CONSTRUCTIONS

TO CONSTRUCT A TANGENT INTO A CIRCLE

CONSTRCUTION OF TANGENT TO A CIRCLE :

To Draw the Tangent to a Circle at a Given Point on it, When the Centre of the Circle is Known :

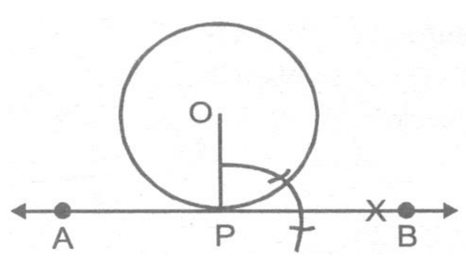
Given : A circle with centre O and a point P and it.

Required : To draw the tangent to the circle at P.

Steps of Construction.

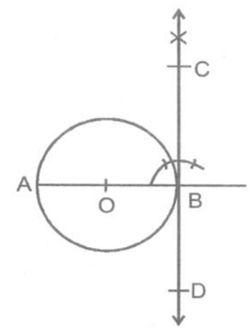
(i) Join OP.

(ii) Draw a line AB perpendicular to OP at the point P. APB is the required tangent at P.



Ex. 1 Draw a circle of diameter 6 cm with centre O. Draw a diameter AOB. Through A or B draw tangent to the circle.

Sol. **Given :** A circle with centre O and a point P on it.



Required : To draw tangent to the circle at B or A.

Steps of Construction.

(i) With O as centre and radius equal to 3 cm (6 $\div$ 2) draw a circle.

(ii) Draw a diameter AOB.

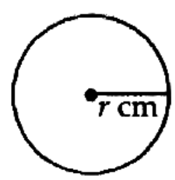
(iii) Draw CD $\perp$ AB.

(iv) So. CD is the required tangent.

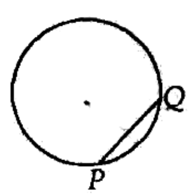
Construction of a Tangent to a Circle at a given point when its centre is not known :

Steps of construction :

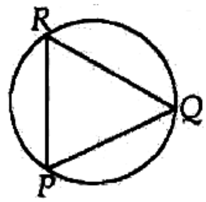
1. Draw a circle of radius r cm.



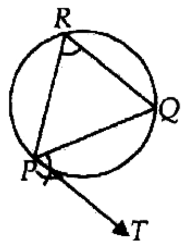
2. Mark a point P on it. Draw any chord PQ.



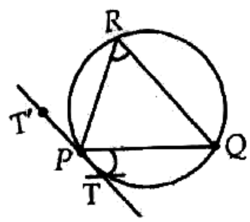
3. Take a point R on the major arc QP. Join RP & RQ.



4. Construct ∠QPT = ∠PRQ.

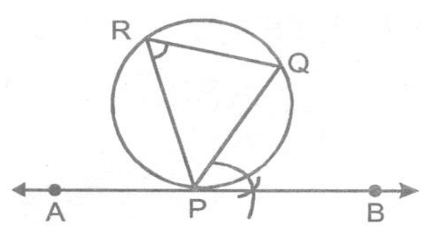


5. Produce TP to T¢ such that T¢PT is the required tangent at P.



Ex. 2 Draw a circle of radius 4.5 cm. Take a point P on it. Construct a tangent at the point P without using the centre of the circle. Write the steps of construction.

Sol. **Given :** To draw a tangent to a circle at P.



Steps of Construction

(i) Draw a circle of radius = 4.5 cm.

(ii) Draw a chord PQ, from the given point P on the circle.

(iii) Take a point R on the circle and joint PR and QR.

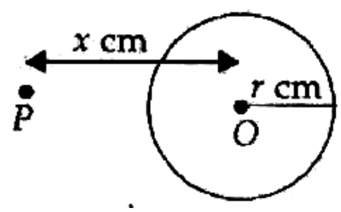
(iv) Draw $\angle QPB = \angle PRQ$ on the opposite side of the chord PQ.

(v) Produce BP to A. Thus, APB is the required tangent.

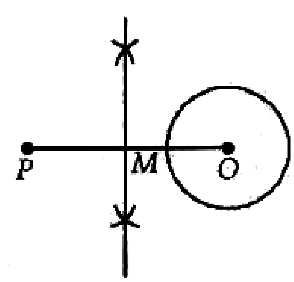
Construction of Tangent to a Circle from a Point Outside it when the Centre of the Circle is known :

Steps of Construction :

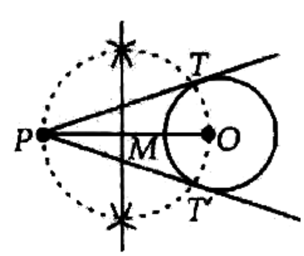
1. Draw a circle with O as centre and radius r cm. Mark a point P outside the circle such that OP = x cm.



2. Join OP and draw its perpendicular bisector, which cut OP at M.



3. Draw a circle with M as centre and radius equal to MP to intersect the given circle at the point T and T¢. Join PT and PT¢. PT and PT¢ are the required tangents.



Ex. 3 Draw a circle of radius 2.5 cm. From a point P, 6 cm apart from the centre of a circle, draw two tangents to the circle.

Sol. **Given :** A point P is at a distance of 6 cm from the centre of a circle of radius 2.5 cm

Required : To draw two tangents to the circle from the given point P.

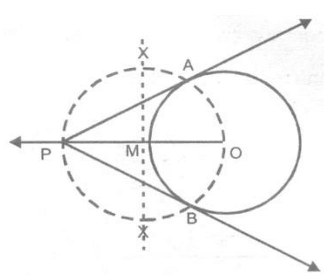
Steps of Construction :

(i) Draw a circle of radius 2.5 cm. Let it centre be O.

(ii) Join OP and bisect it. Let M be mid-point of OP.

(iii) Taking M as centre and MO as radius draw a circle to intersect C in two points, say A and B.

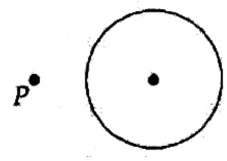
(iv) Join PA and PB. These are the required tangents from P to C.



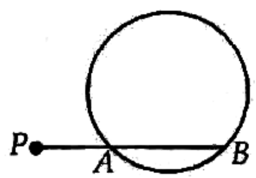
Construction of tangents to a circle from a point out side it without using the centre :

Step of Construction :

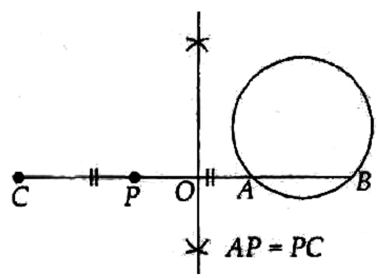
1. Draw a circle of radius r cm and a point P outside it.



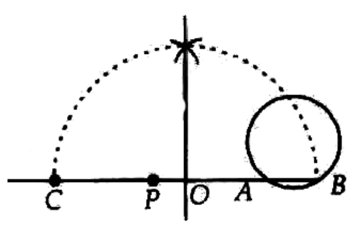
2. Through P draw a secant PAB to intersect the circle at A and B.



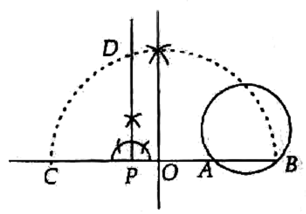
3. Produce AP to C such that AP = PC. Draw the perpendicular bisector of CB which cuts CB at O.



4. Draw a semi circle with CB as diameter, O as centre and OC as radius.

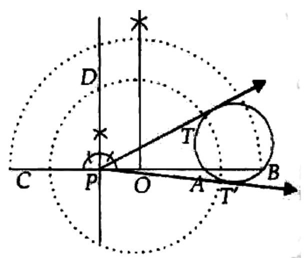


5. Draw PD ⊥ CB, intersecting the semicircle at D.



6. With P as centre PD as radius, draw arcs to intersect the circle at T and T¢.

Join PT and PT¢. PT and PT¢ are the required tangents.



Ex. 4 Draw a circle of radius 3 cm. From a point P, outside the circle draw two tangents to the circle without using the centre of the circle.

Sol. **Given :** A point P is outside the circle of radius 3 cm.

Required : To draw two tangents to the circle from the point P, without the use of centre.

Steps of constructing

(i) Draw a circle of radius 3 cm.

(ii) Take a point P outside the circle and draw a secant PAB, intersecting the circle at A and B.

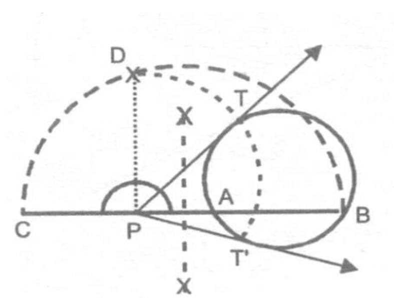
(iii) Produce AP to C such that AP = CP.

(iv) Draw a semicircle, wit CB as a diameter.

(v) Draw PD $\perp$ AB, intersecting the semi-circle AT D.

(vi) With PD as radius and P as centre draw two arcs to intersect the given circle at T and T'.

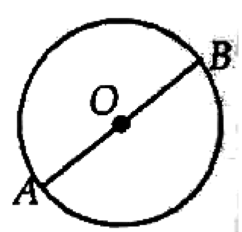
(vii) Joint PT and PT'. Which are the required tangents.



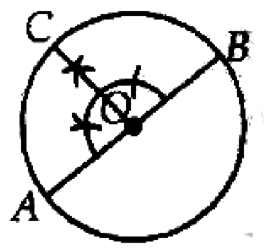
Construction of tangents to a circle inclined to each ohter at a given angle :

Steps of Construction :

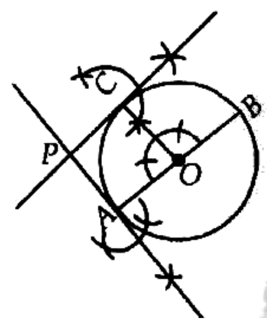
1. Draw a circle with O as centre and radius r cm and any diameter AOB of this circle.



2. Construct the given angle at O such that radius OC meets the circle at C. (Suppose given angle is 90º)



3. Draw perpendicular at A and C intersect each other at P.



Hence PA and PC are the required tangents to the given circle, inclined at a given angle.

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

Sol. Steps of construction

Step I : Draw a circle with O as centre and radius = 3 cm.

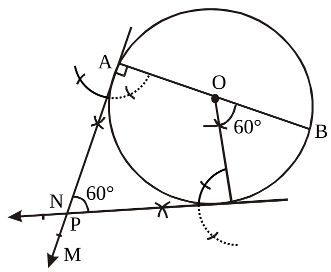
Step II : Draw any diameter AOB of this circle.

Step III : Construct $\angle BOC = 60^\circ$ such that radius OC meets the circle at C.

Step IV : Draw AM ⊥ AB and CN ⊥OC.

Let AM and CN intersect each other at P.

Then, PA and PC are the desired tangents to the given circle, inclined at an angle of 60º



Ex. 6 Draw a pair of tangents to a circle of radius 5 cm which are inclined to each other an angle of 60º.

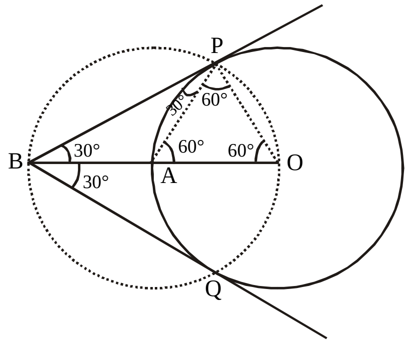
Sol. In order to draw the pair of tangents, we follow the following steps.

Step I : Take a point O on the plane of the paper and draw a circle of radius OA = 5 cm.

Step II : Produce OA to B such that OA = AB = 5 cm.

Step III : Taking A as the centre draw a circle of radius AO = AB = 5 cm. Suppose it cuts the circle drawn in step I at P and Q.

Step IV : Join BP and BQ to get the desired tangents.



Justification: In OAP, we have

OA = OP = 5 cm (= Radius) Also,

AP = 5 cm (= Radius of circle with centre A)

$\therefore$ ΔOAP is equilateral.

$\Rightarrow$ $\angle PAO = 60^{\circ} \Rightarrow \angle BAP = 120^{\circ}$

In ΔBAP, we have

BA = AP and $\angle BAP = 120^{\circ}$

$\therefore$ $\angle ABP = \angle APB = 30^{\circ} \Rightarrow \angle PBQ = 60^{\circ}$