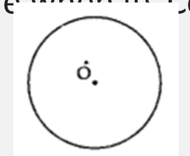
CONSTRUCTIONS
PPT-3

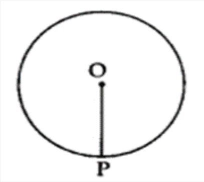
SUBJECT : MATHEMATICS
CHAPTER NUMBER: 11
CHAPTER NAME : CONSTRUCTIONS

PREVIOUS KNOWLEDGE TEST

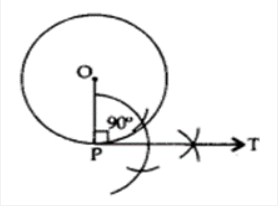
Construction of a Tangent at a Point on a Circle to the Circle when its Centre is Known

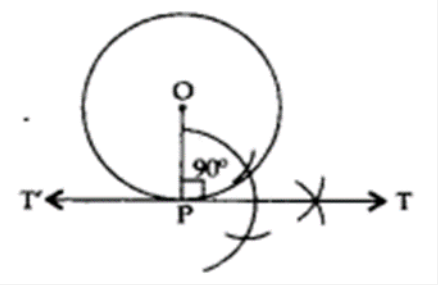


- Draw a circle with Centre O of the given radius.
- Take a given point P on the circle.



- Join OP.
- Construct ∠OPT = 90°.
- Produce TP to T’ to get TPT’ as the required tangent.





LEARNING OUTCOME

1 . Students will be able to learn to divide a line segment internally in a given ratio.

2.Students will be able to construct a triangle similar to a given triangle as per given scale factor which may be less than 1 or greater than1.

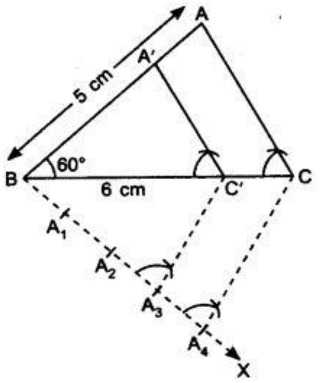
3. Students will be able to construct the pair of tangents from an external point to a circle.

1.Draw a triangle ABC with side BC = 6 cm, AB = 5 cm and ∠ABC = 60°. Then construct a triangle whose sides are 3 /4 of the corresponding sides of the triangle ABC.

Steps of Construction:

1. Draw a line segment BC = 6 cm and at point B draw an ∠ABC = 60°.
2. Cut AB = 5 cm. Join AC. We obtain a ΔABC.
3. Draw a ray BX making an acute angle with BC on the side opposite to the vertex A.
4. Locate 4 points A_1, A_2, A_3 and A_4 on the ray BX so that $BA_1 = A_1A_2 = A_2A_3 = A_3A_4$.
5. Join A_4 to C.
6. At A_3, draw $A_3C' \parallel A_4C$, where C′ is a point on the line segment BC.
7. At C′, draw C′A′ ∥ CA, where A′ is a point on the line segment BA.

∴ ΔA′BC′ is the required triangle.



Justification: In ΔA′BC′ and ΔABC,

$$A'C' \parallel AC$$

$$\frac{A'B}{AB} = \frac{BC'}{BC} \quad \text{(By the Basic Proportionality Theorem) ...}(i)$$

In $\Delta BA_3C'$ and ΔBA_4C,

$$A_3C' \parallel A_4C$$

$$\frac{BC'}{BC} = \frac{BA_3}{BA_4} = \frac{3}{4} \quad \text{(By the Basic Proportionality Theorem)}$$

$$\therefore \quad \frac{BC'}{BC} = \frac{3}{4} \quad \text{...}(ii)$$

From (*i*) and (*ii*), we get

$$\frac{A'B}{AB} = \frac{3}{4} \Rightarrow A'B = \frac{3}{4}AB$$

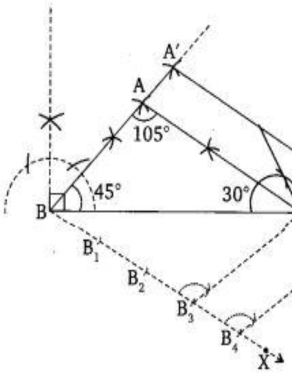
∴ Sides of new triangle formed are $\frac{3}{4}$ times the corresponding sides of first triangle.

2. Draw a triangle ABC with side BC = 7 cm, ∠ B = 45°, ∠ A = 105°. Then, construct a triangle whose sides are 4 /3 times the corresponding sides of Δ ABC

Steps of Construction:

1. Draw a line segment BC – 7 cm.
2. Draw ∠ABC = 45° and ∠ACB = 30°, i.e., ∠BAC = 105°.
3. We get ΔABC
4. Draw a ray BX making an acute angle with BC
5. Mark four points B_1, B_2, B_3 and B_4 on BX, such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.
6. Join B_3C.
7. Through B_4 draw a line B_4C' parallel to B_3C, intersecting the extended line segment BC at C'.
8. Through C', draw a line A'C' parallel to CA, intersecting the extended line segment BA at A'.

Thus, A'BC' is the required triangle.



Justification:

In ΔABC and ΔA'BC',

∠ABC = ∠A'BC' [Common]

∠ACB = ∠A'C'B [Corresponding angles]

∴ ΔABC ~ ΔA'BC' [By AA similarity]

$$\therefore \quad \frac{AB}{A'B} = \frac{AC}{A'C'} = \frac{BC}{BC'}$$

$$\text{But,} \quad \frac{BC}{BC'} = \frac{BB_3}{BB_4} = \frac{3}{4}$$

$$\therefore \quad \frac{BC'}{BC} = \frac{4}{3}$$

$$\Rightarrow \quad \frac{A'B}{AB} = \frac{A'C'}{AC} = \frac{BC'}{BC} = \frac{4}{3}.$$

3. Draw a pair of tangents to a circle of radius 5 cm which are inclined to each other at an angle of 60 degree.

Steps of Construction

1. Draw a circle with center O and radius 5 cm.
2. Draw any radius OA.
3. Construct $\angle AOB = 180° - 60° = 120°$.
4. Draw $AM \perp OA$ and $BN \perp OB$. Let the two perpendiculars meet at point P.

Then, PA and PB are the required tangents to the given circle, inclined at an angle 60°.

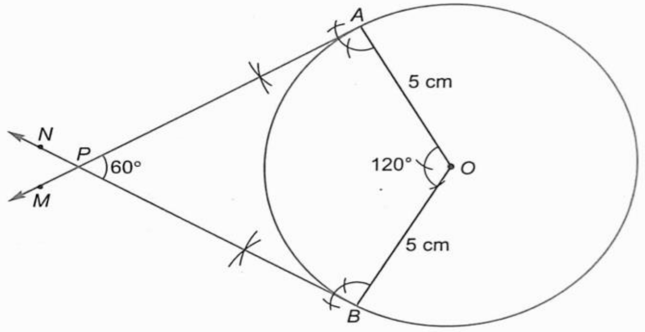


FIGURE 11.20

Justification. In quadrilateral $OAPB$, we have

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

$$\Rightarrow \quad 90° + \angle APB + 90° + 120° = 360°$$

$$\therefore \quad \angle APB = 360° - (90° + 90° + 120°) = 60°$$

4. Let ABC be a right triangle in which AB = 6 cm, BC = 8 cm and ∠ B = 90°. BD is the perpendicular from B on AC. The circle through B, C, D is drawn. Construct the tangents from A to this circle.

Steps of Construction

1. Construct a right ΔABC with $AB = 6$ cm, $BC = 8$ cm and $\angle B = 90°$.
2. Draw $BD \perp AC$.
3. Draw the perpendicular bisector of BC which intersects it at O.
4. With O as centre and OB as radius, we draw a circle. Thus, we get a circle passing through B, C and D.
5. With A as centre and radius $= AB = 6$ cm, draw an arc which intersects the above circle at P.
6. Join AP.

Then, AB and AP are the required tangents from A to the circle passing through B, C and D.

Justification. As $\angle BDC = 90°$, so BC is a diameter of the circle. The circle of radius OB passes through B, C and D.

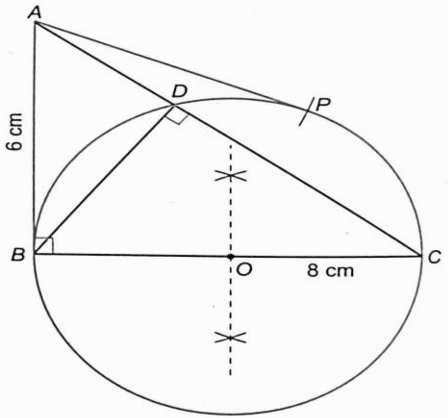
$$\angle OBA = 90°$$

$$\Rightarrow \quad AB \perp OB$$

Since, OB as a radius of the given circle, AB has to be a tangent to the circle.

By construction, $AP = PB$

Hence, AP is also a tangent to this circle.



HOME ASSIGNMENT:Ex-11.2 Q1 to Q3 AHA

1. Draw a line segment AB of length 8 cm. Taking A as Centre, draw a circle of radius 4 cm and taking B as Centre, draw another circle of radius 3 cm. Construct tangents to each circle from the Centre of the other circle.

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