

## Geometric Constructions

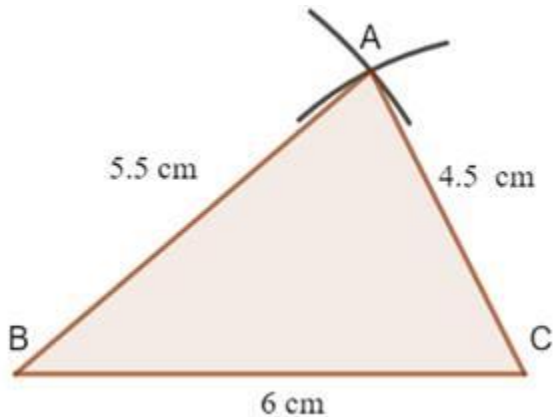
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### Practice Set 4.1

**Q. 1.**  $\triangle ABC \sim \triangle LMN$ . In  $\triangle ABC$ ,  $AB = 5.5$  cm,  $BC = 6$  cm,  $CA = 4.5$  cm.

**Construct  $\triangle ABC$  and  $\triangle LMN$  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  $\triangle ABC$  is similar to  $\triangle LMN$

$\therefore$  corresponding sides will have same ratio

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

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

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

$$\Rightarrow LM = 4.4 \text{ cm}$$

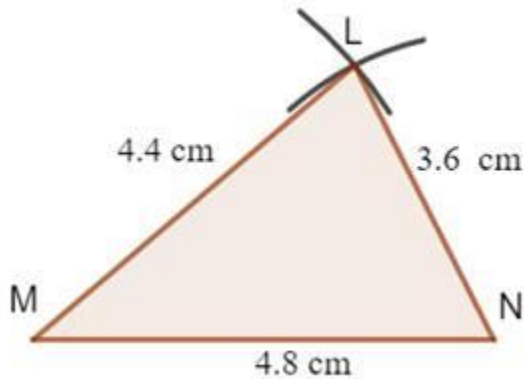
$$\Rightarrow \frac{6}{MN} = \frac{5}{4}$$

$$\Rightarrow MN = 4.8 \text{ cm}$$

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

$$\Rightarrow LN = 3.6 \text{ cm}$$

Now, make a  $\triangle LMN$ , with  $LM = 4.4 \text{ cm}$ ,  $MN = 4.8 \text{ cm}$  and  $LN = 3.6 \text{ cm}$

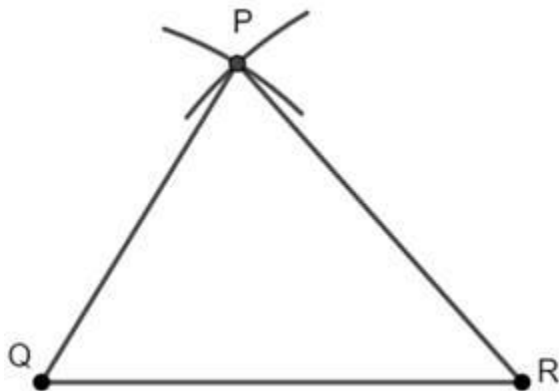


**Q. 2.**  $\triangle PQR \sim \triangle LTR$ . In  $\triangle PQR$ ,  $PQ = 4.2 \text{ cm}$ ,  $QR = 5.4 \text{ cm}$ ,  $PR = 4.8 \text{ cm}$ .

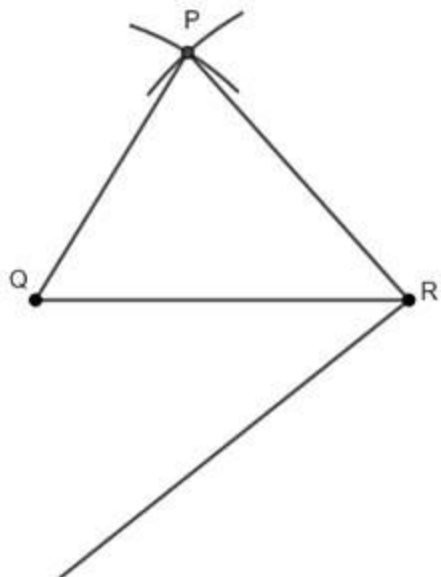
**Construct  $\triangle PQR$  and  $\triangle LTR$ , such that  $\frac{PQ}{LT} = \frac{3}{4}$ .**

**Answer :** Steps of construction:

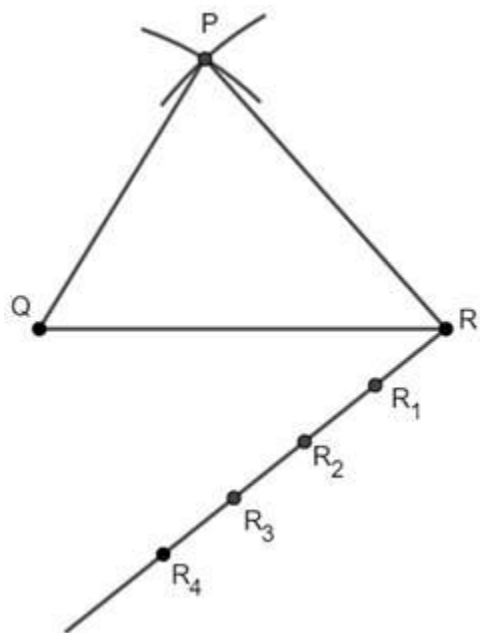
i. Draw a triangle  $PQR$ , with  $PQ = 4.2 \text{ cm}$ ,  $QR = 5.4 \text{ cm}$  and  $PR = 4.8 \text{ cm}$ , choosing  $QR$  = 5.4 cm as base.



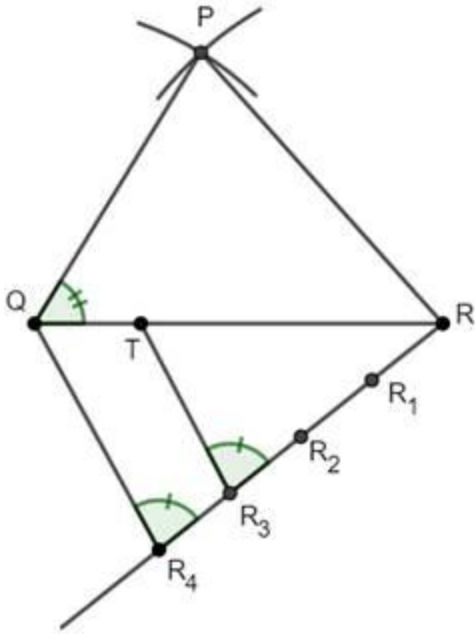
ii. Below  $QR$ , draw an acute angle  $\angle QRX$ .



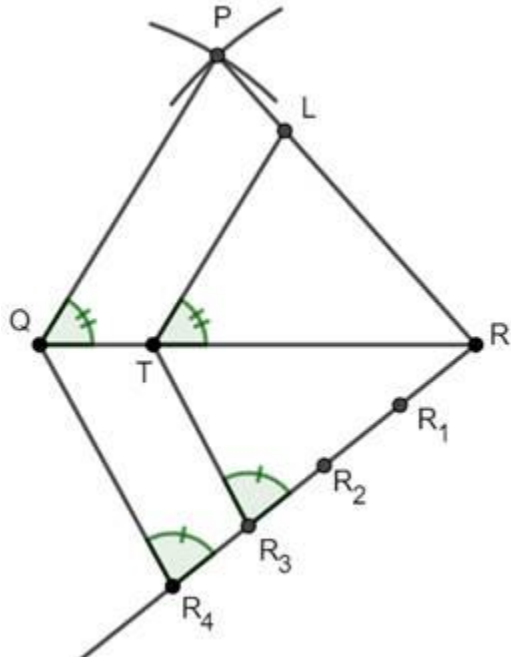
iii. Mark four points  $R_1$ ,  $R_2$ ,  $R_3$  and  $R_4$  on  $RX$ , such that  $RR_1 = R_1R_2 = R_2R_3 = R_3R_4$ . [As ratio is 4:3, we choose 4 points]



iv. Join  $QR_4$  and Draw  $TR_3 \parallel QR_4$



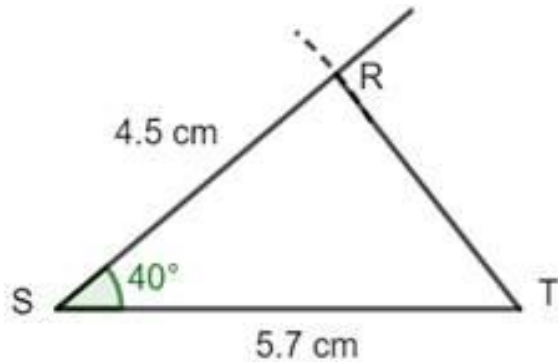
v. Draw  $LT \parallel PQ$ .



Q. 3.  $\triangle RST \sim \triangle XYZ$ . In  $\triangle RST$ ,  $RS = 4.5$  cm,  $\angle RST = 40^\circ$ ,  $ST = 5.7$  cm.

Construct  $\triangle RST$  and  $\triangle XYZ$ , such that  $\frac{RS}{XY} = \frac{3}{5}$ .

**Answer :** First we draw a triangle RST, with RS = 4.5 cm,  $\angle RST = 40^\circ$  cm and ST = 5.7 cm



Now, as  $\triangle RST$  is similar to  $\triangle XYZ$ ,

$\therefore$  corresponding sides will have same ratio

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

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

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

$$\Rightarrow XY = 7.5 \text{ cm}$$

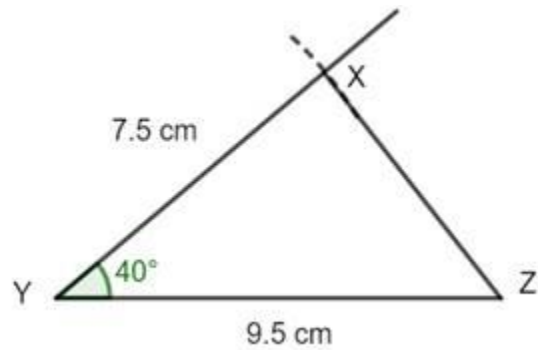
$$\Rightarrow \frac{5.7}{YZ} = \frac{3}{5}$$

$$\Rightarrow YZ = 9.5 \text{ cm}$$

Also, Corresponding angles of similar triangles are equal

$$\Rightarrow \angle RST = \angle XYZ = 40^\circ$$

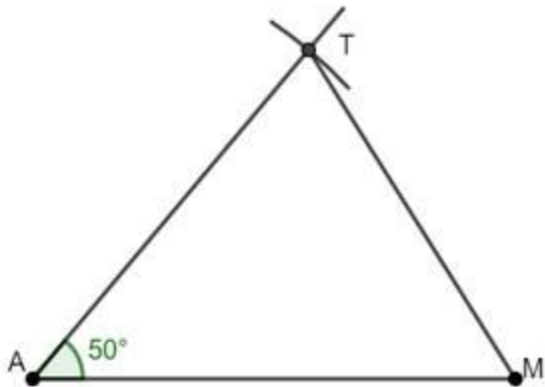
Now, draw a triangle XYZ, with XY = 7.5 cm,  $\angle XYZ = 40^\circ$  cm and YZ = 9.5 cm.



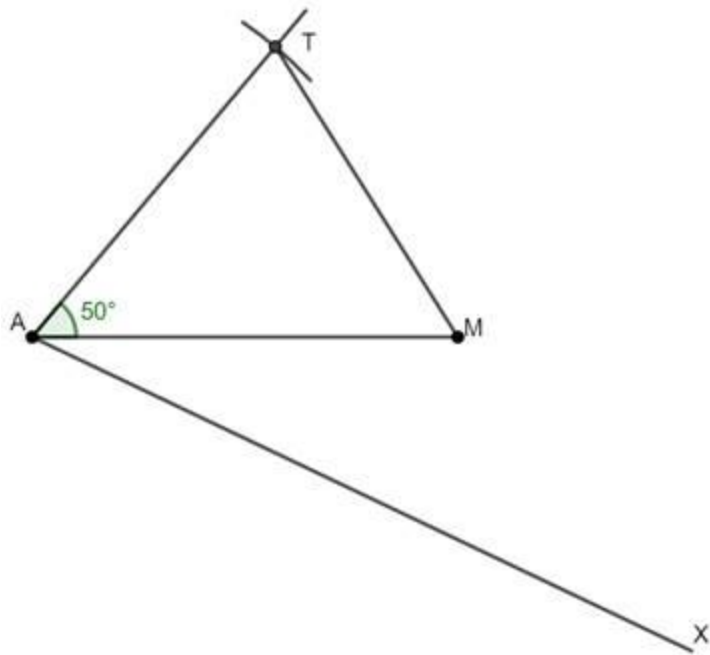
**Q. 4.**  $\triangle AMT \sim \triangle AHE$ . In  $\triangle AMT$ ,  $AM = 6.3$  cm,  $\angle TAM = 50^\circ$ ,  $AT = 5.6$  cm.  $\frac{AM}{AH} = \frac{7}{5}$ .  
**Construct  $\triangle AHE$ .**

**Answer :** Steps of construction:

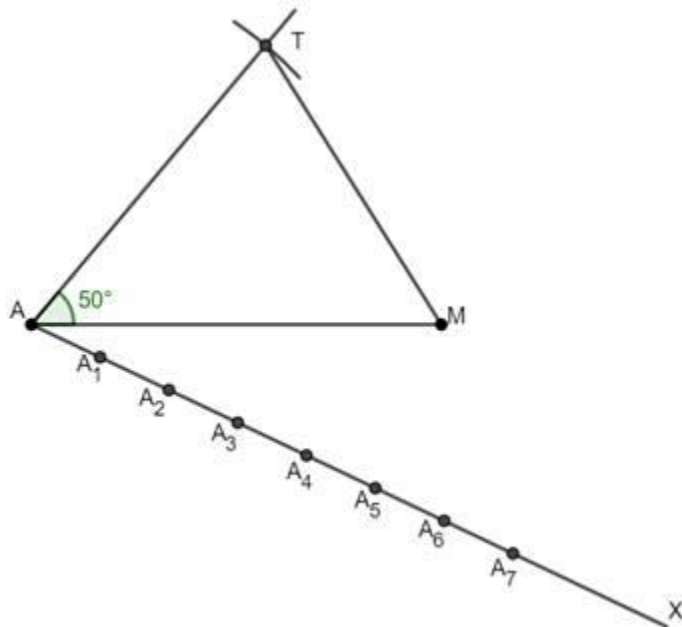
i. Draw a triangle  $AMT$ , with  $AM = 6.3$  cm,  $\angle TAM = 50^\circ$  cm and  $AT = 5.6$  cm, choosing  $AM$  as base.



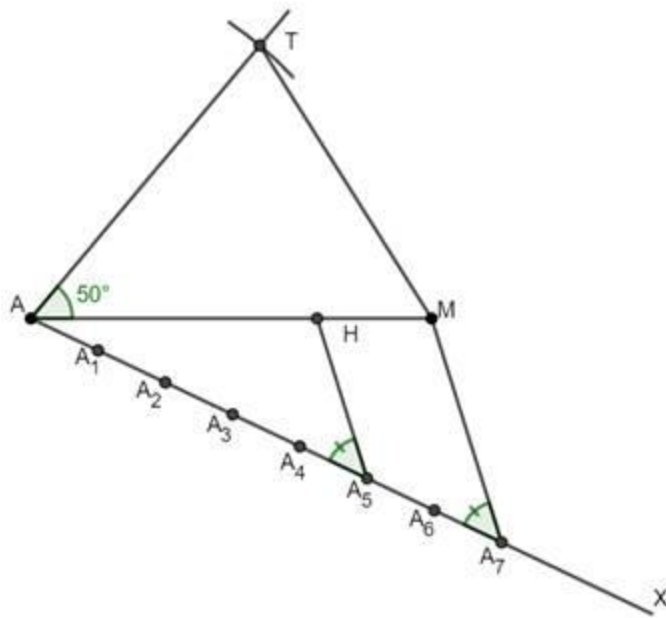
ii. Below  $AM$ , draw an acute angle  $\angle MAX$ .



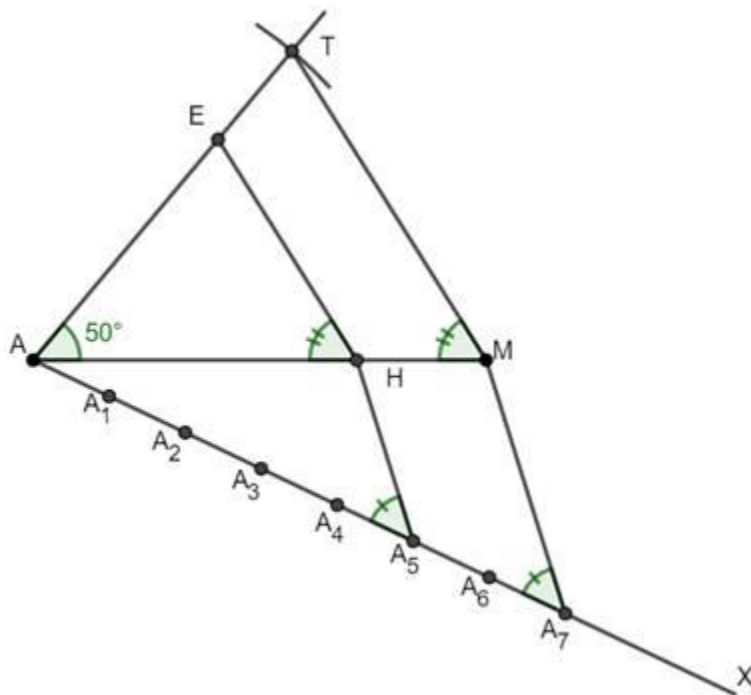
iii. Mark four points  $A_1, A_2, A_3, A_4, A_5, A_6$  and  $A_7$  on  $AX$ , such that  $AA_1 = A_1A_2 = \dots = A_6A_7$  [As ratio is 7:5, we choose 7 points]



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



v. Draw  $HE \parallel MT$



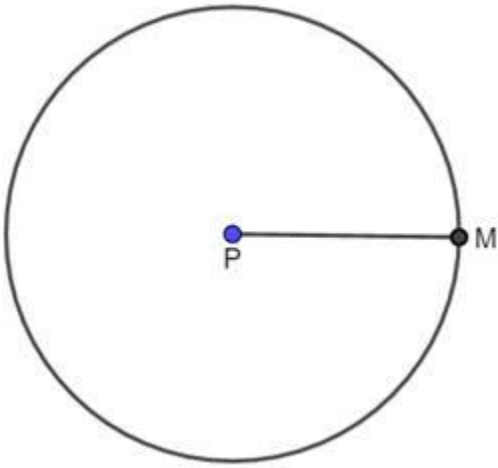
### Practice Set 4.2

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

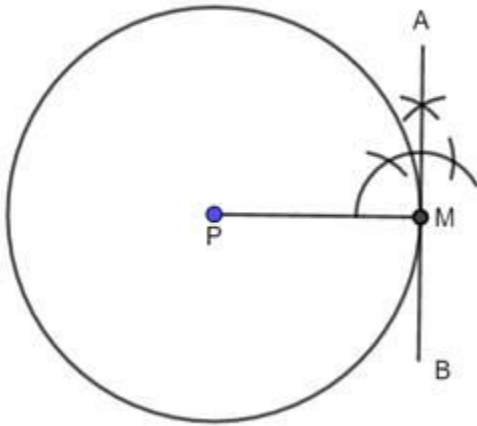
**Answer :** Steps of construction:



- i. Draw a circle with center P and radius 3.2 cm
- ii. Take a point M on the circle, Join PM.



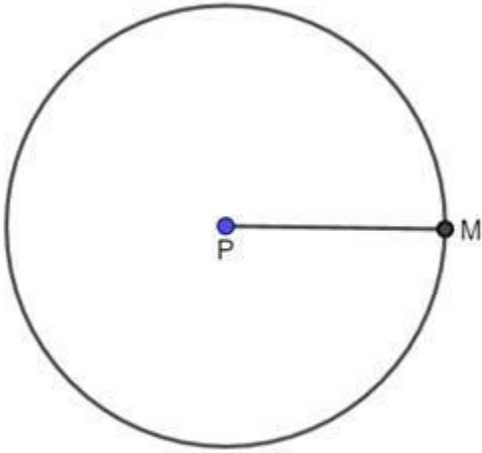
- iii. Draw  $AB \perp PM$  such that AB passes through M, AB is required tangent.



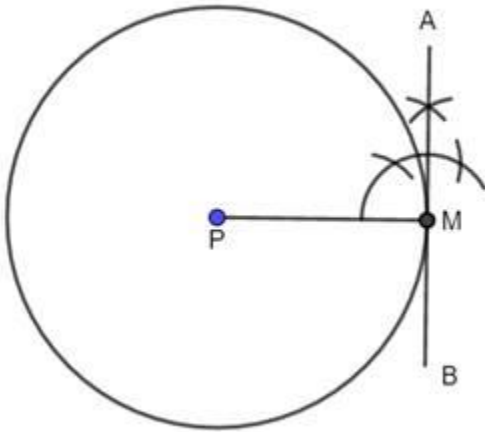
**Q. 2. Draw a circle of radius 2.7 cm. Draw a tangent to the circle at any point on it.**

**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.

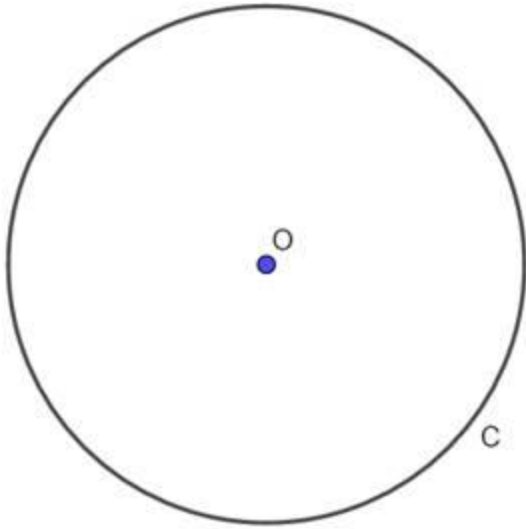


iii. Draw  $AB \perp PM$  such that AB passes through M, AB is required tangent.

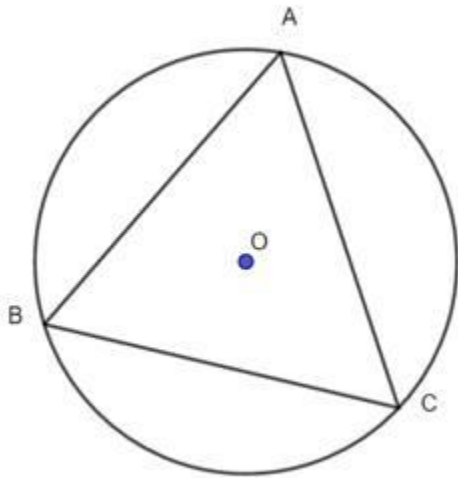


**Q. 3. Draw a circle of radius 3.6 cm. Draw a tangent to the circle at any point on it without using the centre.**

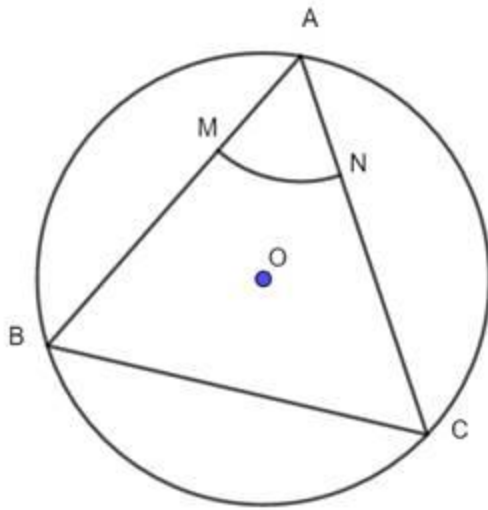
**Answer :** i. Draw a circle of radius 3.6 cm. Take any point C on it.



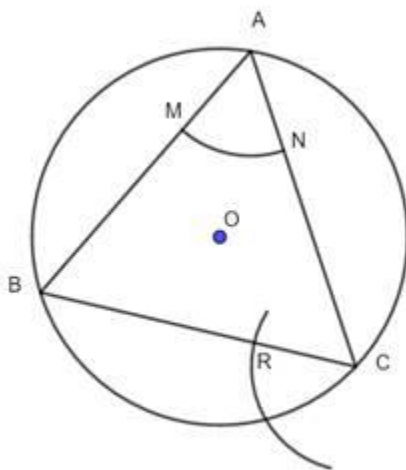
ii. Draw chord  $CB$  and an inscribed  $\angle CAB$ .



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



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



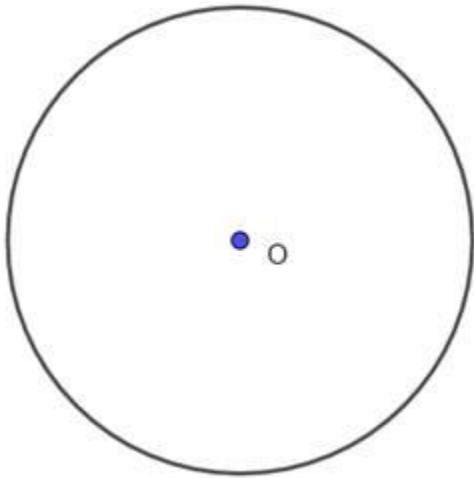
v. Taking the radius equal to  $d(MN)$  and centre R, draw an arc intersecting the arc drawn in the previous step. Let D be the point of intersection of these arcs. Draw line CD. Line CD is the required tangent to the circle.

**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.**

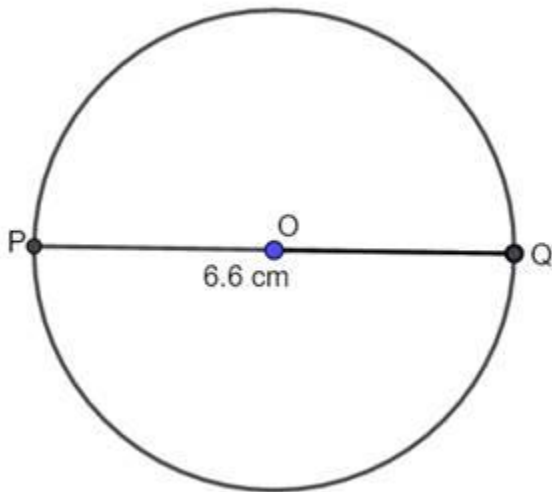
**Answer :** Here chord =  $6.6 = 2 \times 3.3 \text{ cm} = 2 \times \text{radius}$ , hence PQ is diameter of the circle.

Steps of construction:

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

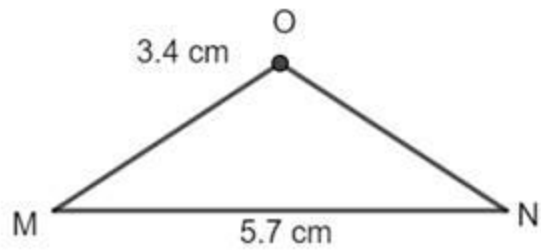


ii. Draw a diameter PQ passing through center.

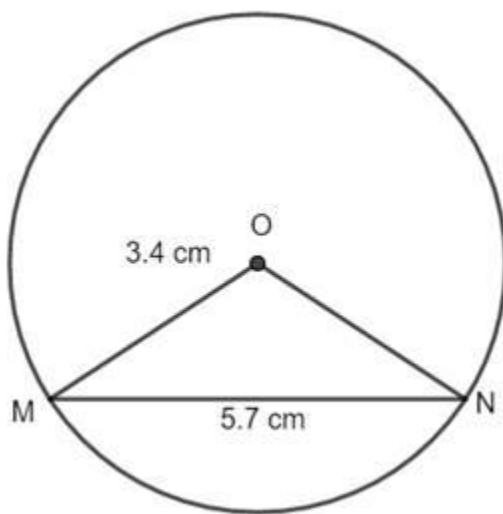


iii. Draw  $AB \perp OQ$  and  $CD \perp OP$ , such that AB and CD pass through Q and P respectively.

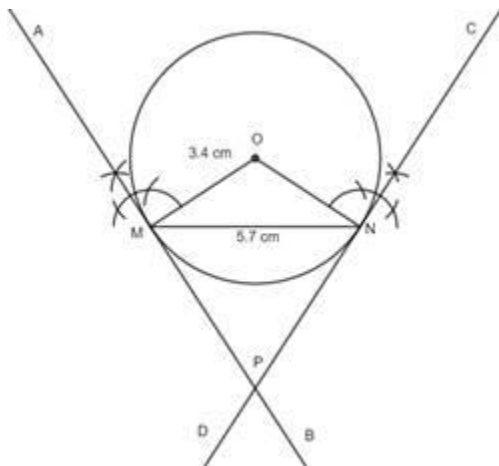
i. Draw an isosceles triangle OMN, with  $OM = ON = 3.4$  cm and  $MN = 5.7$  cm as base.



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



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



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

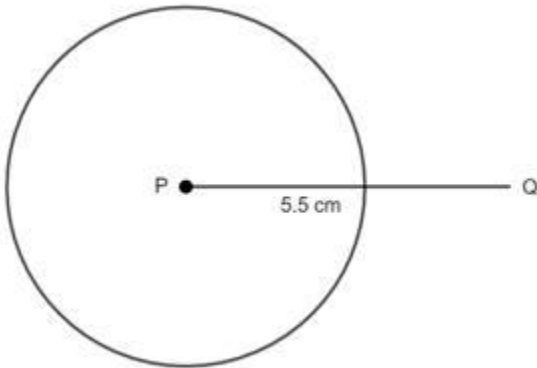
**Q. 6. Draw a circle with centre P and radius 3.4 cm. Take point Q at a distance 5.5 cm from the centre. Construct tangents to the circle from point Q.**

**Answer :** Steps of construction:

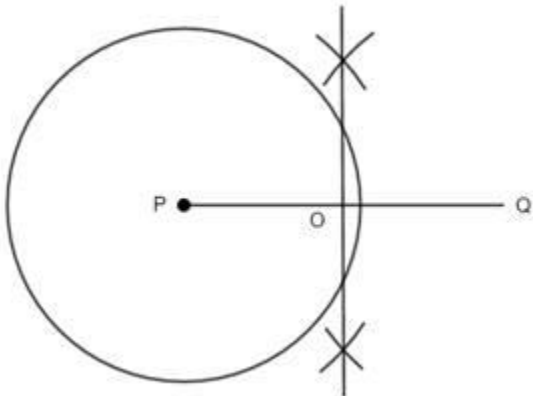
i. Draw a circle with center P and radius 3.4 cm.



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

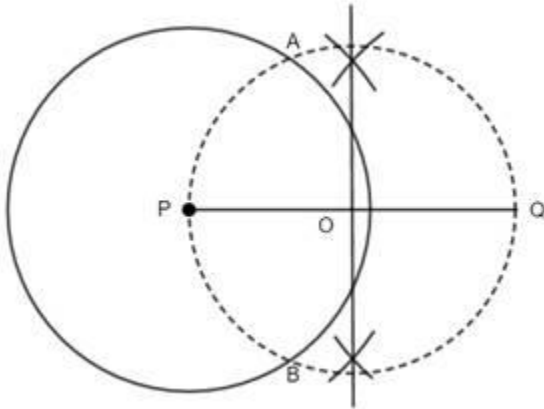


iii. Draw the perpendicular bisector of PQ, which bisects PQ at O.

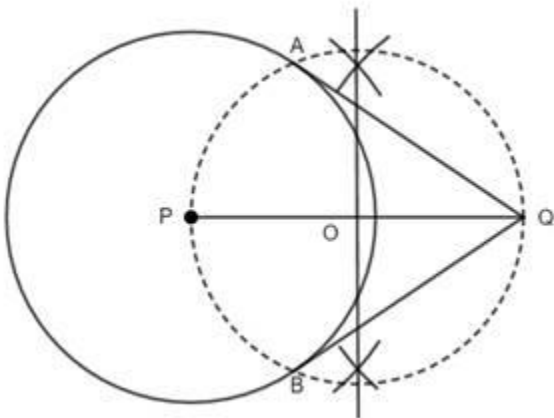




iv. Taking O as center and  $OP = OQ$  as radius, draw another circle, which intersects the previous circle at A and B.



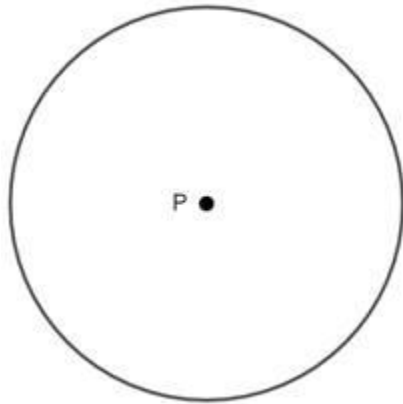
v. Join AQ and BQ, which are required tangents.



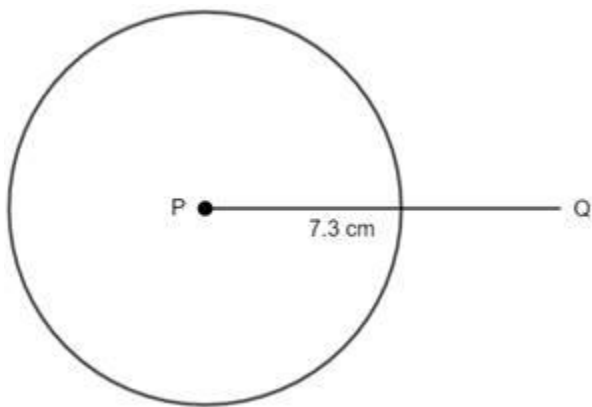
**Q. 7. Draw a circle with radius 4.1 cm. Construct tangents to the circle from a point at a distance 7.3 cm from the centre.**

**Answer :** Steps of construction:

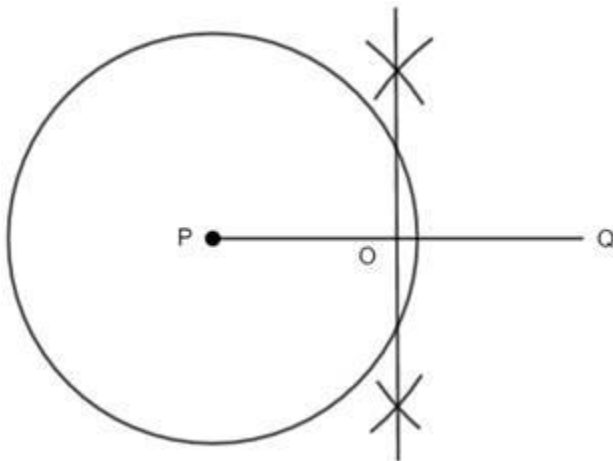
i. Draw a circle with center P and radius 4.1 cm.



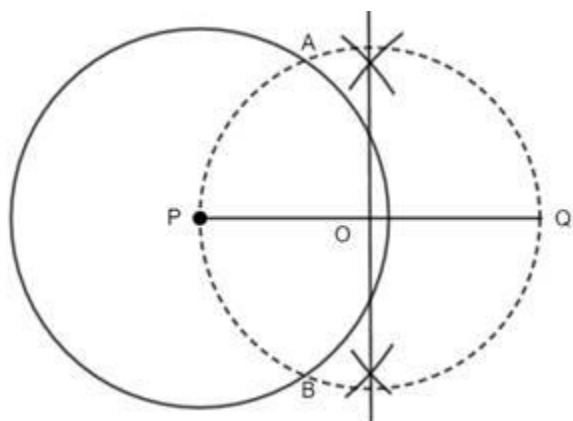
ii. Take a point Q outside the circle such that  $PQ = 7.3$  cm



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.

