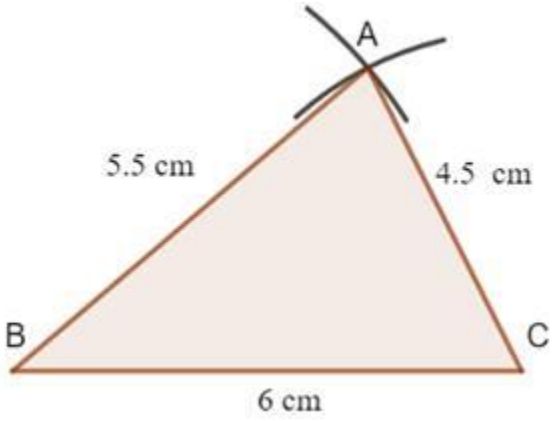
Geometric Constructions

Practice Set 4.1

Q. 1. ∆ ABC ~ ∆ LMN. In ∆ ABC, AB = 5.5 cm, BC = 6 cm, CA = 4.5 cm.

Construct ∆ABC and ∆ LMN such that $\frac{BC}{MN} = \frac{5}{4}$.

Answer : First we draw a triangle ABC, with AB = 5.5 cm, BC = 6 cm and CA = 4.5 cm



Now, as ΔABC is similar to ΔLMN

∴ corresponding sides will have same ratio

Now, as $\frac{BC}{MN} = \frac{5}{4}$

$\Rightarrow \frac{AB}{LM} = \frac{BC}{MN} = \frac{AC}{LN} = \frac{5}{4}$

$\Rightarrow \frac{5.5}{LM} = \frac{5}{4}$

⇒ LM = 4.4 cm

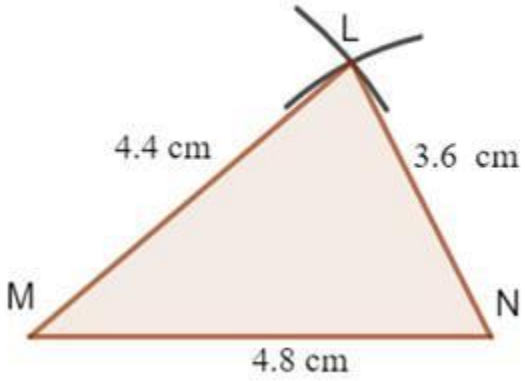
$\Rightarrow \frac{6}{MN} = \frac{5}{4}$

⇒ MN = 4.8 cm

$$\Rightarrow \frac{4.5}{LN} = \frac{5}{4}$$

⇒ LN = 3.6 cm

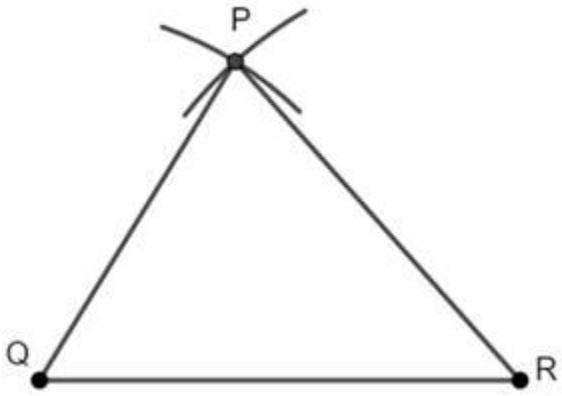
Now, make a ΔLMN, with LM = 4.4 cm, MN = 4.8 cm and LN = 3.6 cm



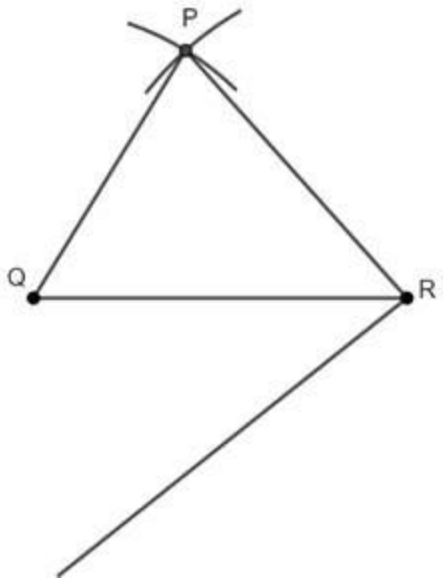
Q. 2. ∆ PQR ~ ∆ LTR. In ∆ PQR, PQ = 4.2 cm, QR = 5.4 cm, PR = 4.8 cm.
Construct∆ PQR and ∆ LTR, such that $\frac{PQ}{LT} = \frac{3}{4}$.

Answer : Steps of construction:

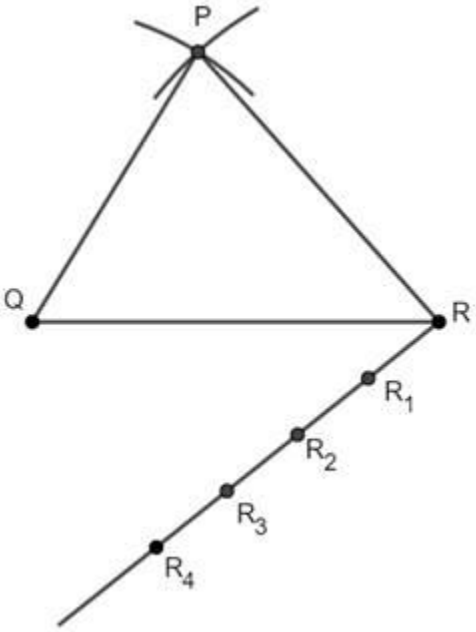
i. Draw a triangle PQR, with PQ = 4.2 cm, QR = 5.4 cm and PR = 4.8 cm, choosing QR = 5.4 cm as base.



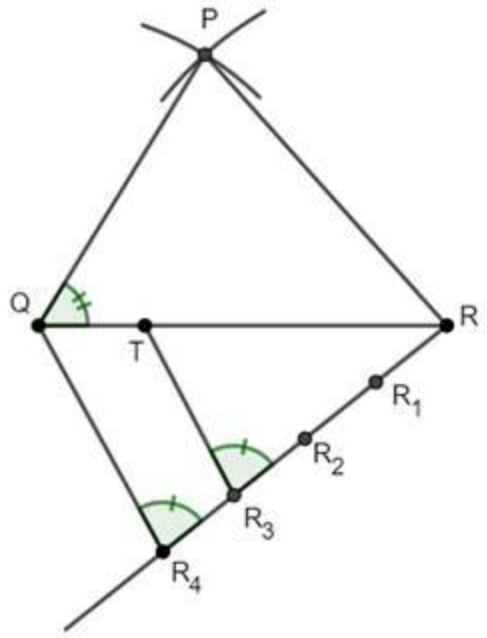
ii. Below QR, draw an acute angle ∠QRX.



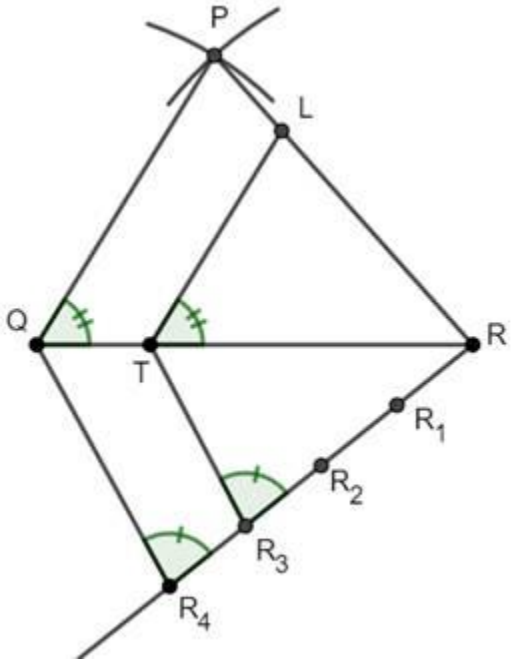
iii. Mark four points R_1, R_2, R_3 and R_4 on RX, such that $RR_1 = R_1R_2 = R_2R_3 = R_3R_4$. [As ratio is 4:3, we choose 4 points]



iv. Join QR_4 and Draw TR_3 || QR_4

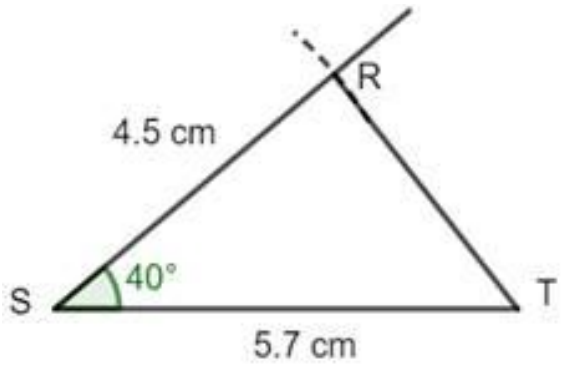


v. Draw LT || PQ.



Q. 3. **∆ RST ~ ∆ XYZ. In ∆ RST, RS = 4.5 cm, ∠RST = 40°, ST = 5.7 cm. Construct ∆RST and ∆XYZ, such that** $\frac{RS}{XY} = \frac{3}{5}$.

Answer : First we draw a triangle RST, with RS = 4.5 cm, ∠RST = 40° cm and ST = 5.7 cm



Now, as ΔRST is similar to ΔXYZ,

∴ corresponding sides will have same ratio

Now, as $\frac{RS}{XY} = \frac{3}{5}$

$$\Rightarrow \frac{RS}{XY} = \frac{ST}{YZ} = \frac{TR}{ZX} = \frac{3}{5}$$

$$\Rightarrow \frac{4.5}{XY} = \frac{3}{5}$$

⇒ XY = 7.5 cm

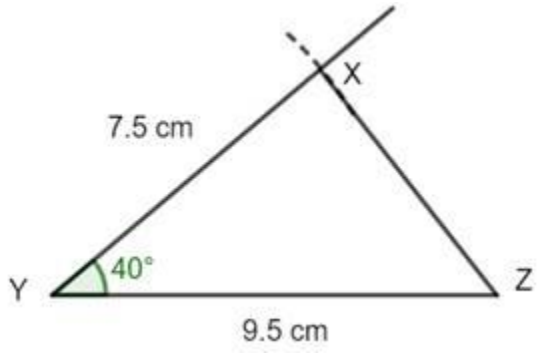
$$\Rightarrow \frac{5.7}{YZ} = \frac{3}{5}$$

⇒ YZ = 9.5 cm

Also, Corresponding angles of similar triangles are equal

⇒ ∠RST = ∠XYZ = 40°

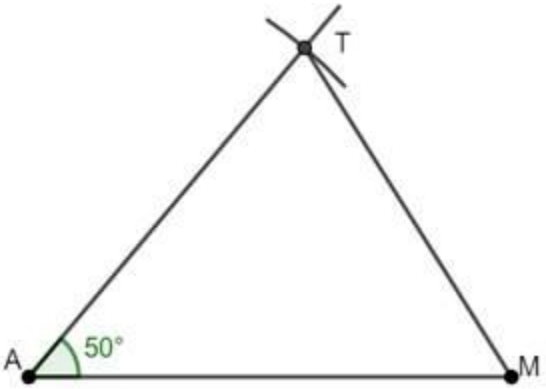
Now, draw a triangle XYZ, with XY = 7.5 cm, ∠XYZ = 40° cm and YZ = 9.5 cm.



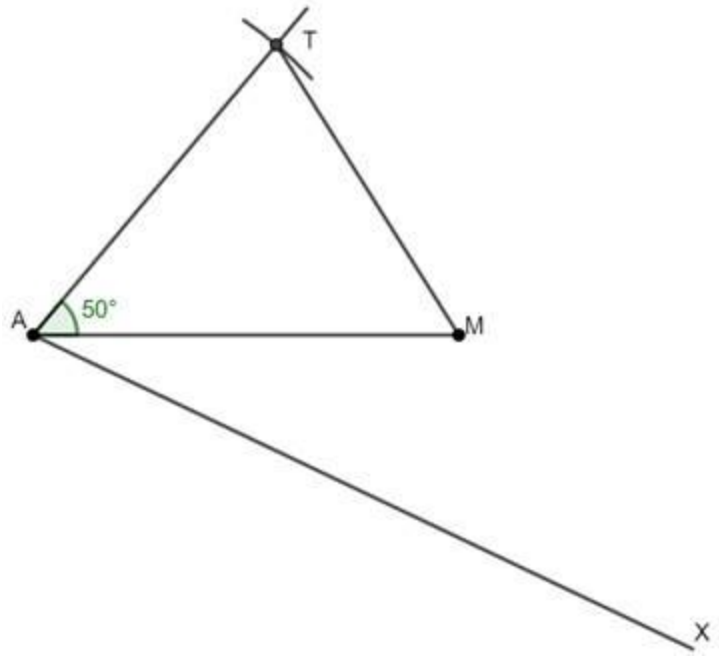
Q. 4. ∆ AMT ~ ∆ AHE. In ∆ AMT, AM = 6.3 cm, ∠TAM = 50°, AT = 5.6 cm. $\frac{AM}{AH} = \frac{7}{5}$. Construct ∆ AHE.

Answer : Steps of construction:

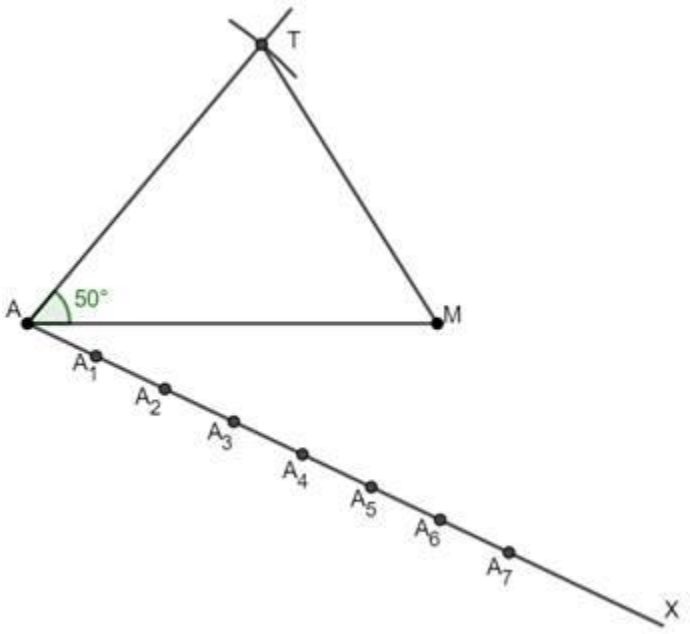
i. Draw a triangle AMT, with AM = 6.3 cm, ∠TAM = 50° cm and AT = 5.6 cm, choosing AM as base.



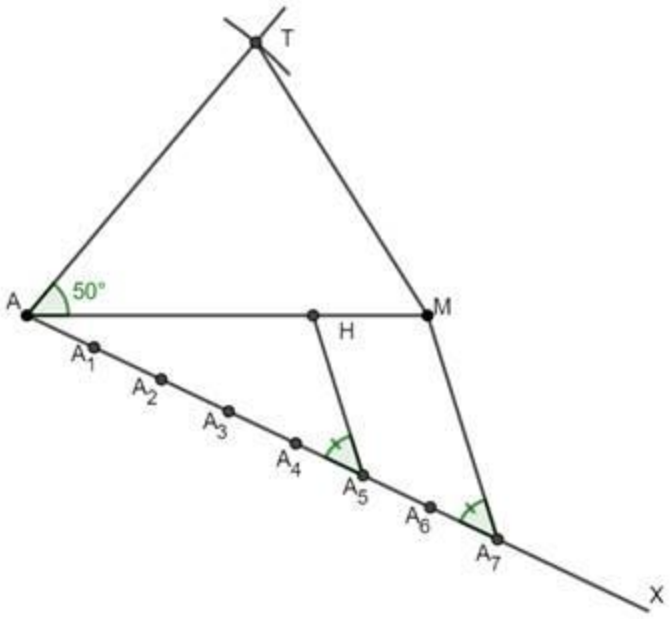
ii. Below AM, draw an acute angle ∠MAX.



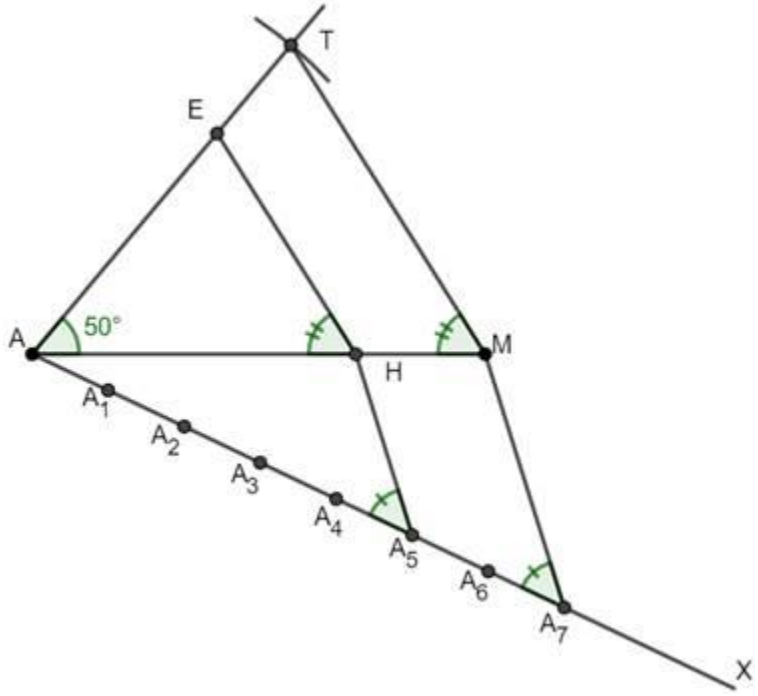
iii. Mark four points A_1, A_2, A_3, A_4, A_5, A_6 and A_7 on AX, such that $AA_1 = A_1A_2 = \ldots = A_6A_7$ [As ratio is 7:5, we choose 7 points]



iv. Join MA_7 and Draw $HA_5 \parallel MA_7$



v. Draw HE || MT



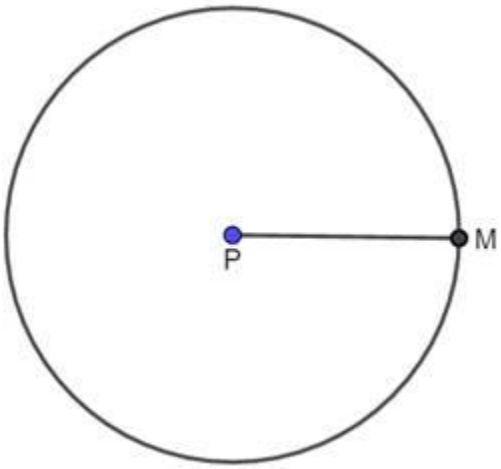
Practice Set 4.2

Q. 1. Construct a tangent to a circle with centre P and radius 3.2 cm at any point M on it.

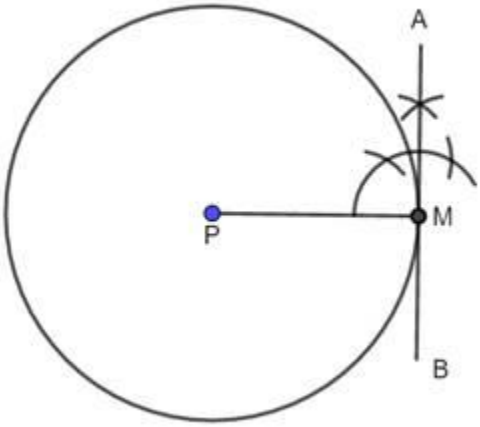
Answer : Steps of construction:

i. Draw a circle with center P and radius 3.2 cm

ii. Take a point M on the circle, Join PM.



iii. Draw AB ⊥ PM such that AB passes through M, AB is required tangent.

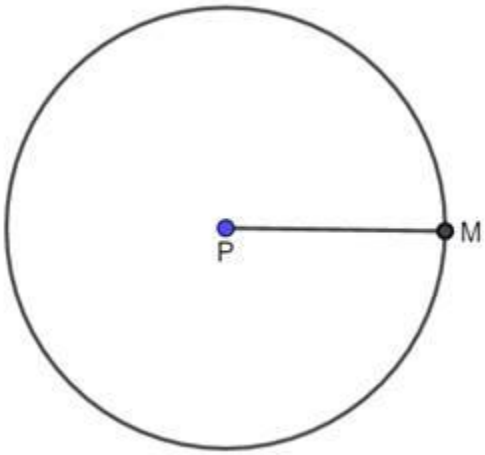


Q. 2. Draw a circle of radius 2.7 cm. Draw a tangent to the circle at any point on it.

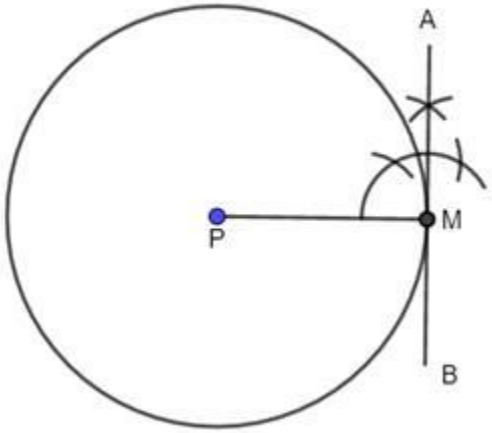
Answer : Steps of construction:

i. Draw a circle with center P and radius 2.7 cm

ii. Take a point M on the circle, Join PM.

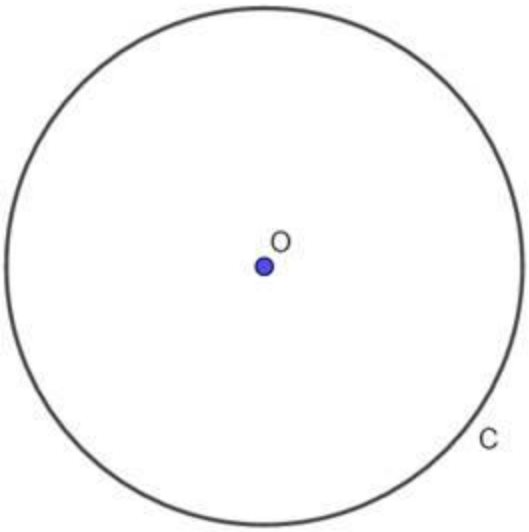


iii. Draw AB ⊥ PM such that AB passes through M, AB is required tangent.

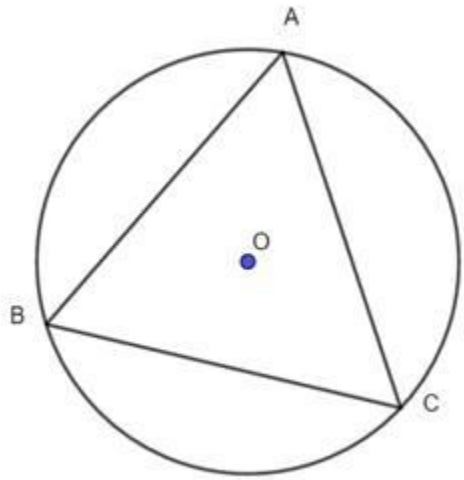


Q. 3. Draw a circle of radius 3.6 cm. Draw a tangent to the circle at any point on it without using the centre.

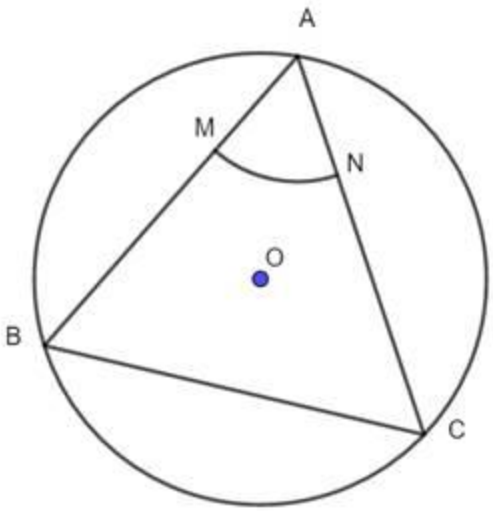
Answer : i. Draw a circle of radius 3.6 cm. Take any point C on it.



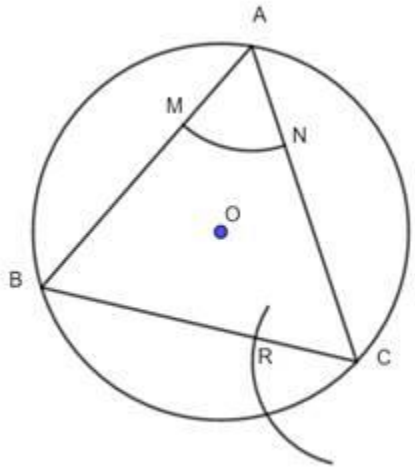
ii. Draw chord CB and an inscribed ∠CAB.



iii. With the centre A and any convenient radius draw an arc intersecting the sides of ∠BAC in points M and N.



iv. Using the same radius and centre C, draw an arc intersecting the chord CB at point R.



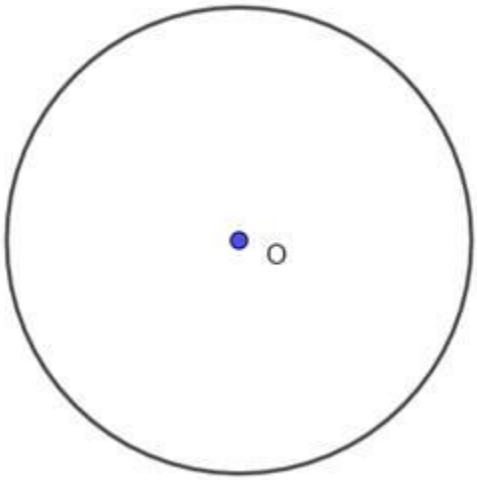
v. Taking the radius equal to d(MN) and centre R, draw an arc intersecting the arc drawn in the previous step. Let D be the point of intersection of these arcs. Draw line CD. Line CD is the required tangent to the circle.

Q. 4. Draw a circle of radius 3.3 cm Draw a chord PQ of length 6.6 cm. Draw tangents to the circle at points P and Q. Write your observation about the tangents.

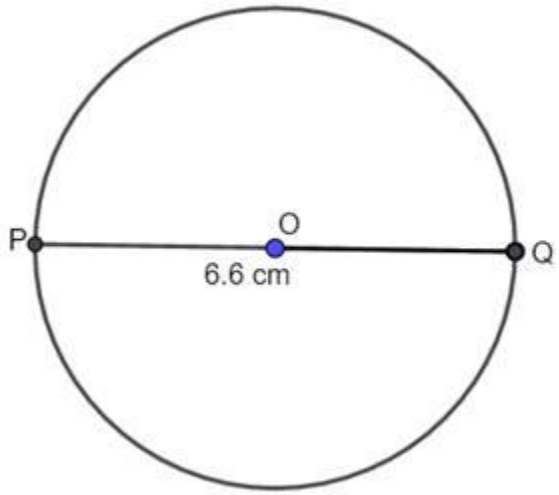
Answer : Here chord = 6.6 = 2 × 3.3 cm = 2 × radius, hence PQ is diameter of the circle.

Steps of construction:

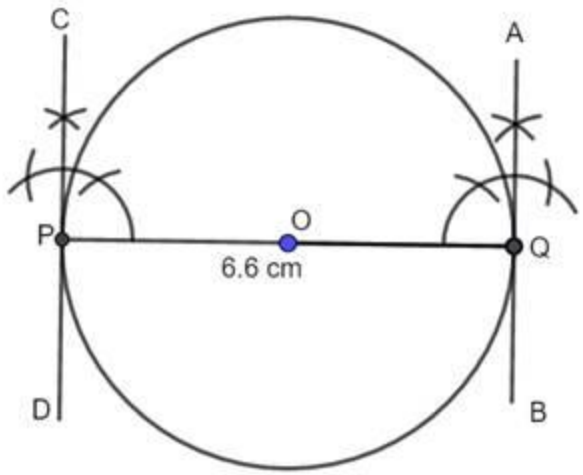
i. Draw a circle with center O, and radius 3.3 cm



ii. Draw a diameter PQ passing through center.

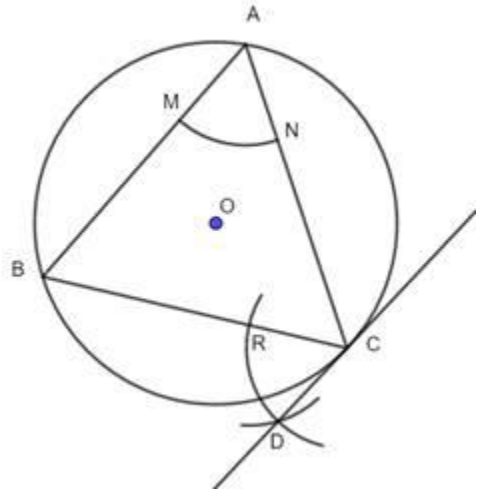


iii. Draw AB ⊥ OQ and CD ⊥ OP, such that AB and CD pass through Q and P respectively.



iv. AB and CD are required tangents.

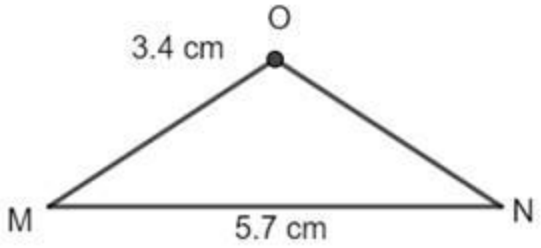
Observation: AB || CD, i.e. tangents at opposite ends of diameter are parallel.



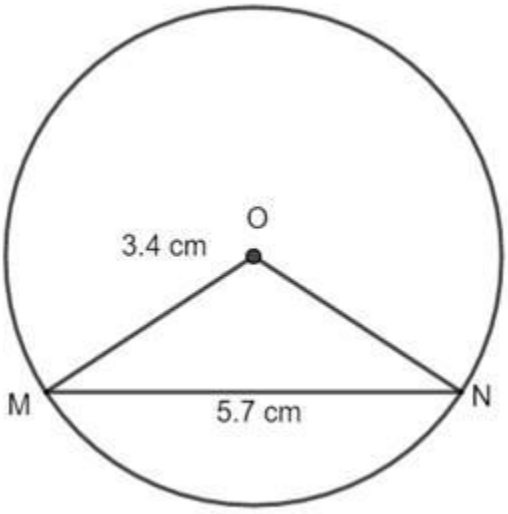
Q. 5. Draw a circle with radius 3.4 cm. Draw a chord MN of length 5.7 cm in it. Construct tangents at point M and N to the circle.

Answer : Steps of construction:

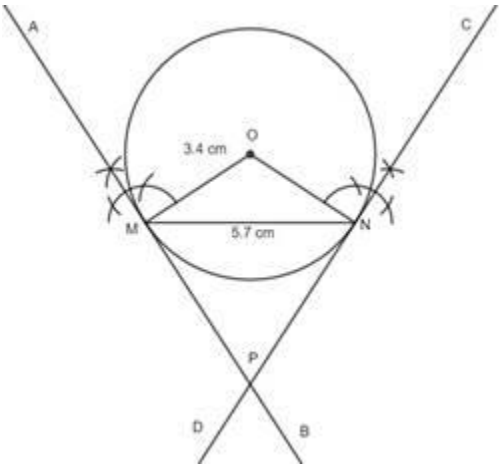
i. Draw an isosceles triangle OMN, with OM = ON = 3.4 cm and MN = 5.7 cm as base.



ii. Taking O as center, and OM or ON as radius, draw a circle.



iii. Draw AB ⊥ OM and CD ⊥ ON, such that AB and CD pass through M and N respectively.

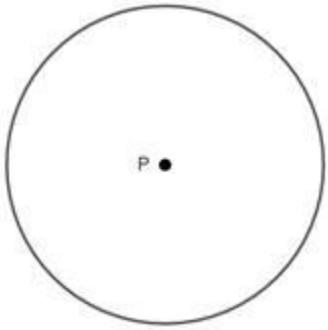


iv. AB and CD are required tangents and intersects each other at P.

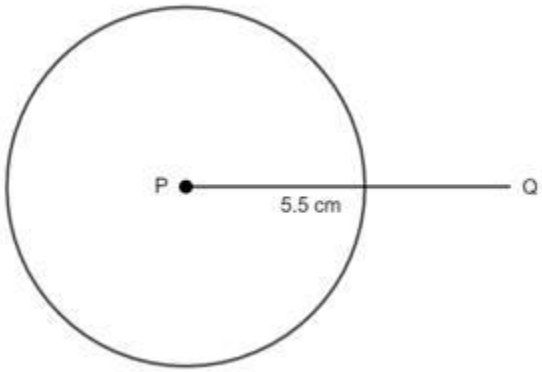
Q. 6. Draw a circle with centre P and radius 3.4 cm. Take point Q at a distance 5.5 cm from the centre. Construct tangents to the circle from point Q.

Answer : Steps of construction:

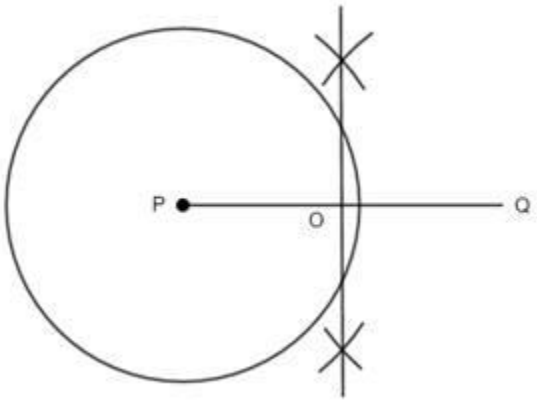
i. Draw a circle with center P and radius 3.4 cm.



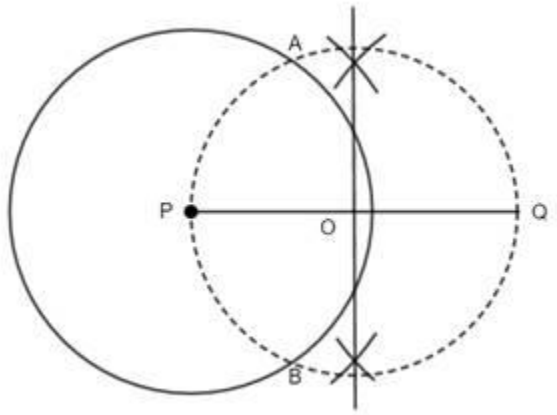
ii. Take a point Q outside the circle such that PQ = 5.5 cm



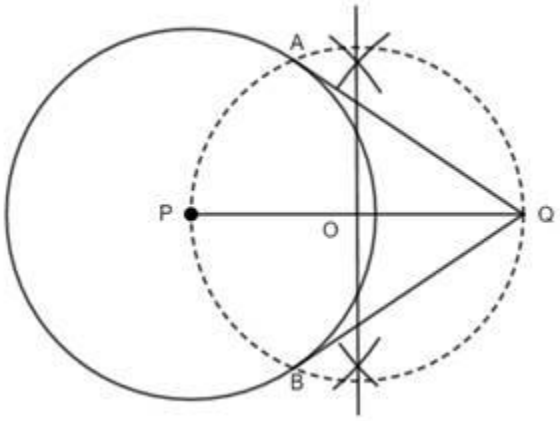
iii. Draw the perpendicular bisector of PQ, which bisects PQ at O.



iv. Taking O as center and OP = OQ as radius, draw another circle, which intersects the previous circle at A and B.



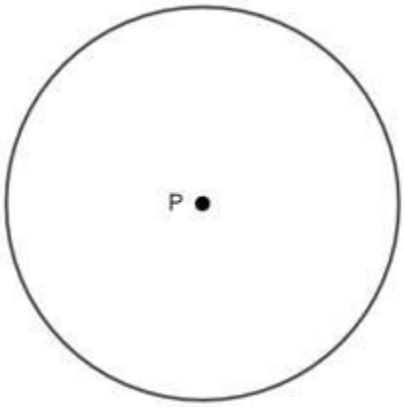
v. Join AQ and BQ, which are required tangents.



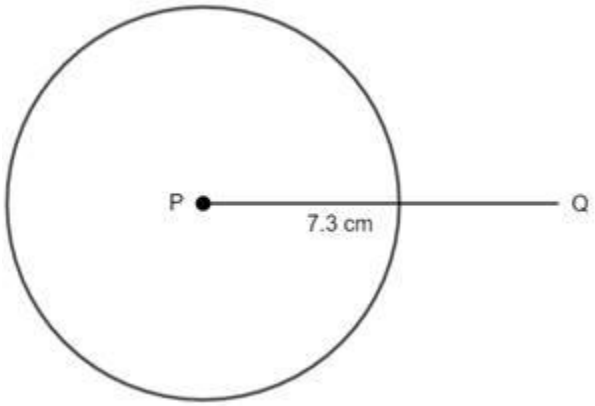
Q. 7. Draw a circle with radius 4.1 cm. Construct tangents to the circle from a point at a distance 7.3 cm from the centre.

Answer : Steps of construction:

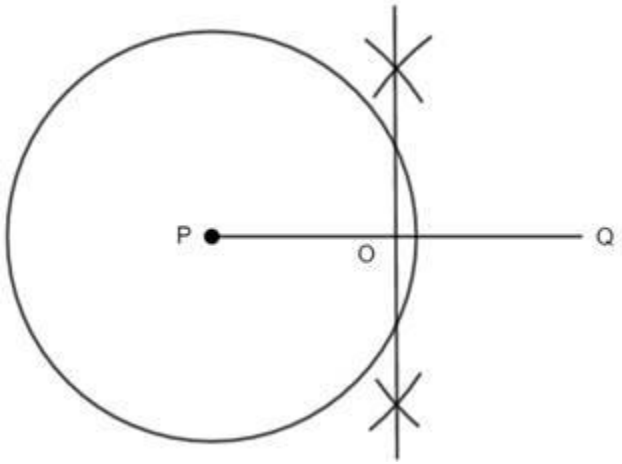
i. Draw a circle with center P and radius 4.1 cm.



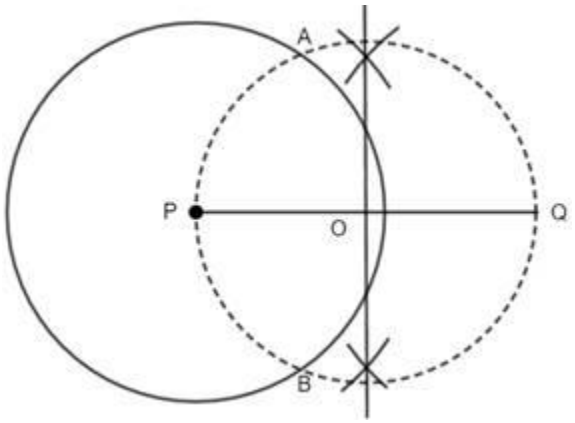
ii. Take a point Q outside the circle such that PQ = 7.3 cm



iii. Draw the perpendicular bisector of PQ, which bisects PQ at O.



iv. Taking O as center and OP = OQ as radius, draw another circle, which intersects the previous circle at A and B.



v. Join AQ and BQ, which are required tangents.