

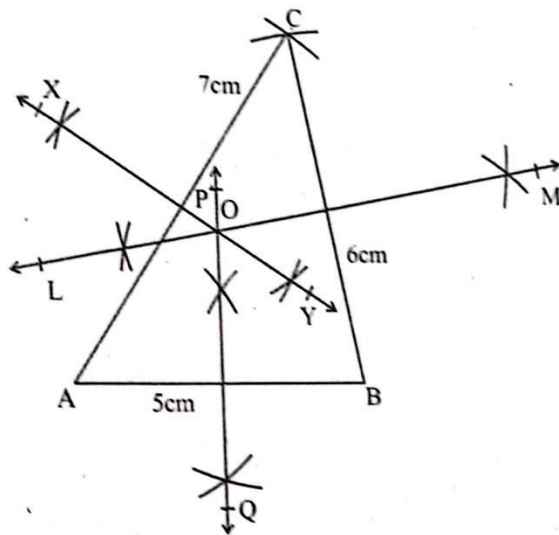
9th Maths Exercise 11.1

Q.1 Construct $\triangle ABC$ with the given measurements and verify that the perpendicular bisectors of the triangle are concurrent.

Solution :

Perpendicular bisectors

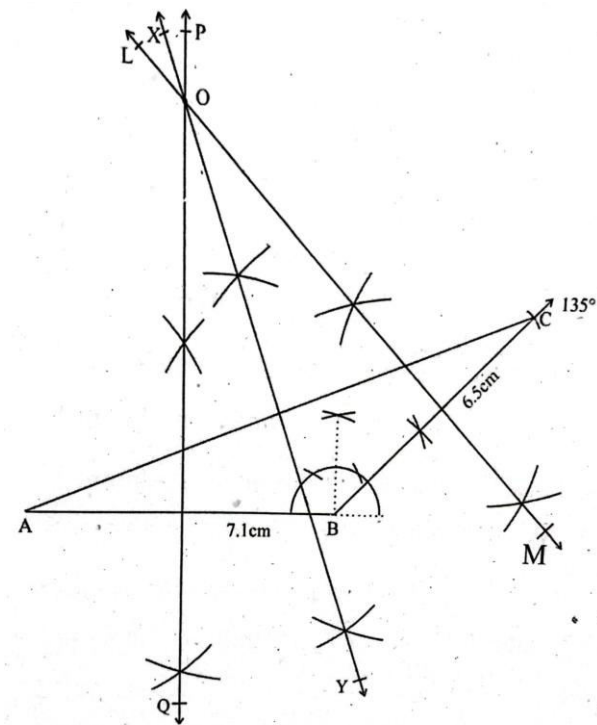
(i) $m\overline{AB} = 5 \text{ cm}$, $m\overline{BC} = 6 \text{ cm}$, $m\overline{AC} = 7 \text{ cm}$



Educational Guide
EEM ZONE

Steps of construction:

- i. Construct a $\triangle ABC$ using the given measurements.
 - ii. With centre at A, draw two arcs above and below side $\overline{AB}$ with radius more than half of $m\overline{AB}$.
 - iii. With centre at B, draw two arcs above and below the side $\overline{AB}$ with the same radius as in step ii.
 - iv. Draw a line through the points of intersection of the arcs in step (ii) and (iii), we get the perpendicular bisector $\overline{PQ}$ of the side $\overline{AB}$.
 - v. Draw two more perpendicular bisectors $\overline{LM}$ and $\overline{XY}$ of the sides $\overline{BC}$ and $\overline{AC}$ respectively.
 - vi. We observe that perpendicular bisectors $\overline{PQ}$, $\overline{LM}$ and $\overline{XY}$ of sides of $\triangle ABC$ are concurrent at O, in side the triangle.
- (ii) $m\overline{AB} = 7.1 \text{ cm}$, $m\angle B = 135^\circ$, $m\overline{BC} = 6.5 \text{ cm}$



Educational Guide

TALEEM ZONE

Steps of construction:

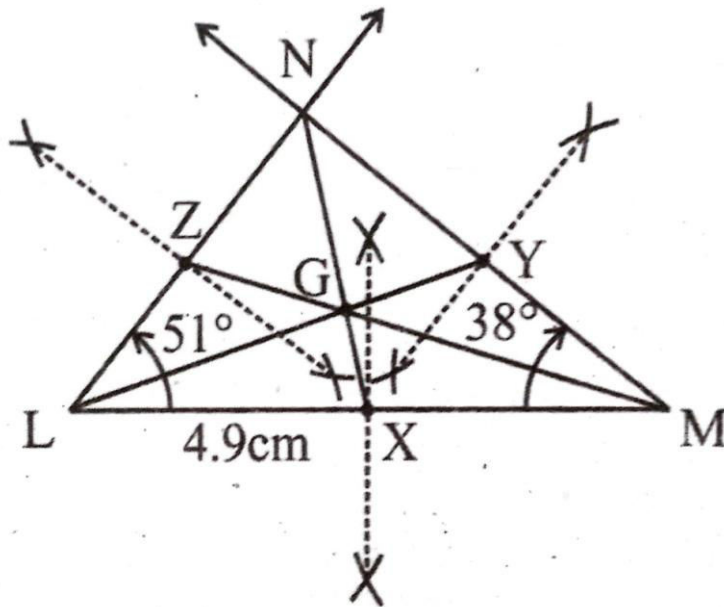
- i Construct a $\triangle ABC$ using the given measurements.
- ii. With centre at A , draw two arcs above and below side $\overline{AB}$ with radius more than half of $m\overline{AB}$
- iii. With centre at B , draw two arcs above and below the side $\overline{AB}$ with the same radius as in step ii.
- iv. Draw a line through the points of intersection of the arcs in step (ii) and (iii), we get the perpendicular bisector $\overline{PQ}$ of the side $\overline{AB}$
- v. Draw two more perpendicular bisectors $\overline{LM}$ and $\overline{XY}$ of the sides $\overline{BC}$ and $\overline{AC}$ respectively.
- vi. We observe that perpendicular bisectors $\overline{PQ}$, $\overline{LM}$ and $\overline{XY}$ of sides of $\triangle ABC$ are concurrent at O , outside the triangle.

Q. 2 Construct $\triangle LMN$ of the following measurements and verify that the medians of the triangle are concurrent.

Medians of $\triangle LMN$

- (i) $m\overline{LM} = 4.9 \text{ cm}$, $m\angle L = 51^\circ$, $m\angle M = 38^\circ$

Solution:



i. Construct a $\triangle LMN$ using the given measurements of side and angles

ii. Draw a right bisector of side $\overline{LM}$ to find its mid point X.

iii. Draw a right bisector of side $\overline{MN}$ to find its mid point Y.

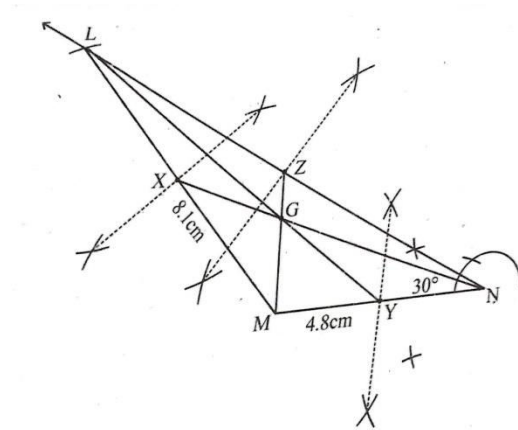
iv. Draw a right bisector of side $\overline{LN}$ to find its midpoint Z.

v. Join L to Y, M to Z and N to X.

vi. Thus $\overline{LY}$, $\overline{MZ}$ and $\overline{NX}$ are the required medians of $\triangle LMN$.

We observe that the medians $\overline{LY}$, $\overline{MZ}$ and $\overline{NX}$ of $\triangle LMN$ are concurrent at G, inside the triangle.

(ii) $m\overline{MN} = 4.5 \text{ cm}$, $m\angle N = 30^\circ$, $m\overline{LM} = 8.1 \text{ cm}$ Solution:



Steps of construction:

1 Construct a $\triangle LMN$ using the given measurements of side and angles

ii Draw a right bisector of side $\overline{LM}$ to find its midpoint X

iii Draw a right bisector of side $\overline{MN}$ to find its midpoint Y

iv Draw a right bisector of side $\overline{LN}$ to find its midpoint Z

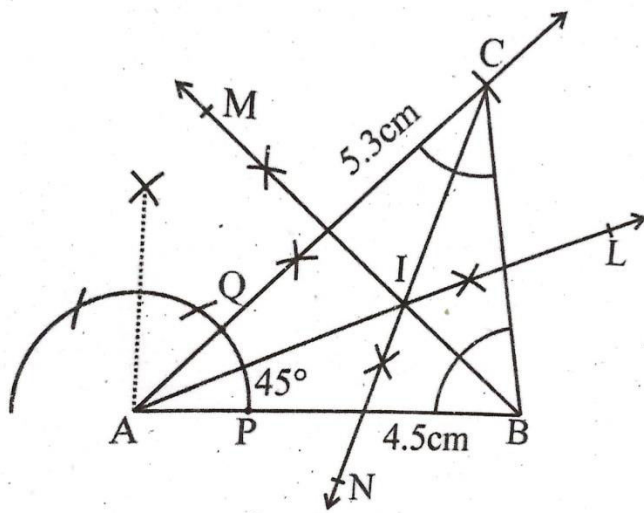
v Join L to Y , M to Z and N to X

vi. Thus, $\overline{LY}$, $\overline{MZ}$ and $\overline{NX}$ are the required medians of $\triangle LMN$. We observe that the medians $\overline{LY}$, $\overline{MZ}$ and $\overline{NX}$ of $\triangle LMN$ are concurrent at G . Hence the triangle.

Q3 Verify that the angle bisectors of $\triangle ABC$ are concurrent with the following measurement:

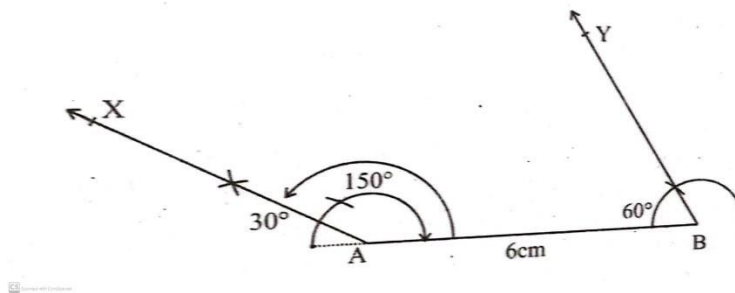
(i) $m\overline{AB} = 4.5$ cm, $m\angle A = 45^\circ$, $m\angle B = 5.3$ cm

Solution:



Steps of construction:

- i. Construct a $\triangle ABC$ using the given measurements.
 - ii. With centre at A, draw an arc of suitable radius intersecting the sides $\overline{AB}$ and $\overline{AC}$ at points P and Q.
 - iii. With centre at P and Q, draw two arcs of suitable same radius which intersect each other.
 - iv. Draw a ray $\overrightarrow{AL}$ through the points of intersection of the arcs in step (iii), which is the required angle bisector $\overrightarrow{AL}$ of $\angle A$.
 - v. Draw two more angle bisectors $\overrightarrow{BM}$ and $\overrightarrow{CN}$ of the $\angle B$ and $\angle C$ respectively. We observe that the angle bisectors $\overrightarrow{AL}$, $\overrightarrow{BM}$ and $\overrightarrow{CN}$ of angles of $\triangle ABC$ are concurrent at I, inside the triangle.
- (ii) $m\overline{AB} = 6$ cm, $m\angle A = 150^\circ$, $m\angle B = 60^\circ$
- Solution:



Steps of construction:

- i. Draw $\overline{AB} = 6$ cm
- ii. At vertex A, draw an angle of 150° with help of compass
- iii. At vertex B, draw an angle of 60° with help of compass
- iv. We observe that construction of required triangle according to given measurements is not possible.

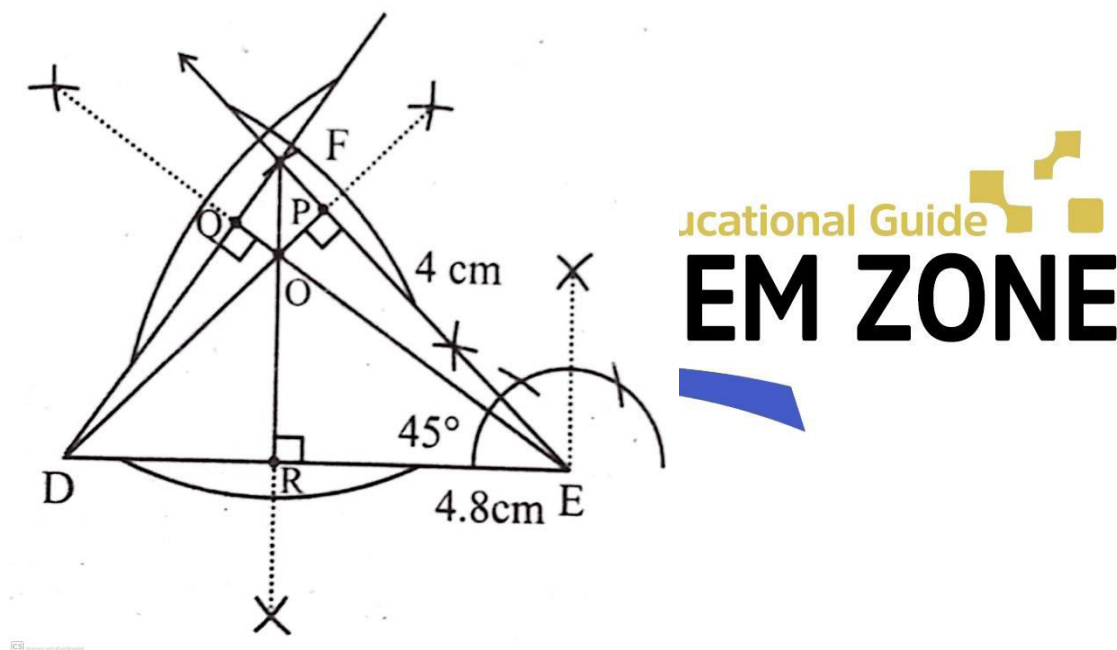
$$\therefore 150^\circ + 60^\circ = 210^\circ > 180^\circ$$

Q. 4 Given the measurements of $\triangle DEF$: $m\overline{DE} = 4.8$ cm, $m\overline{EF} = 4$ cm and $m\angle E = 45^\circ$, draw altitudes of $\triangle DEF$ and find orthocenter.

Solution:

Altitudes: $\triangle DEF$

$$m\overline{DE} = 4.8 \text{ cm}, m\overline{EF} = 4 \text{ cm}, m\angle E = 45^\circ$$



Steps of construction :

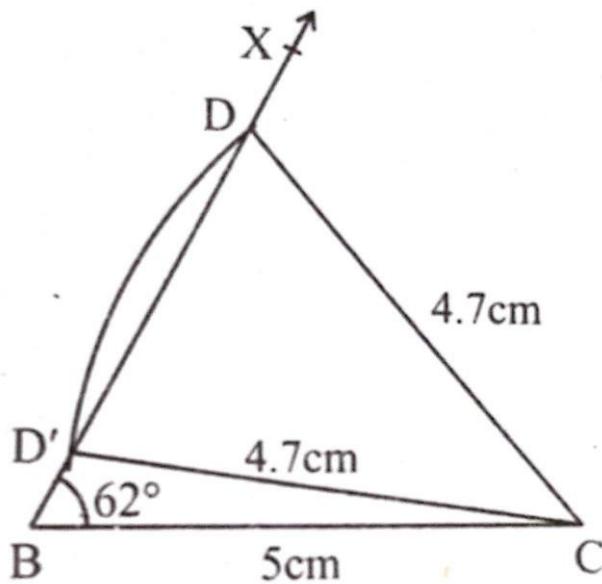
- i. Construct a $\triangle DEF$ using the given measurements.
 - ii. Draw perpendicular $\overline{DP}$ from vertex D to the opposite side $\overline{EF}$
 - iii. Draw perpendicular $\overline{EQ}$ from vertex E to the opposite side $\overline{DF}$.
 - iv. Draw perpendicular $\overline{FR}$ from vertex F to the opposite side $\overline{DE}$.
 - v. Thus $\overline{DP}$, $\overline{EQ}$ and $\overline{FR}$ are three required altitudes of $\triangle DEF$
- We observe that three altitudes $\overline{DP}$, $\overline{EQ}$ and $\overline{FR}$ of $\triangle DEF$ are concurrent at O, inside the triangle.

Q. 5 Construct the following triangles and find whether there exists

any ambiguous.

(i) $\triangle BCD$, $m\overline{BC} = 5 \text{ cm}$, $m\angle B = 62^\circ$, $m\overline{CD} = 4.7 \text{ cm}$

Solution :



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WALLEN ZONE

Steps of construction:

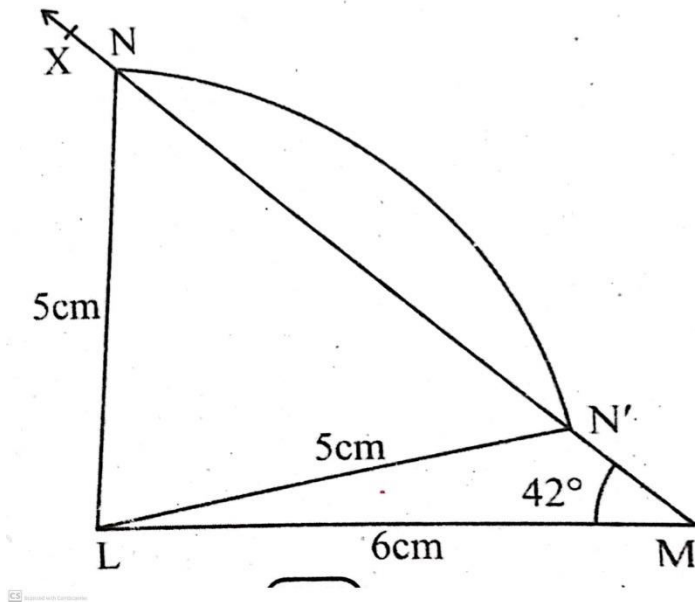
- i. Draw $m\overline{BC} = 5 \text{ cm}$
- ii. Construct $m\angle B = 62^\circ$ with the help of protractor and ruler and draw $m\overrightarrow{BX}$.
- iii. With center C , draw an arc of radius 4.7 cm intersecting $\overrightarrow{BX}$ at D and D' .
- iv Join C to D and C to D' ..

Thus two triangles $\triangle BCD$ and $\triangle BCD'$ are constructed according to the given measurements.

(ii) $\triangle KLM$; (Correction $\triangle LMN$)

$$m\overline{LM} = 6 \text{ cm}, m\angle M = 42^\circ, m\angle \overline{LM} = 5 \text{ cm}$$

Solution:



Steps of construction:

- i. Draw $\overline{LM} = 6 \text{ cm}$
 - ii. Construct $m\angle M = 42^\circ$ with the help of protractor and ruler and draw $\overrightarrow{MX}$.
 - iii. With center L , draw an arc of radius 5 cm intersecting $\overrightarrow{MX}$ at N and N' .
 - iv. Join L to N and L to N' .
- Thus two triangles $\triangle LMN$ and $\triangle LMN'$ are constructed according to the given information.

Educational Guide

TALEEM ZONE