But $\angle AMT$ and $\angle MAB$ are alternate angles, which is possible only when $AB \parallel TMT'$

Hence, the tangent drawn at the mid-point of an arc of a circle is parallel to the chord joining the end points of the arc.

- Hence proved

17. From a point P, two tangents PA and PB are drawn to a circle with centre O. If OP = diameter of the circle, show that $\triangle APB$ is equilateral.

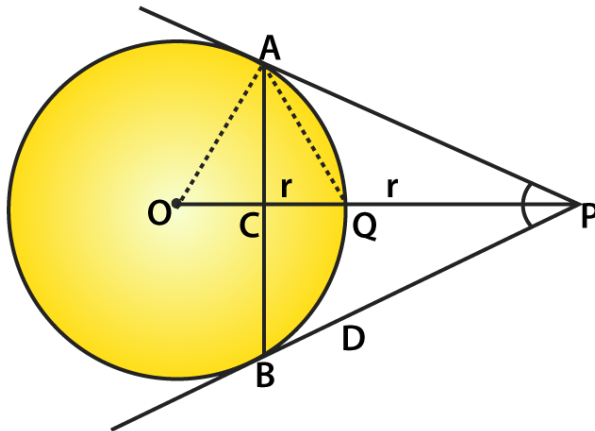
Solution:

Given: From a point P outside the circle with centre O, PA and PB are the tangents to the circle such that OP is diameter.

And, AB is joined.

Required to prove: APB is an equilateral triangle

Construction: Join OP, AQ, OA



Proof:

We know that, $OP = 2r$

$$\Rightarrow OQ + QP = 2r$$

$$\Rightarrow OQ = QP = r$$

Now in right $\triangle OAP$,

OP is its hypotenuse and Q is its mid-point

Then, $OA = AQ = OQ$

(mid-point of hypotenuse of a right triangle is equidistant from its vertices)

Thus, $\triangle OAQ$ is equilateral triangle. So, $\angle AOQ = 60^\circ$

Now in right $\triangle OAP$,

$$\angle APO = 90^\circ - 60^\circ = 30^\circ$$

$$\Rightarrow \angle APB = 2 \angle APO = 2 \times 30^\circ = 60^\circ$$

But $PA = PB$ (Tangents from P to the circle)

$$\Rightarrow \angle PAB = \angle PBA = 60^\circ$$

Hence $\triangle APB$ is an equilateral triangle.

18. Two tangents segments PA and PB are drawn to a circle with centre O such that $\angle APB = 120^\circ$. Prove that $OP = 2 AP$.

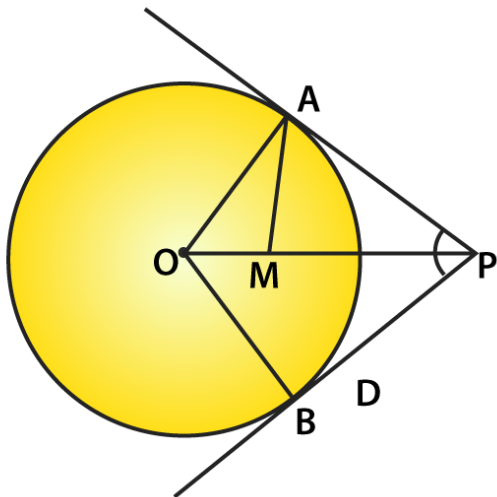
Solution:

Given: From a point P. Outside the circle with centre O, PA and PB are tangents drawn and $\angle APB = 120^\circ$

And, OP is joined.

Required to prove: $OP = 2 AP$

Construction: Take mid-point M of OP and join AM, join also OA and OB.



Proof:

In right $\triangle OAP$,

$$\angle OPA = \frac{1}{2}\angle APB = \frac{1}{2}(120^\circ) = 60^\circ$$

$$\angle AOP = 90^\circ - 60^\circ = 30^\circ \text{ [Angle sum property]}$$

M is mid-point of hypotenuse OP of $\triangle OAP$ [from construction]

So, $MO = MA = MP$

$$\angle OAM = \angle AOM = 30^\circ \text{ and } \angle PAM = 90^\circ - 30^\circ = 60^\circ$$

Thus, $\triangle AMP$ is an equilateral triangle

$$MA = MP = AP$$

But, M is mid-point of OP

So,

$$OP = 2 MP = 2 AP$$

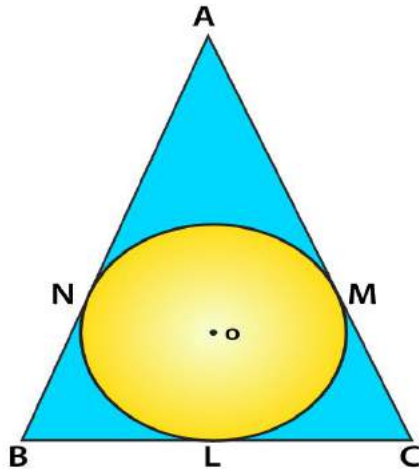
- Hence proved.

19. If $\triangle ABC$ is isosceles with $AB = AC$ and C (0, r) is the incircle of the $\triangle ABC$ touching BC at L. Prove that L bisects BC.

Solution:

Given: In $\triangle ABC$, $AB = AC$ and a circle with centre O and radius r touches the side BC of $\triangle ABC$ at L.

Required to prove : L is mid-point of BC.



Proof :

AM and AN are the tangents to the circle from A.

So, $AM = AN$

But $AB = AC$ (given)

$AB - AN = AC - AM$

$\Rightarrow BN = CM$

Now BL and BN are the tangents from B

So, $BL = BN$

Similarly, CL and CM are tangents

$CL = CM$

But $BN = CM$ (proved above)

So, $BL = CL$

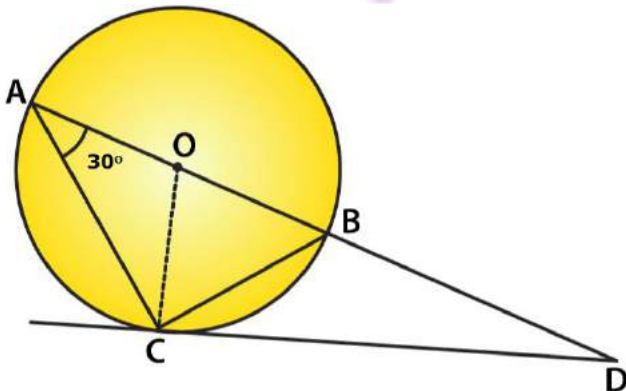
Therefore, L is mid-point of BC.

20. AB is a diameter and AC is a chord of a circle with centre O such that $\angle BAC = 30^\circ$. The tangent at C intersects AB at a point D. Prove that $BC = BD$. [NCERT Exemplar]

Solution:

Required to prove: $BC = BD$

Join BC and OC.



Given, $\angle BAC = 30^\circ$

$\Rightarrow \angle BCD = 30^\circ$

[angle between tangent and chord is equal to angle made by chord in the alternate segment]

$$\angle ACD = \angle ACO + \angle OCD$$

$$\angle ACD = 30^\circ + 90^\circ = 120^\circ$$

$$[OC \perp CD \text{ and } OA = OC = \text{radius} \Rightarrow \angle OAC = \angle OCA = 30^\circ]$$

In $\triangle ACD$,

$$\angle CAD + \angle ACD + \angle ADC = 180^\circ \quad [\text{Angle sum property of a triangle}]$$

$$\Rightarrow 30^\circ + 120^\circ + \angle ADC = 180^\circ$$

$$\Rightarrow \angle ADC = 180^\circ - (30^\circ + 120^\circ) = 30^\circ$$

Now, in $\triangle BCD$,

$$\angle BCD = \angle BDC = 30^\circ$$

$$\Rightarrow BC = BD \quad [\text{As sides opposite to equal angles are equal}]$$

- Hence Proved

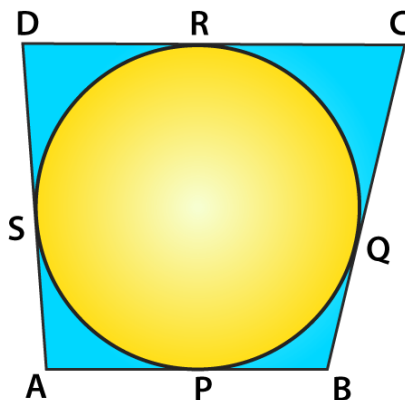
21. In the figure, a circle touches all the four sides of a quadrilateral ABCD with AB = 6 cm, BC = 7 cm, and CD = 4 cm. Find AD.

Solution:

Given,

A circle touches the sides AB, BC, CD and DA of a quadrilateral ABCD at P, Q, R and S respectively.

AB = 6 cm, BC = 7 cm, CD = 4 cm



Let $AD = x$

As AP and AS are the tangents to the circle

$$AP = AS$$

Similarly,

$$BP = BQ$$

$$CQ = CR$$

$$\text{and } OR = DS$$

So, In ABCD

$$AB + CD = AD + BC \quad (\text{Property of a cyclic quadrilateral})$$

$$\Rightarrow 6 + 4 = 7 + x$$

$$\Rightarrow 10 = 7 + x$$

$$\Rightarrow x = 10 - 7 = 3$$

Therefore, $AD = 3$ cm.

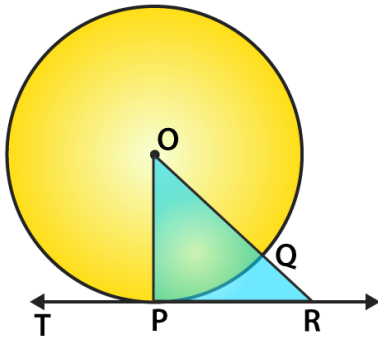
22. Prove that the perpendicular at the point contact to the tangent to a circle passes through the centre of the circle.

Solution:

Given: TS is a tangent to the circle with centre O at P, and OP is joined.

Required to prove: OP is perpendicular to TS which passes through the centre of the circle

Construction: Draw a line OR which intersect the circle at Q and meets the tangent TS at R



Proof:

$OP = OQ$ (radii of the same circle)

And $OQ < OR$

$\Rightarrow OP < OR$

similarly, we can prove that OP is less than all lines which can be drawn from O to TS.

OP is the shortest

OP is perpendicular to TS

Therefore, the perpendicular through P will pass through the centre of the circle

- Hence proved.

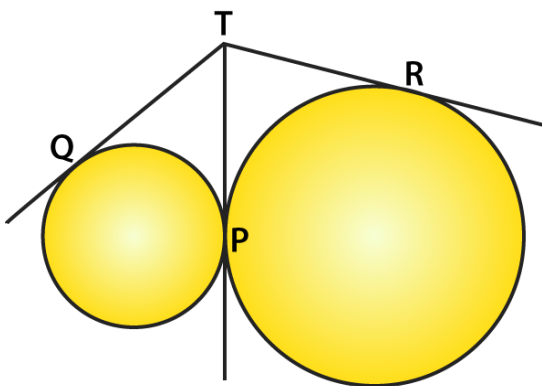
23. Two circles touch externally at a point P. From a point T on the tangent at P, tangents TQ and TR are drawn to the circles with points of contact Q and R respectively. Prove that $TQ = TR$.

Solution:

Given: Two circles with centres O and C touch each other externally at P. PT is its common tangent

From a point T: PT, TR and TQ are the tangents drawn to the circles.

Required to prove: $TQ = TR$



Proof:

From T, TR and TP are two tangents to the circle with centre O

So, TR = TP(i)

Similarly, from point T

TQ and TP are two tangents to the circle with centre C

TQ = TP(ii)

From (i) and (ii) \Rightarrow

TQ = TR

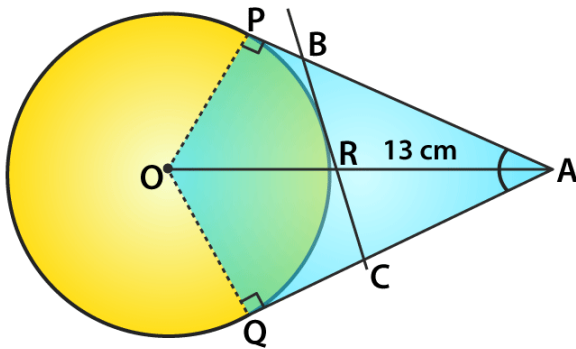
- Hence proved.

24. A is a point at a distance 13 cm from the centre O of a circle of radius 5 cm. AP and AQ are the tangents to the circle at P and Q. If a tangent BC is drawn at a point R lying on the minor arc PQ to intersect AP at B and AQ at C, find the perimeter of the ΔABC .

Solution:

Given: Two tangents are drawn from an external point A to the circle with centre O. Tangent BC is drawn at a point R and radius of circle = 5 cm.

Required to find : Perimeter of ΔABC .



Proof:

We know that,

$\angle OPA = 90^\circ$ [Tangent at any point of a circle is perpendicular to the radius through the point of contact]

$OA^2 = OP^2 + PA^2$ [by Pythagoras Theorem]

$$(13)^2 = 5^2 + PA^2$$

$$\Rightarrow PA^2 = 144 = 12^2$$

$$\Rightarrow PA = 12 \text{ cm}$$

Now, perimeter of $\Delta ABC = AB + BC + CA = (AB + BR) + (RC + CA)$

$= AB + BP + CQ + CA$ [BR = BP, RC = CQ tangents from internal point to a circle are equal]

$= AP + AQ = 2AP = 2 \times (12) = 24 \text{ cm}$

[AP = AQ tangent from internal point to a circle are equal]

Therefore, the perimeter of $\Delta ABC = 24 \text{ cm}$.