Exercise – 13B

1. Draw a circle of radius 3 cm. Form a point P, 7 cm away from the centre of the circle, draw two tangents to the circle. Also, measure the lengths of the tangents.

Sol:

Steps of Construction

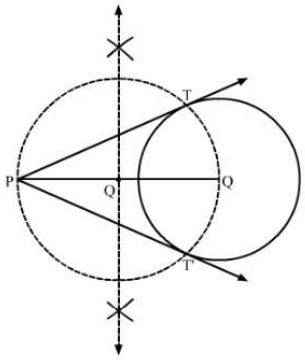
Step 1: Draw a circle with O as center and radius 3 cm.

Step 2: Mark a point P outside the circle such that $OP = 7\,cm.$

Step 3: Join OP. Draw the perpendicular bisector XY of OP. cutting OP at Q.

Step 4: Draw a circle with Q as center and radius PQ (or OQ), to intersect the given circle at the points T and T'.

Step 5: Join PT and PT'.



Here, PT and PT' are the required tangents.

$PT = PT' = 6.3\,cm$ (Approx)

2. Draw two tangents to a circle of radius 3.5 cm form a point P at a distance of 6.2 cm form its centre.

Sol:

Steps of Construction

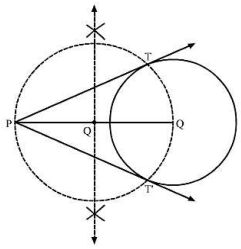
Step 1: Draw a circle with O as center and radius 3.5 cm.

Step 2: Mark a point P outside the circle such that $OP = 6.2\,cm$.

Step 3: Join OP. Draw the perpendicular bisector XY of OP, cutting OP at Q.

Step 4: Draw a circle with Q as center and radius PQ (or 0Q), to intersect the given circle at the points T and T'.

Step 5: Join PT and PT'.



Here, PT and PT' are the required tangents.

3. Draw a circle of radius 3.5 cm. Take two points A and B on one of its extended diameter, each at a distance of 5 cm from its center. Draw tangents to the circle from each of these points A and B.

Sol:

Steps of Construction

Step 1: Draw a circle with center O and radius 3.5 cm.

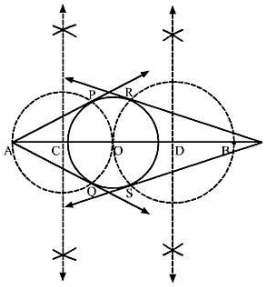
Step 2: Extends its diameter on both sides and mark two points A and B on it such that $OA = OB = 5\ cm$.

Step 3: Draw the perpendicular bisectors of OA and OB. Let C and D be the mid-points of OA and OB, respectively.

Step 4: Draw a circle with C as center and radius OC (or AC), to intersect the circle with center O, at the points P and Q.

Step 5: Draw another circle with D as center and radius OD (or BD), to intersect the circle with center O at the points R and S.

Step 6: Join AP and AQ, Also, join BR and BS.



Here, AP and AQ are the tangents to the circle from A, Also, BR and BS are the tangents to the circle from B.

4. Draw a circle with center O and radius 4 cm. Draw any diameter AB of this circle. Construct tangents to the circle at each of the two end points of the diameter AB.

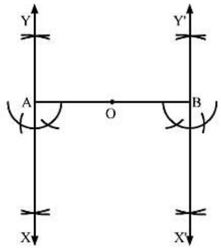
Sol:

Step 1: Draw a circle with center *O* and radius 4 cm.

Step 2: Draw any diameter *AOB* of the circle.

Step 3: At *A*, draw $\angle OAX = 90°$. Produce $XA = Y$.

Step 4: At *B*, draw $\angle OBX' = 90°$. Produce $X'B$ to Y'.



Here, XAY *and* $X'BY'$ are the tangents to the circle at the end points of the diameter *AB*.

5. Draw a circle with the help of a bangle. Take any point P outside the circle. Construct the pair of tangents form the point P to the circle

Sol:

Steps of Construction

Step 1: Draw a circle with the help of a bangle.

Step 2: Mark a point *P* outside the circle.

Step 3: Through *P*. draw a secant *PAB* to intersect the circle at *A* and *B*.

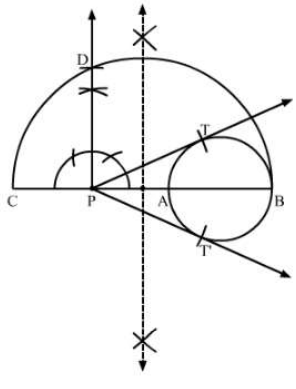
Step 4: Produce *AP* to *C* such that *PA* = *PC*.

Step 5: Draw a semicircle with *CB* as diameter.

Step 6: Draw $PD \perp BC$, intersecting the semicircle at *D*.

Step 7: With *P* as center and *PD* as radius, draw arcs to intersect the circle at T and T'.

Step 8: Join *PT* and *PT'S*.



Here, *PT* and *PT'* are the required pair of tangents.

6. 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 form the centre of the other circle.

Sol:

Steps of Construction

Step 1: Draw a line segment $AB = 8$ cm.

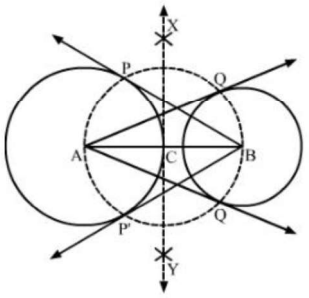
Step 2: With A as center and radius 4 cm, draw a circle.

Step 3: With B as center and radius 3 cm, draw another circle.

Step 4: Draw the perpendicular bisector XY of AB, cuffing AB at C.

Step 5: With C as center and radius AC (or BC), draw a circle intersecting the circle with center A at P and P': and the circle with center B at Q and Q'.

Step 6: Join BP and BP' Also, join AQ and AQ'.



Here. AQ and AQ' are the tangents from A to the circle with center B. Also, BP and BP' are the tangents from B to the circle with center A.

7. Draw a circle of radius 4.2. Draw a pair of tangents to this circle inclined to each other at an angle of $45°$

Sol:

Steps of Construction:

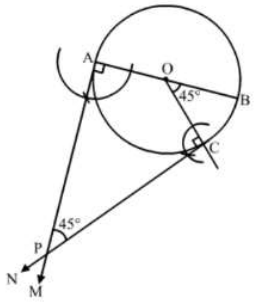
Step 1: Draw a circle with center O and radius = 4.2 cm.

Step 2: Draw any diameter AOB of this circle.

Step 3: Construct $\angle BOC = 45°$. such that the radius OC meets the circle at C.

Step4: Draw $AM \perp AB$ and $CN \perp OC$.

AM and CN intersect at P.



Thus, PA and PC are the required tangents to the given circle inclined at an angle of $45°$.

8. Write the steps of construction for drawing a pair of tangents to a circle of radius 3 cm , which are inclined to each other at an angle of $60°$.

Sol:

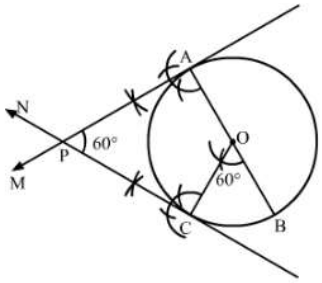
Steps of Construction

Step 1: Draw a circle with center O and radius 3c m.

Step 2: Draw any diameter AOB of the circle.

Step 3: Construct $\angle BOC = 60°$ such that radius OC cuts the circle at C.

Step 4: Draw $AM \perp AB$ and $CN \perp OC$. Suppose AM and CN intersect each other at P.



Here, AP and CP are the pair of tangents to the circle inclined to each other at an angle of 60°.

9. Draw a circle of radius 32 cm. Draw a tangent to the circle making an angle $30°$ with a line passing through the centre.

Sol:

Steps Of construction:

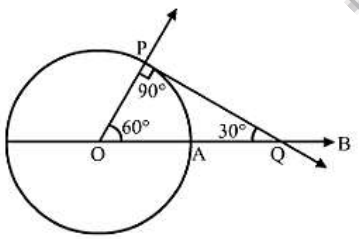
Step 1: Draw a circle with center O and radius 3 cm.

Step 2: Draw radius OA and produce it to B.

Step 3: Make $\angle AOP = 60°$

Step 4: Draw $PQ \perp OP$, meeting OB at Q.

Step 5: Then, PQ is the desired tangent, such that $\angle OQP = 30°$



10. Construct a tangent to a circle of radius 4 cm form a point on the concentric circle of radius 6 cm and measure its length. Also, verify the measurement by actual calculation.

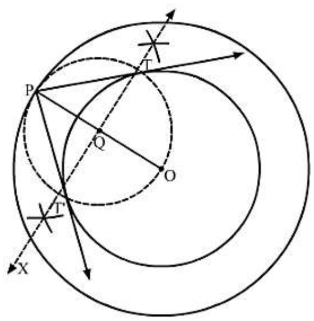
Sol:

Steps of Construction

Step 1: Mark a point O on the paper

Step 2: With O as center and radii 4cm and 6cm, draw two concentric circles.

Step 3: Mark a point P on the outer circle.
Step 4: Join OP.
Step 5: Draw the perpendicular bisector *XY* of OP, cutting *OP* at *Q*.
Step 6: Draw a circle with *Q* as center and radius *OQ* (or *PQ*), to intersect the inner circle in points T and T'.
Step 7: Join PT and PT'.



Here, PT and PT' are the required tangents.
PT = PT' 4.5 cm (Approx)
Verification by actual calculation
Join OT to form a right ΔOTP (Radius is perpendicular to the tangent at the point of contact)
In right ΔOTP,

$$OP^2 = OT^2 + PT^2 \qquad \text{(Pythagoras Theorem)}$$

$$\Rightarrow PT = \sqrt{OP^2 - OT^2}$$

$$\Rightarrow PT = \sqrt{6^2 - 4^2} = \sqrt{36-16} = \sqrt{20} \approx 4.5\ cm$$

$$(OP = 6\ cm\ and\ OT = 4\ cm)$$