

Constructions

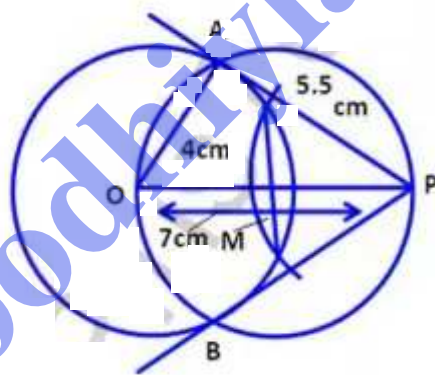
EXERCISE - 16.1

Q1. Use a ruler and compass only in this question.

- (i) Draw a Circle, centre O and radius 4cm .
- (ii) Mark a point P such that $OP = 7\text{cm}$

Construct two tangents to the circle from P .
Measure and record the length of one of the tangents.

Sol.



Steps of construction:

- (i) Draw a Circle with O and radius 4cm .
- (ii) take a point P such that $OP = 7\text{cm}$.
- (iii) Bisect OP at M .
- (iv) With centre M and diameter OP , draw another circle intersecting the given circle at A and B .

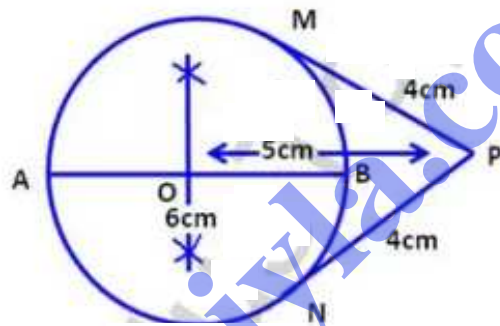
(v) join PA and PB.

PA and PB is a pair of tangents to the circle on measuring PA, it is equal to 5.8cm.

Q2. Draw a line $AB = 6\text{cm}$. Construct a circle with AB as diameter. Mark a point P at a distance of 5cm from the mid point of AB .

Construct two tangents from P to the circle with AB as diameter. Measure the length of each tangent.

Sol.



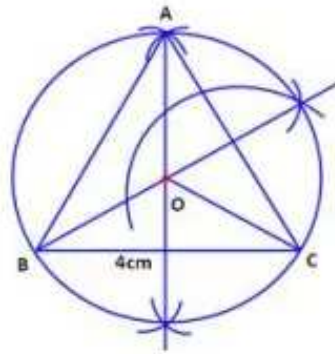
Steps of Construction:

- (i) Draw a line segment $AB = 6\text{cm}$
- (ii) Draw a perpendicular bisector on AB which cut AB at O . which is the Centre of the Circle.
- (iii) Take O as Centre and draw a circle with radius $\frac{6}{2} = 3\text{cm}$.
- (iv) From the point O , Take a point P at a distance of 5cm .
- (v) Draw two tangents from which cut the circle at M and N .

(vi) Measure $PM = PN = 4\text{cm}$.

Q3. Draw an equilateral triangle of side 4cm .
Draw its circumcircle.

Sol.



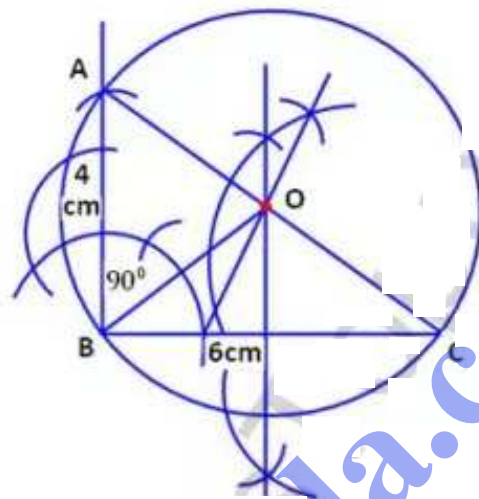
Steps of Construction :

- (i) Draw a line segment $BC = 4\text{cm}$.
- (ii) With centers B and C, draw two arcs of radius 4cm which intersect each other at A.
- (iii) Join AB and AC. $\triangle ABC$ is equilateral triangle.
- (iv) Draw the right bisector of BC and AC intersecting each other at O.
- (v) Join OA, OB and OC.
- (vi) With centre O, and radius equal to OB or OC or OA draw a circle which will pass through A, B and C.
This is the required circumcircle of $\triangle ABC$.

Q4. Using a ruler and pair of compasses only, Construct:

- (i) An $\triangle ABC$, given $AB = 4\text{cm}$, $BC = 6\text{cm}$ and $\angle ABC = 90^\circ$.
- (ii) A circle which passes through the points A, B and C and mark its centre as O.

sol.



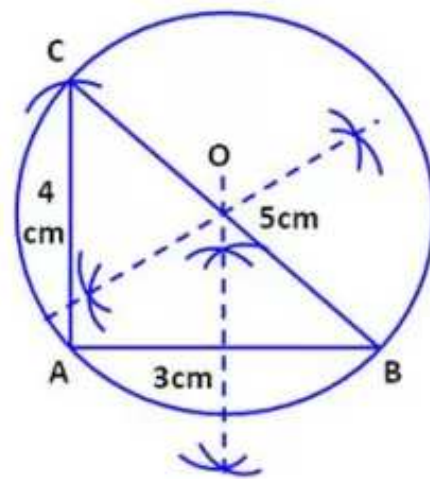
steps of construction:

- (i) Draw a line segment $BC = 6\text{cm}$.
- (ii) At B draw an angle of 90° and cut off $BA = 4\text{cm}$.
- (iii) Join AC.
- (iv) Draw the right bisectors of sides BC and AC intersecting each other at O.
- (v) Join OB.
- (vi) With centre O and radius OA or OC, draw a circle which will pass through A, B and C.

This is the required circumcircle whose radius is equal to 3.6cm .

Q5. Construct a triangle with sides 3cm, 4cm and 5cm. Draw its circumcircle and measure its radius.

Sol.



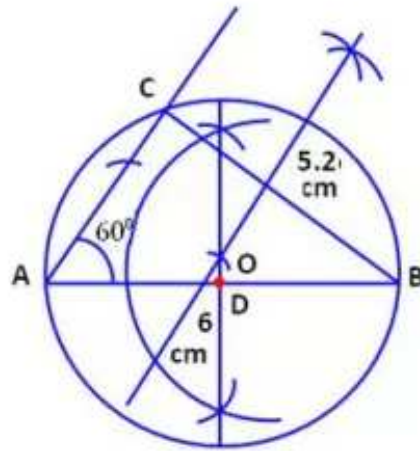
Steps of Construction :

- (i) Draw $\triangle ABC$ with the given data.
- (ii) Draw perpendicular bisector of AB and BC.
- (iii) with O as Centre and radius $OA = OB = OC$, draw a circle. The circle drawn passes through the points A, B and C and it is the required circumcircle of $\triangle ABC$.
- (iv) Measure its radius $OA = OB = OC = 2.5\text{cm}$.

Q6. Using ruler and compasses only :

- (i) Construct a triangle ABC with the data :
 $AB = 6\text{cm}$, $BC = 5.2\text{cm}$ 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.

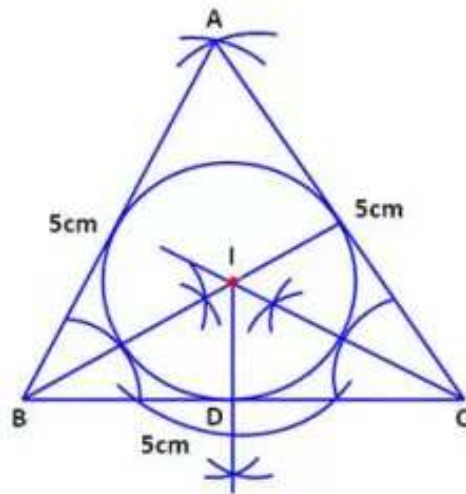
sol.



steps of construction :

- (i) Draw on Line Segment $AB = 6\text{cm}$.
 - (ii) At A, draw a ray making an angle of 60°
 - (iii) with centre B and radius 5.2cm . Draw an arc which intersecting each other ray C.
 - (iv) Join BC.
 - (v) Draw the perpendicular bisector of AB and BC intersecting each other at O.
 - (vi) Draw $OD \perp AB$ which meets AB at D.
- \therefore O lies on the perpendicular bisector of AB.
 $\therefore AD = DB$.

Q7. Using ruler and compasses only, draw an equilateral triangle of side 5cm and draw its inscribed circle. Measure the radius of the circle.

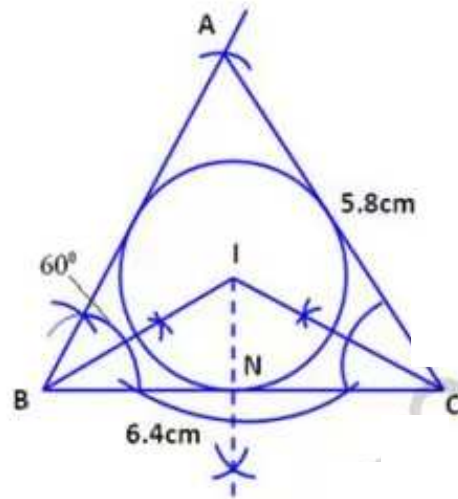


steps of Construction :

- (i) Draw a Line Segment $BC = 5\text{cm}$.
 - (ii) With Centre B and C and radius 5cm , draw two arcs intersecting each other at A.
 - (iii) Join AB and AC.
 - (iv) Draw the angle bisectors of $\angle B$ and $\angle C$ intersecting each other at I.
 - (v) From I, draw a perpendicular ID on BC.
 - (vi) With Centre I and radius ID, draw a Circle which touches the Sides of the triangle internally.
- on measuring radius of circle = 0.3cm .

Q8. Construct a triangle ABC with $BC = 6.4\text{cm}$, $CA = 5.8\text{cm}$ and $\angle ABC = 60^\circ$. Draw its incircle. Measure and record the radius of incircle.

sol.



Steps of Construction :

- (i) Construct $\triangle ABC$ with given data.
 - (ii) Draw the (internal) bisectors of $\angle B$ and $\angle C$.
Let these bisectors meet at the point I.
 - (iii) From I draw IN perpendicular to the side BC.
 - (iv) With I as Centre and radius equal to IN draw a circle. So drawn touches all the sides of the $\triangle ABC$ is incircle of $\triangle ABC$.
- on measuring radius of circle = 1.6 cm.

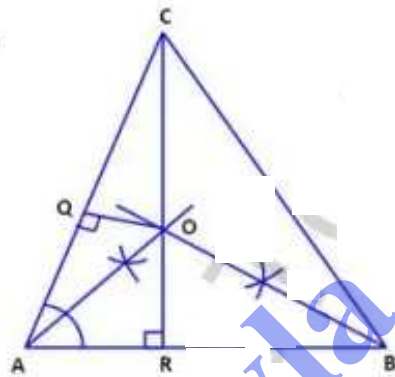
Q9. The bisectors of angles A and B of a Scalene triangle ABC meet at O.

(i) what is the point O called ?

(ii) OR and OQ are drawn perpendicular to AB and CA respectively. what is the relation between OR and OQ ?

(iii) what is the relation between $\angle ACO$ and $\angle BCO$?

Sol.



(i) The point O where the angle bisectors of meet is called the incentre of the circle triangle.

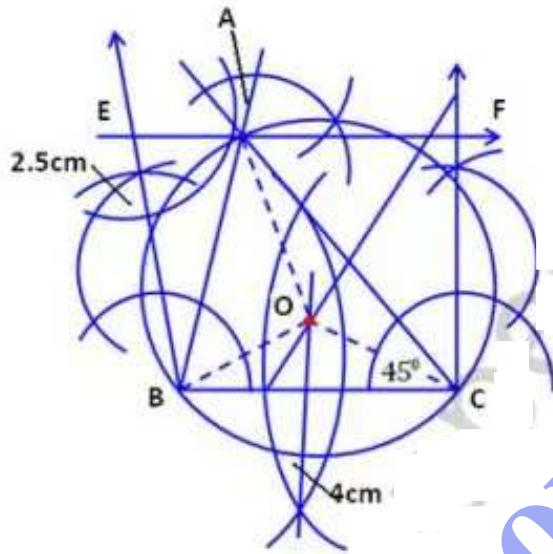
(ii) The perpendiculars drawn from O to AB and CA are equal i.e., OR and OQ

(iii) $\angle ACO = \angle BCO$

\therefore OC will bisect the $\angle C$

Q10. Using ruler and compasses only, construct a triangle ABC in which $BC = 4\text{cm}$, $\angle ACB = 45^\circ$ and the perpendicular from A on BC is 2.5cm . Draw the circumcircle of triangle ABC and measure its radius.

Sol.

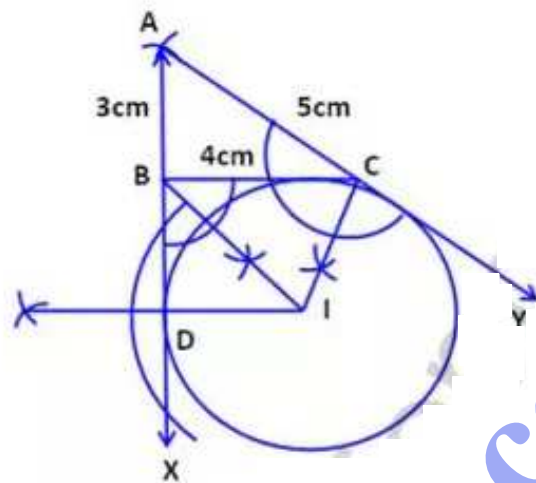


Steps of Construction:

- (i) Draw a line segment $BC = 4\text{cm}$.
- (ii) At B, draw a perpendicular and cut $BE = 2.5\text{cm}$.
- (iii) From E, draw a line EF parallel to BC.
- (iv) From C, draw a ray making an angle of 45° which intersects EF at A.
- (v) Join AB.
- (vi) Draw the perpendicular bisectors of sides BC and AC intersecting each other at O.
- (vii) Join OB, OC and OA.
- (viii) With centre O and radius OB or OC or OA, draw a circle which will pass through A, B and C. The circle is circumcircle of $\triangle ABC$.
on measuring its radius $OB = 2\text{cm}$.

- Q11. Using ruler and compasses only:
- Construct a $\triangle ABC$ from the data $AB = 3\text{cm}$, $AC = 5\text{cm}$ and $BC = 4\text{cm}$.
 - Draw the inscribed circle to the triangle ABC drawn in part (i) so that the circle touches the side BC . Measure the radius of the circle.

Sol.

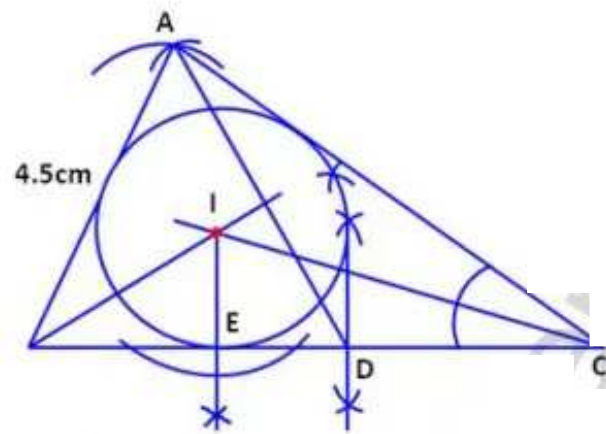


Steps of construction:

- Draw a line segment $BC = 4\text{cm}$.
- From B , draw an arc with radius of 3cm and from C , radius of 5cm which intersect each other at A .
- Join AB and AC .
- Produce AB and AC to X and Y respectively.
- Draw the angle bisectors of exterior $\angle B$ and $\angle C$ intersecting each other at I .
- From I , draw a perpendicular ID to BX .
- With centre I and radius ID , draw a circle which will touch BC and AB , AC on producing. length of $ID = 6.5\text{cm}$.

Q12. Construct a $\triangle ABC$, given that $AB = 4.5\text{cm}$, $BC = 7\text{cm}$ and median $AD = 4\text{cm}$. Construct inscribed circle of $\triangle ABC$ and measure its radius.

sol.

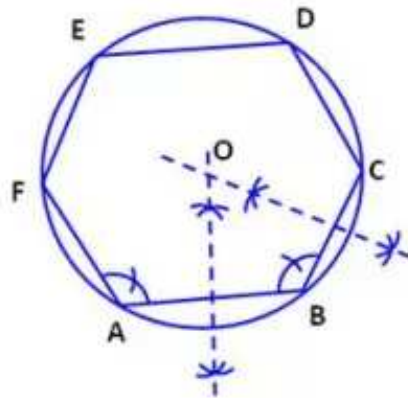


steps of construction:

- (i) Draw a line segment $BC = 7\text{cm}$ and bisect it at D .
- (ii) With centre B and radius 4.5cm draw an arc.
- (iii) With centre D and radius 4cm draw another arc which intersects the first arc at A .
- (iv) Join AB , AD and AC .
- (v) Draw the angle bisector of B and C intersecting each other at I .
- (vi) From I , draw a perpendicular IE at BC .
- (vii) With centre I and radius IE , draw a circle which will touch the sides of the triangle ABC . This is the required incircle of $\triangle ABC$ and on measuring its radius. $IE = 1.6\text{cm}$.

Q13. Draw a regular hexagon of side 3.5cm. Construct its circumcircle. measure and record its radius.

Sol.

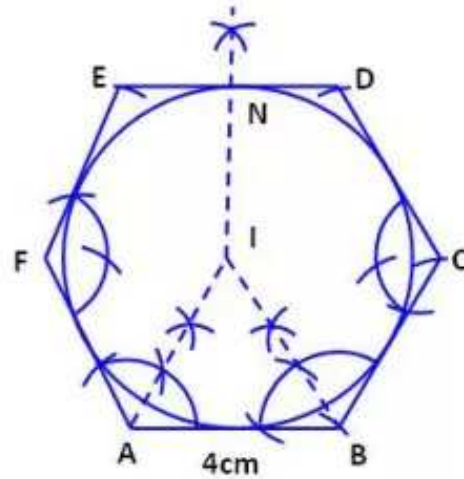


Steps of Construction :

- (i) Draw a hexagon with side $AB = 3.5\text{cm}$.
- (ii) Draw a perpendicular bisector of two sides AB and BC which cut at O which is the centre of the circumcircle.
- (iii) Now take O as centre and $OA = OB$ as radius draw a circle which cuts the hexagon at points A, B, C, D, E, F and it is the required hexagon.
- (iv) Measure its radius $OA = OB = OC = OD = OE = OF = 3.5\text{cm}$.

Q14. Draw a regular hexagon of side 4cm and construct its incircle.

sol.



Steps of Construction :

- (i) Construct a regular hexagon ABCDEF with side 4cm.
- (ii) Draw bisectors of $\angle A$ & $\angle B$ let these bisectors meet at the point I.
- (iii) From I draw IN perpendicular to ED.
- (iv) with I as Centre and radius equal to IN draw a circle. This circle touches all the sides of the hexagon ABCDEF and is the required circle in the regular hexagon.