

# Chapter 16.

# Construction

## Exercise 16.1

1. Use a ruler and compass only in this question:

i) draw a circle, centre  $O$  and radius  $4\text{cm}$ .

ii) Mark a point  $P$  so that  $OP = 7\text{cm}$

Construct the two tangents to the circle from  $P$ .

Measure and record the length of one of the tangents.

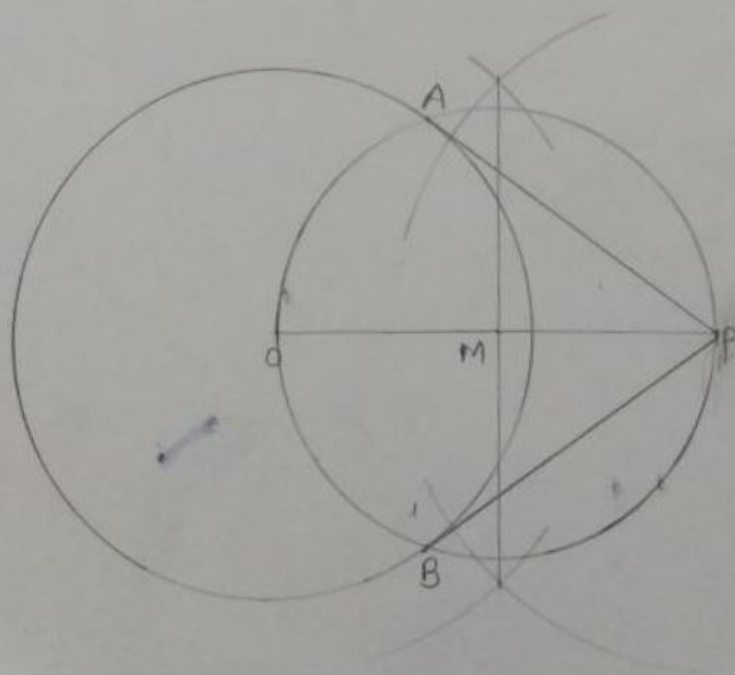
→ Initially draw a circle with centre  $O$  and radius  $4\text{cm}$ .

• Take one point  $P$  from the centre of a circle at a distance of  $7\text{cm}$  i.e.  $OP = 7\text{cm}$

• Now, bisect  $OP$  at point  $M$  and with centre  $M$  & diameter  $OP$  draw another circle which intersects given circle at points  $A$  and  $B$ .

• Now, join the points  $PA$  and  $PB$  which are the pairs of tangents to the circle.

• If we measure  $PA$  it is found that  $l(PA) = 5.5\text{cm}$



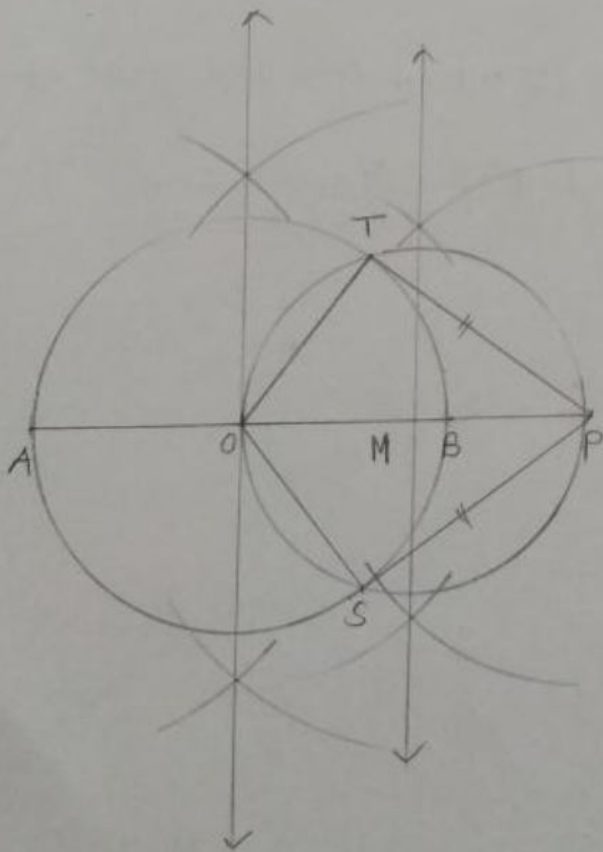
2) Draw a line  $AB = 6\text{ cm}$ . Construct a circle with  $AB$  as diameter. Mark a point  $P$  at a distance of  $5\text{ cm}$  from the mid-point of  $AB$ . Construct two tangents from  $P$  to the circle with  $AB$  as a diameter. Measure the length of each tangent.

→ We follow the following steps for construction:

- First draw a line segment  $AB = 6\text{ cm}$  as shown.
- Draw a perpendicular bisector of  $AB$  which bisects  $AB$  at  $O$ .
- Now, take point  $O$  as centre and radius  $OB$  to draw a circle.
- Now extend  $AB$  to point  $P$  so that  $OP = 5\text{ cm}$ .
- Draw perpendicular bisector of  $OP$  which meets at  $M$ .
- With centre  $M$  and by taking radius as  $OM$  draw a circle which intersects the given circle at points  $T$  and  $S$  as shown.
- Now, join  $OT, OS, TP$  and  $SP$ .

We can see here,  $PT$  and  $PS$  are the required tangents to the circle.

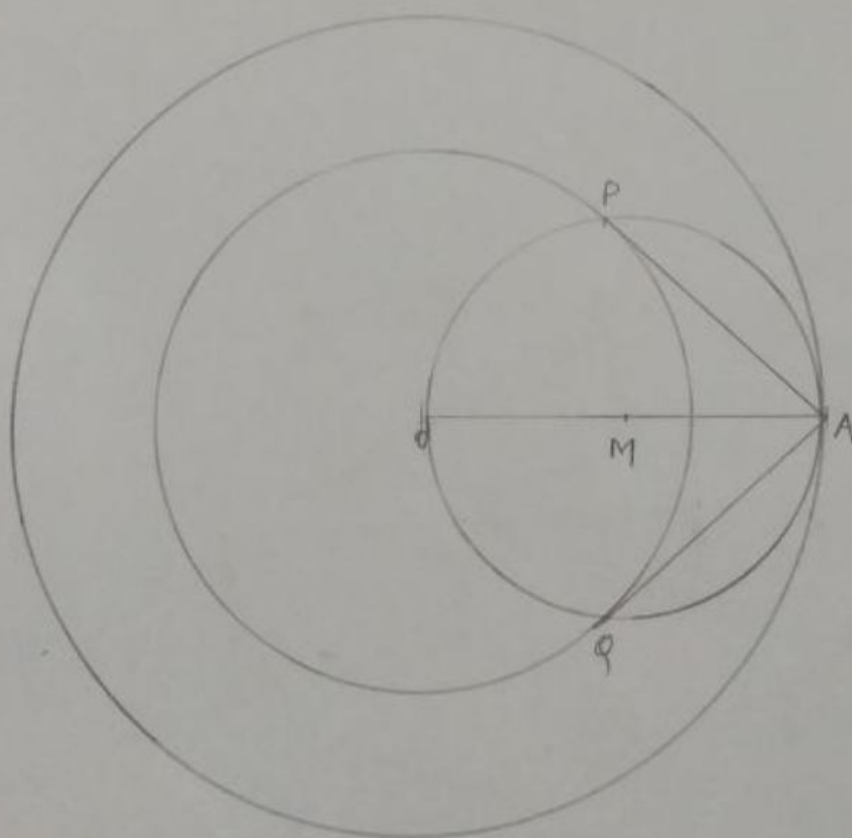
- Here, it is found that  $\angle(PT) = \angle(PS) = 4\text{ cm}$ .



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

→ We follow the following steps for construction:

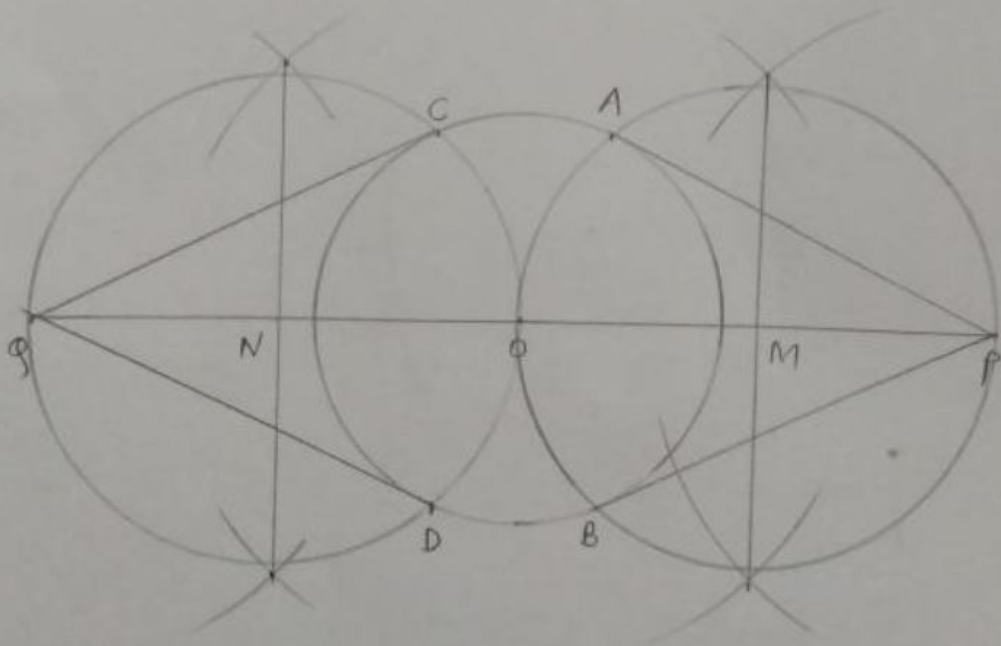
- Take a point 'O' as centre and draw two concentric circles with radii 4cm and 6cm as shown.
  - Now join OA and take its mid-point as M.
  - By taking point M as centre and MA as a radius draw another circle which intersects given circles at points P and Q as shown.
  - Now, join segments AP and AQ.
- Here, AP and AQ are the required tangent to the given circle from point A.



4) Draw a circle of radius 3 cm. Take two points P and Q on one of its extended diameters each at a distance of 7 cm from its centre. Draw tangents to the circle from these two points P and Q.

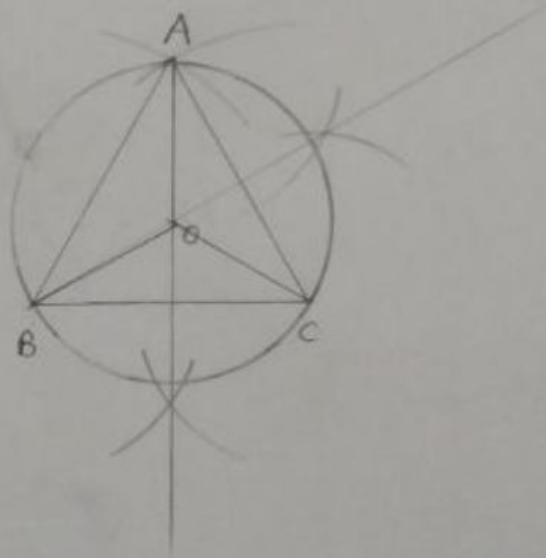
→ We follow the following steps for construction:

- Initially, take a point 'O' as centre and draw a circle of radius 3 cm as shown.
- extend the diameter from both sides so that  $OP = OQ = 7$  cm
- Let us consider mid-points of OP and OQ as M and N respectively as shown.
- Now take points M and N as centres and OP & OQ as diameters to draw circle which intersects given circle at points A, B and C and D respectively.
- Now join the segments PA, PB, QC and QD as shown. Here, PA, PB and QC, QD are the required tangents.



### Exercise 16.2

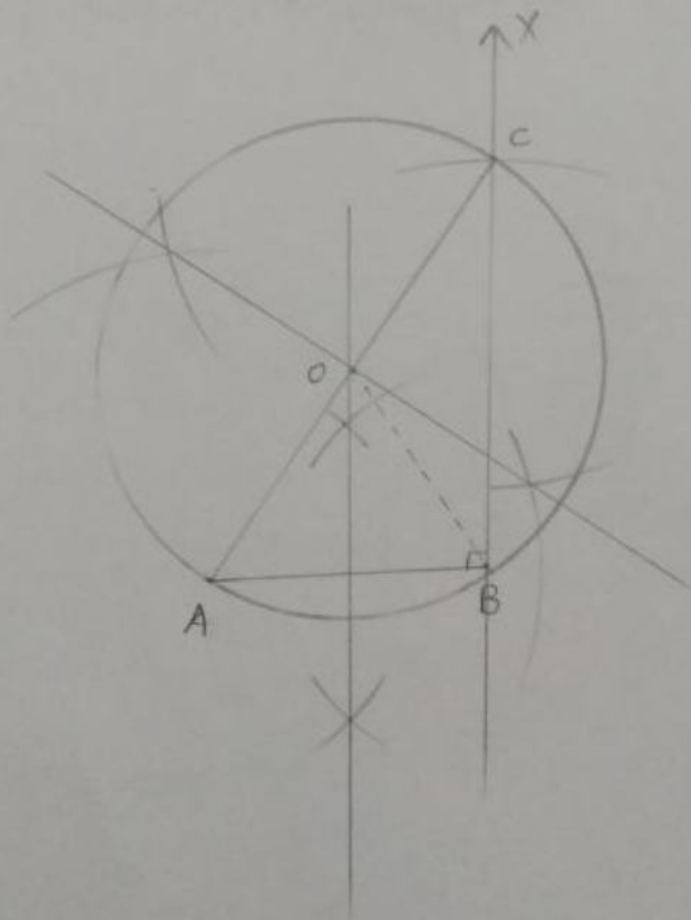
- 1.) Draw an equilateral triangle of side 4cm. Draw its circumcircle.
- We follow the following steps for construction:
- Initially, draw a line segment  $BC = 4\text{cm}$  as shown.
  - Now by taking points  $B$  and  $C$  as centres draw two arcs of radius 4cm which intersect each other at point  $A$  as shown.
  - Now, join segments  $AB$  and  $AC$  & hence  $\triangle ABC$  is formed which is a equilateral triangle.
  - Now, draw right bisectors of  $BC$  and  $AC$  intersecting each other at point  $O$  and join segments  $OA$ ,  $OB$  &  $OC$ .
  - By taking centre  $O$  and radius  $OB$  or  $OC$  or  $OA$  draw a circle which passes through points  $A$ ,  $B$  and  $C$ .
- Now, here we got the required circumcircle of given  $\triangle ABC$ .



- 2) Using a ruler & a pair of compass only, construct
- a triangle ABC given  $AB = 4\text{cm}$ ,  $BC = 6\text{cm}$ ,  $\angle ABC = 90^\circ$
  - a circle which passes through points A, B and C and marks its centre as O.

→ We follow the following steps for construction:

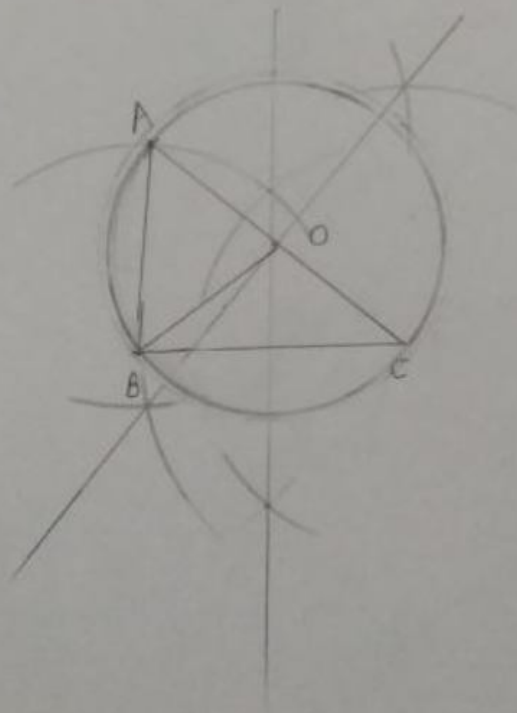
- Initially, draw a line segment  $AB = 4\text{cm}$  as shown.
- At point B, draw a ray BX making an angle of  $90^\circ$  so that  $BC = 6\text{cm}$  and join AC.
- Now, draw perpendicular bisectors of sides AB & AC which intersect each other at point O as shown.
- By taking O as centre and radius equal to OB or OA or OC draw a circle, which passes through points A, B and C respectively.
- Here, we got our required circle.



3) Construct a triangle with sides 3cm, 4cm and 5cm. Draw its circumcircle and measure its radius.

→ We follow following steps for construction.

- Initially draw a line segment  $BC = 4\text{cm}$  as shown.
- By taking point B as centre and radius 3cm, also by taking point C as centre with radius 5cm draw two arcs which intersect each other at one point say 'A'.
- Now, join segments AB and AC.
- Now, draw perpendicular bisectors of sides BC & AC which intersect each other at point 'O' and join OB.
- By taking point 'O' as centre and OB as radius draw a circle which passes through point A, B and C as shown.
- After measuring the radius it's found that  $OB = 2.5\text{cm}$ .



4) Using ruler & compass only:

i) Construct a triangle ABC with the following data:  
Base  $AB = 6\text{cm}$ ,  $AC = 5.2\text{cm}$  and  $\angle CAB = 60^\circ$

ii) In the same diagram, draw a circle which passes through the points A, B and C and mark its centre 'O'.

→ We follow following steps for construction:

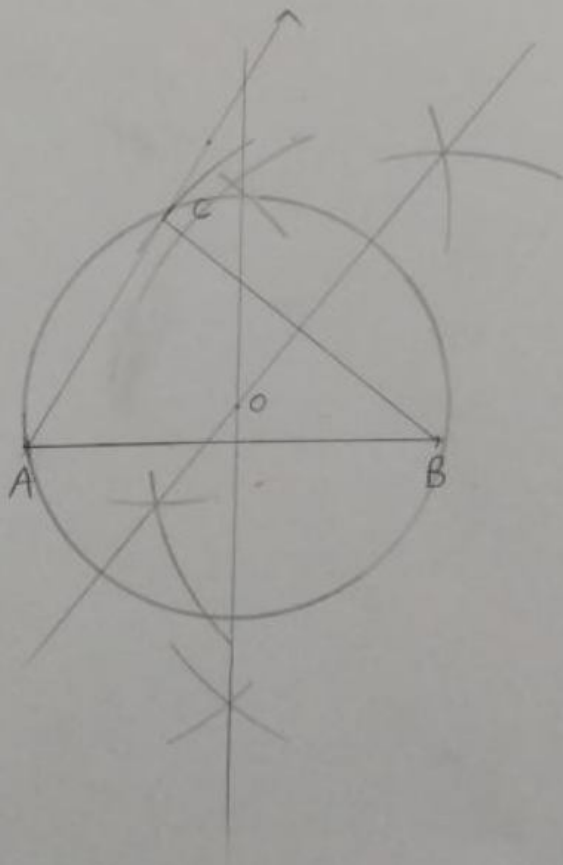
i) Initially, draw a line segment  $AB = 6\text{cm}$  as shown.

• at point A, draw a ray making angle  $60^\circ$ .

• By taking point B as centre and radius equal to  $5.2\text{cm}$  draw an arc which intersects the ray at point C as shown.

• Now, join BC and draw perpendicular bisectors of AB and BC which intersect each other at point 'O'.

• By taking point 'O' as centre and OA as radius draw a circle which touches the  $\triangle ABC$  at points A, B & C as shown in fig below -

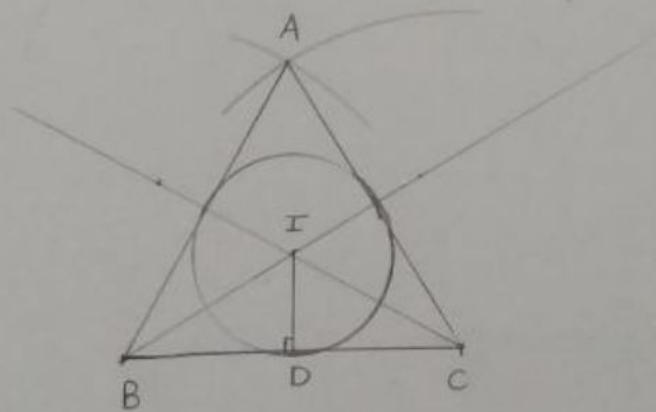




5) Using ruler & compasses only, draw an equilateral triangle of side 5 cm and draw its inscribed circle. Measure the radius of the circle.

→ We follow the following steps for construction:

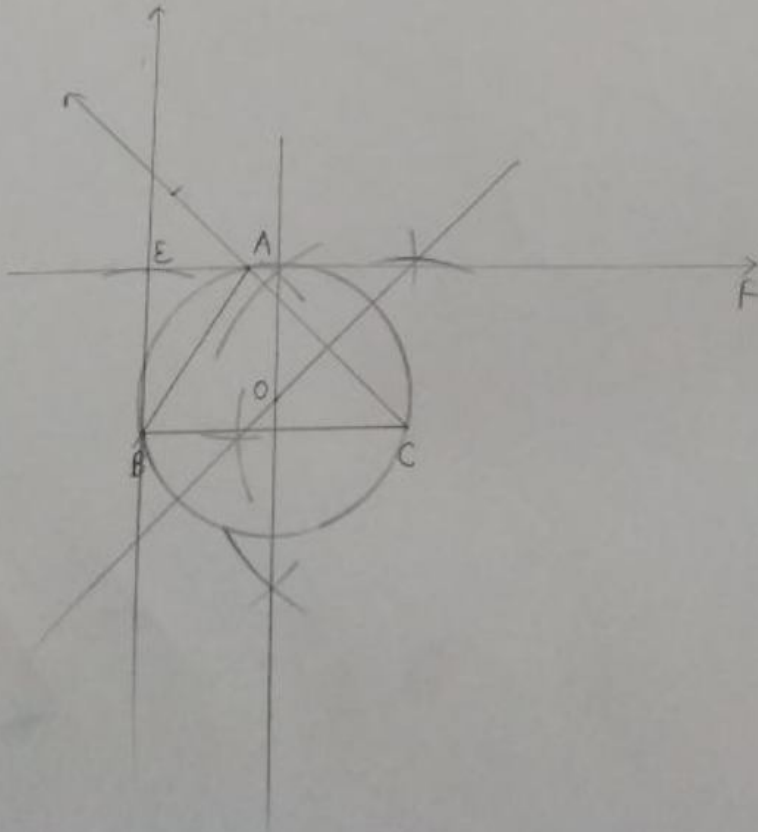
- Initially, draw a line segment  $BC = 5\text{ cm}$  as shown.
- By taking points B and C as centers and radius equal to 5 cm draw two arcs which intersect each other at pt A.
- Now, join segments AB and AC as shown.
- Now, draw angle bisectors of  $\angle B$  and  $\angle C$  which intersect each other at point I.
- Now, from point I, draw perpendicular ID on BC.
- Now, by taking I as centre & radius ID draw a circle which touches the sides of triangle internally.
- Here, it is the required incircle formed. and  $ID = 1.5\text{ cm}$



7. > Using ruler & compasses only, construct a triangle ABC in which  $BC = 4\text{cm}$ ,  $\angle ACB = 45^\circ$  and the perpendicular from A on BC is  $2.5\text{cm}$ . Draw the circumcircle of triangle ABC & measure its radius.

→ We follow the following steps for construction:

- Initially draw a line segment  $BC = 4\text{cm}$ .
- At point B, draw a perpendicular so that  $BE = 2.5\text{cm}$ .
- From point E, draw a line  $EF \parallel BC$ .
- From point C, draw a ray making angle of  $45^\circ$  which intersects EF at point A as shown.
- Now join AB & draw perpendicular bisectors of sides BC & AC which intersects each other at point O as shown.
- Join OB, OC and OA.
- By taking O as centre and radii equal to OB or OC or OA draw a circle which touches A, B & C.
- Now, Here the circumcircle of  $\triangle ABC$  is formed and  $OB = 2\text{cm}$ .

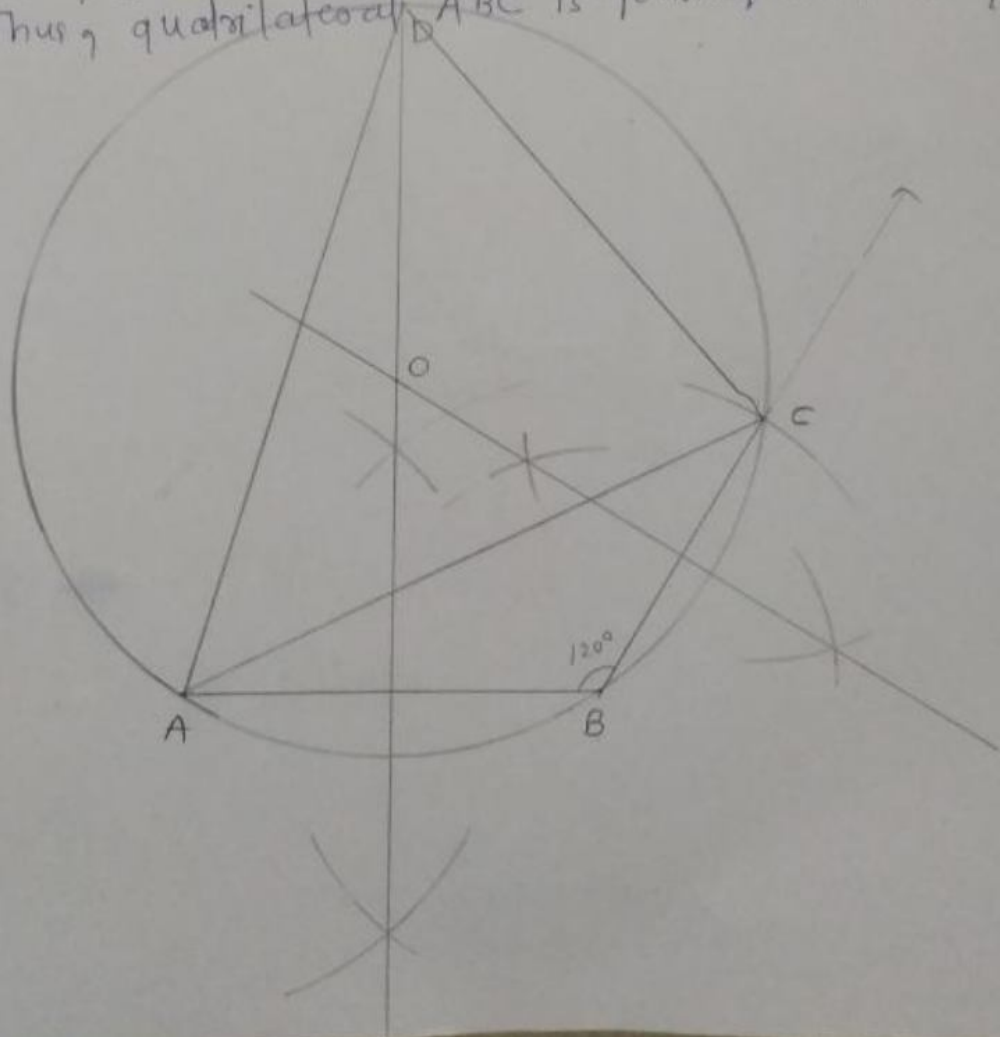


- 8) Using the ruler & Compass only.  
 Construct a  $\Delta ABC$  so that  $BC = 5\text{ cm}$  &  $AB = 6.5\text{ cm}$  and  $\angle ABC = 120^\circ$
- i) Construct a circumcircle of  $\Delta ABC$   
 ii) Construct a cyclic quadrilateral  $ABCD$ , so that point  $D$  is equidistant from  $AB$  and  $BC$ .

→ We follow the following steps for construction:

- Initially, draw a line segment  $AB = 6.5\text{ cm}$
- At point  $B$ , construct an angle of  $120^\circ$  so that  $BC = 5\text{ cm}$ .  
 Now, join segment  $AC$  and  $\Delta ABC$  is formed.
- Now, draw perpendicular bisectors of sides  $AB$  &  $BC$ , which intersect each other at point  $O$ .
- By taking point  $O$  as centre & radius equal to  $OB$  or  $OC$  or  $OA$  draw a circumcircle of  $\Delta ABC$ .
- Extend perpendicular bisector of  $AB$  & it intersects the circumcircle of  $\Delta ABC$  at point  $D$ .
- Now, join  $AD$  and  $CD$ .

Thus, quadrilateral  $ABCD$  is formed which is cyclic.



- 10.) draw a regular hexagon of side 4cm and construct its incircle.
- We follow the following steps for construction:
- Initially draw a regular hexagon ABCDEF of side 4cm.
  - Draw the angle bisectors of  $\angle A$  and  $\angle B$  which intersects each other at point O.
  - Draw  $OL \perp AB$
  - By taking O as centre and radius equal to OB draw a circle which touches the sides of hexagon.

