

CHAPTER-10

Practical Geometry

Ex 10.1:-

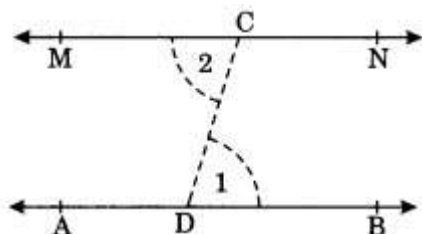
Question 1

Draw a line, say AB, take a point C outside it. Through C draw a line parallel to AB using ruler and compasses only.

Solution:

Steps of construction:

- (i) Draw a line AB.
- (ii) Take any point D on it.
- (iii) Join the given point C to D and mark $\angle 1$ to $\angle CDB$.
- (iv) Mark $\angle 1 = \angle 2$ at C and produce to both side. (v) MN is the required line.



Using the Property of Alternate Angles

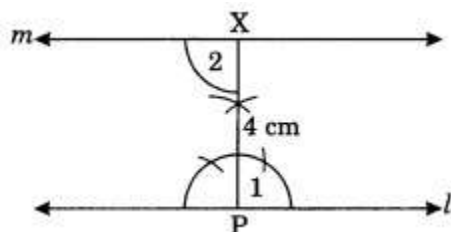
Question 2

Draw a line Z. Draw a perpendicular to l at any point on l. On this perpendicular choose a point X, 4 cm away from l. Through X, draw a line m parallel to l.

Solution:

Steps of construction:

- (i) Draw a given line Z and take any point P on it.
- (ii) Draw a perpendicular line at P to the line Z such that $PX = 4$ cm.



- (iii) Draw $\angle 2 = \angle 1$ i.e. 90° at PX and produce the line both sides.
- (iv) m is the required line parallel to Z through X. Using Properties of Alternate Angles

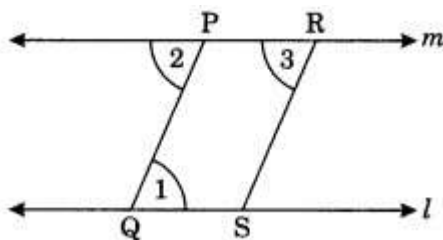
Question 3

Let l be a line and P be a point not on l . Through P , draw a line m parallel to l . Now join P to any point Q on l . Choose any other point R on m . Through R , draw a line parallel to PQ . Let this meet l at S . What shape do the two sets of parallel lines enclose?

Solution:

Steps of Construction:

- (i) Draw a line l and take any point P not on l .
- (ii) Draw a line m parallel to l through P .
- (iii) Join P and Q .
- (iv) PQ makes $\angle 1$ with l and $\angle 2$ with m which are equal angles.
- (v) Take any point R on m and draw $\angle 3$ equal to $\angle 2$ to meet l at S such that $PQ \parallel RS$. (vi) Since $l \parallel m$ and $PQ \parallel RS$. Therefore, $PQSR$ is a parallelogram.



Using the properties of parallel lines and transversal line and alternate angles

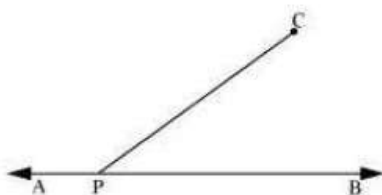
Exercise 10.1

Question 1:

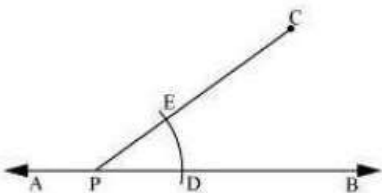
Draw a line, say AB , take a point C outside it. Through C , draw a line parallel to AB using ruler and compasses only.

Answer: The steps of construction are as follows.

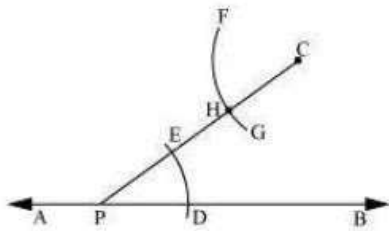
- (i) Draw a line AB . Take a point P on it. Take a point C outside this line. Join C to P .



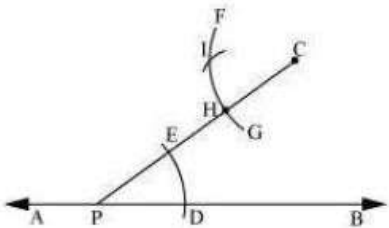
- (ii) Taking P as centre and with a convenient radius, draw an arc intersecting line AB at point D and PC at point E .



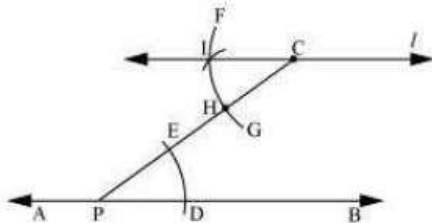
(iii) Taking C as centre and with the same radius as before, draw an arc FG intersecting PC at H.



(iv) Adjust the compasses up to the length of DE. Without changing the opening of compasses and taking H as the centre, draw an arc to intersect the previously drawn arc FG at point I.



(v) Join the points C and I to draw a line 'l'.



This is the required line which is parallel to line AB.

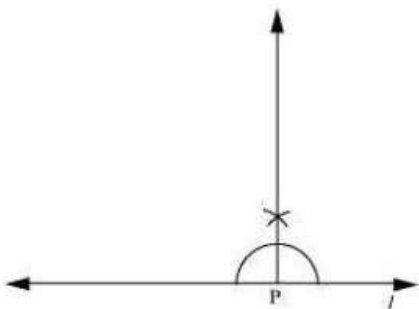
Question 2:

Draw a line l. Draw a perpendicular to l at any point on l. On this perpendicular choose a point X, 4 cm away from l. Through X, draw a line m parallel to l.

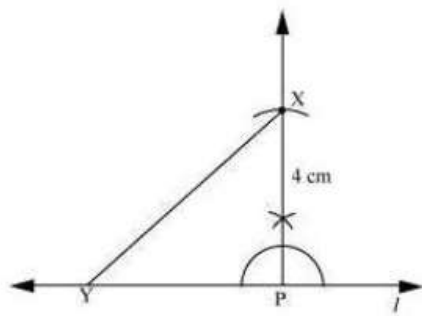
Answer:

The steps of construction are as follows.

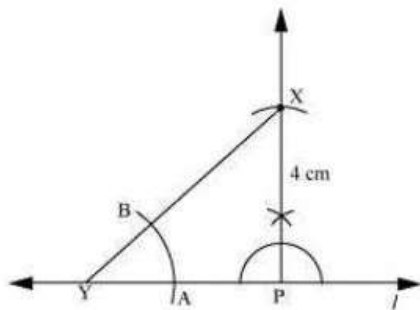
(i) Draw a line l and take a point P on line l. Then, draw a perpendicular at point P.



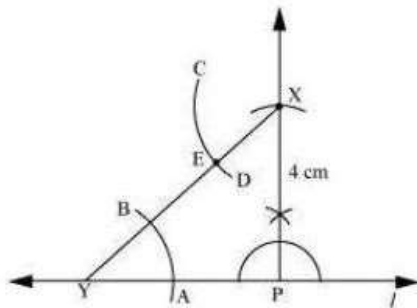
- (ii) Adjusting the compasses up to the length of 4 cm, draw an arc to intersect this perpendicular at point X. Choose any point Y on line l. Join X to Y.



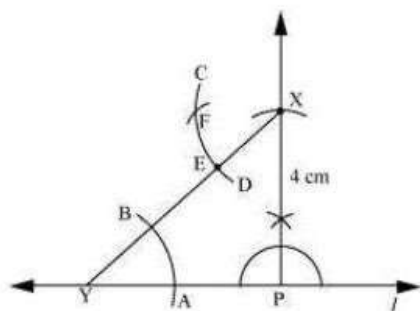
- (iii) Taking Y as centre and with a convenient radius, draw an arc intersecting l at A and XY at B.



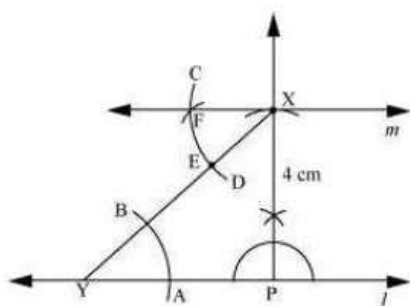
- (iv) Taking X as centre and with the same radius as before, draw an arc CD cutting XY at E.



- (v) Adjust the compasses up to the length of AB. Without changing the opening of compasses and taking E as the centre, draw an arc to intersect the previously drawn arc CD at point F.



(vi) Join the points X and F to draw a line m.



Line m is the required line which is parallel to line l.

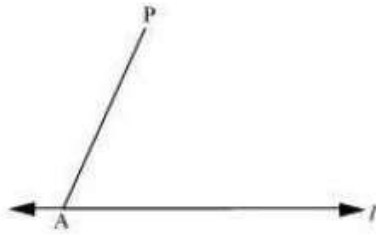
Question 3:

Let l be a line and P be a point not on l. Through P, draw a line m parallel to l. Now join P to any point Q on l. Choose any other point R on m. Through R, draw a line parallel to PQ. Let this meet l at S. What shape do the two sets of parallel lines enclose?

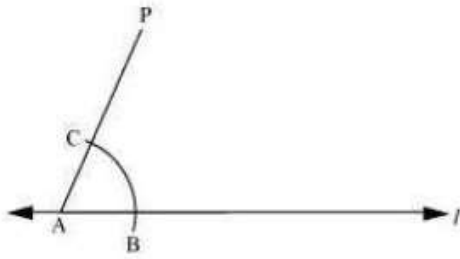
Answer:

The steps of construction are as follows.

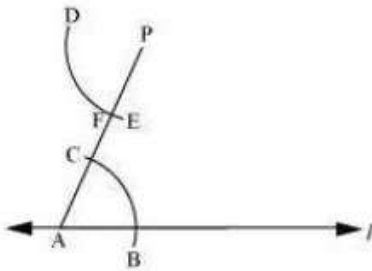
(i) Draw a line l and take a point A on it. Take a point P not on l and join A to P.



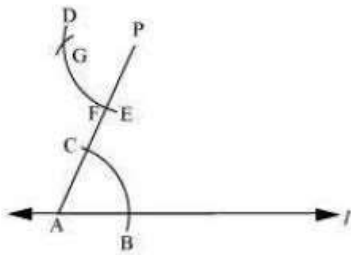
(ii) Taking A as centre and with a convenient radius, draw an arc cutting l at B and AP at C.



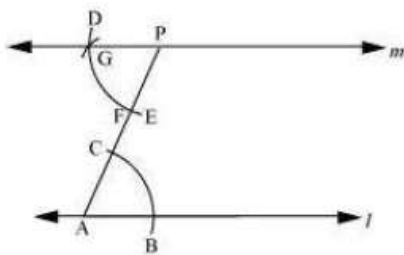
(iii) Taking P as centre and with the same radius as before, draw an arc DE to intersect AP at F.



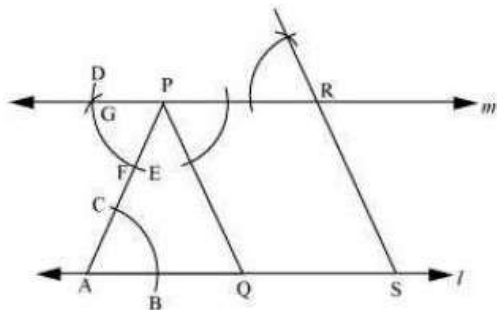
(iv) Adjust the compasses up to the length of BC. Without changing the opening of compasses and taking F as the centre, draw an arc to intersect the previously drawn arc DE at point G.



(v) Join P to G to draw a line m. Line m will be parallel to line l.



(vi) Join P to any point Q on line l. Choose another point R on line m. Similarly, a line can be drawn through point R and parallel to PQ.



Let it meet line l at point S. In quadrilateral PQSR, opposite lines are parallel to each other. $PQ \parallel RS$ and $PR \parallel QS$. Thus, PQSR is a parallelogram.

Ex 10.2:-

Question 1

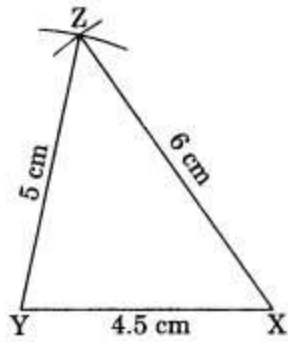
Construct $\triangle XYZ$ in which $XY = 4.5$ cm, $YZ = 5$ cm and $ZX = 6$ cm.

Solution:

Steps of construction:

- (i) Draw $XY = 4.5$ cm.
- (ii) Draw an arc with centre Y and radius 5 cm.
- (iii) Draw another arc with centre X and radius 6 cm to meet the first arc at Z. (iv) Join ZY and ZX.

(v) XYZ is the required triangle.



Using SSS criterion

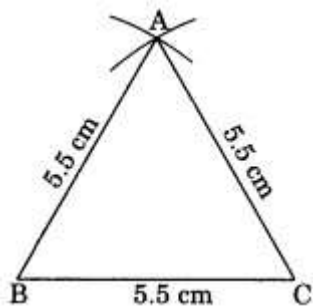
Question 2

Construct an equilateral triangle of side 5.5 cm.

Solution:

Steps of construction:

- (i) Draw $BC = 5.5$ cm.
- (ii) Draw two arcs with centres B and C and same radius of 5.5 cm to meet each other at A.
- (iii) Join AB and AC.
- (iv) ABC is the required triangle.



Using SSS criterion

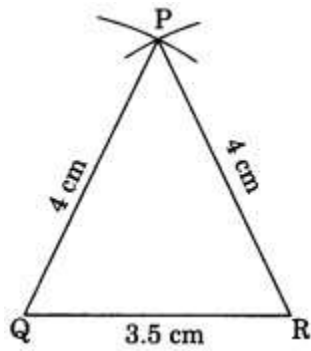
Question 3

Draw $\triangle PQR$ with $PQ = 4$ cm, $QR = 3.5$ cm and $PR = 4$ cm. What type of triangle is this?

Solution:

Steps of construction:

- (i) Draw $QR = 3.5$ cm.
- (ii) Draw two arcs with centre Q and R and same radius of 4 cm to meet each other at P.



- (iii) Join PQ and PR.
- (iv) PQR is the required triangle.
- (v) Since $PQ = PR = 4$ cm, therefore $\triangle PQR$ is an isosceles triangle. Using SSS Criterion

Question 4

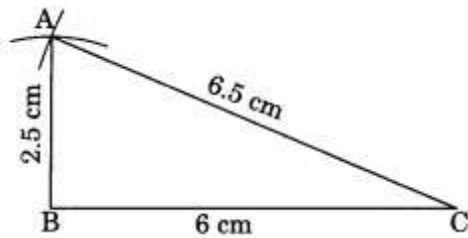
Construct $\triangle ABC$ such that $AB = 2.5$ cm, $BC = 6$ cm and $AC = 6.5$ cm. Measure $\angle B$.

Solution:

Steps of construction:

- (i) Draw $BC = 6$ cm.
- (ii) Draw two arcs with centres B and C and radius 2.5 cm and 6.5 cm respectively to meet each other at A.
- (iii) Join AB and AC.
- (iv) $\triangle ABC$ is the required triangle.

[Using SSS criterion]

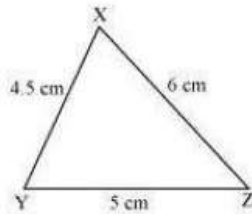


Question 1:

Construct $\triangle XYZ$ in which $XY = 4.5$ cm, $YZ = 5$ cm and $ZX = 6$ cm.

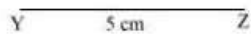
Answer:

The rough figure of this triangle is as follows.



The required triangle is constructed as follows.

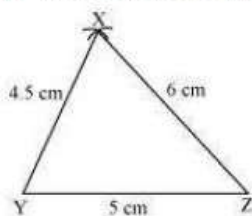
(i) Draw a line segment YZ of length 5 cm.



(ii) Point X is at a distance of 4.5 cm from point Y . Therefore, taking point Y as centre, draw an arc of 4.5 cm radius.



(iii) Point X is at a distance of 6 cm from point Z . Therefore, taking point Z as centre, draw an arc of 6 cm radius. Mark the point of intersection of the arcs as X . Join XY and XZ .



$\triangle XYZ$ is the required triangle.

Question 2:

Construct an equilateral triangle of side 5.5 cm.

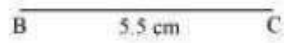
Answer:

An equilateral triangle of side 5.5 cm has to be constructed. We know that all sides of an equilateral triangle are of equal length. Therefore, a triangle ABC has to be constructed with $AB = BC = CA = 5.5$ cm. The steps of construction are as follows.

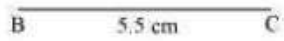
(i) Draw a line segment BC of length 5.5 cm.



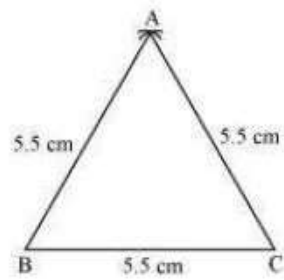
(ii) Taking point B as centre, draw an arc of 5.5 cm radius.



(iii) Taking point C as centre, draw an arc of 5.5 cm radius to meet the previous arc at point A.



(iv) Join A to B and C.



Question 3:

Draw PQR with $PQ = 4\text{ cm}$, $QR = 3.5\text{ cm}$ and $PR = 4\text{ cm}$. What type of triangle is this?

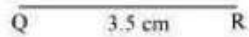
Answer:

The steps of construction are as follows.

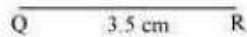
- (i) Draw a line segment QR of length 3.5 cm.



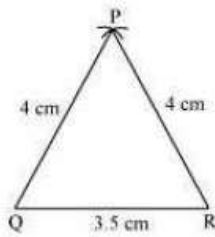
- (ii) Taking point Q as centre, draw an arc of 4 cm radius.



- (iii) Taking point R as centre, draw an arc of 4 cm radius to intersect the previous arc at point P.



(iv) Join P to Q and R.



PQR is the required triangle. As the two sides of this triangle are of the same length ($PQ = PR$), therefore, PQR is an isosceles triangle.

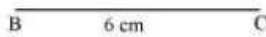
Question 4:

Construct $\triangle ABC$ such that $AB = 2.5$ cm, $BC = 6$ cm and $AC = 6.5$ cm. Measure $\angle B$.

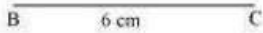
Answer:

The steps of construction are as follows.

(i) Draw a line segment BC of length 6 cm.



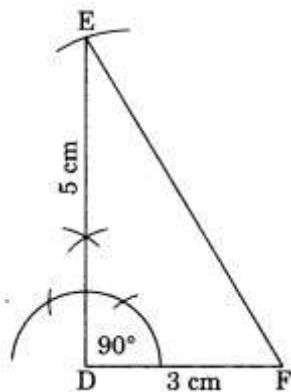
(ii) Taking point C as centre, draw an arc of 6.5 cm radius.



Ex 10.3:-

Question 1

Construct $\triangle DEF$ such that $DE = 5$ cm, $DF = 3$ cm and $m \angle DEF = 90^\circ$.



Solution:

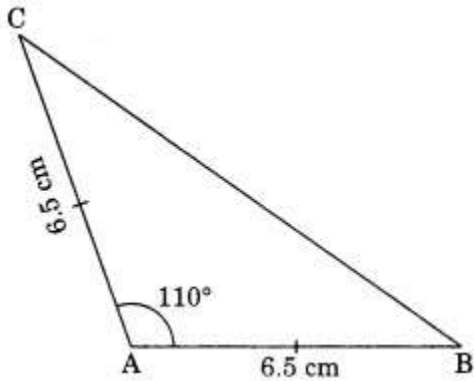
Steps of construction:

- (i) Draw $DF = 3$ cm.
- (ii) Draw an angle of 90° at D and cut $DE = 5$ cm.
- (iii) Join EF.

(iv) EPF is the required triangle.
Using SAS property

Question 2

Construct an isosceles triangle in which the lengths of each of its equal sides is 6.5 cm and the angle between them is 110° .



Solution:

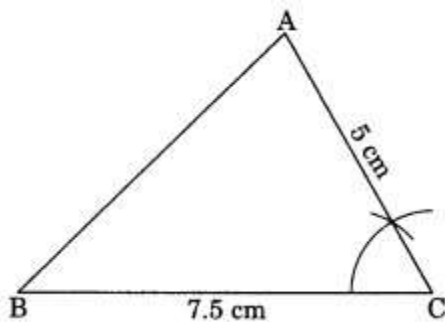
Steps of construction:

- (i) Draw $AB = 6.5$ cm.
- (ii) Draw angle of 110° at A and cut $AC = 6.5$ cm.
- (iii) Join C to B.
- (iv) CAB is the required triangle.

[Using SAS criterion]

Question 3

Construct $\triangle ABC$ with $BC = 7.5$ cm, $AC = 5$ cm and $m \angle C = 60^\circ$.



Solution:

Steps of construction:

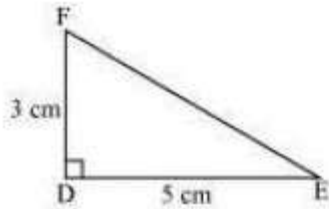
- (i) Draw $BC = 7.5$ cm.
- (ii) Draw $\angle C = 60^\circ$ such that $AC = 5$ cm.
- (iii) Join A to B.
- (iv) ABC is the required triangle. [Using SAS Criterion]

Question 1:

Construct $\triangle DEF$ such that $DE = 5\text{ cm}$, $DF = 3\text{ cm}$ and $m\angle EDF = 90^\circ$.

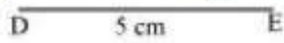
Answer:

The rough sketch of the required $\triangle DEF$ is as follows.

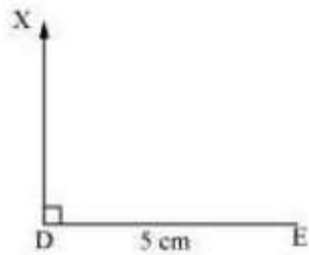


The steps of construction are as follows.

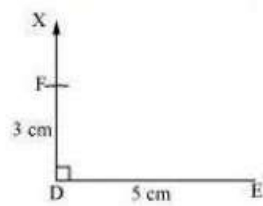
- (i) Draw a line segment DE of length 5 cm .



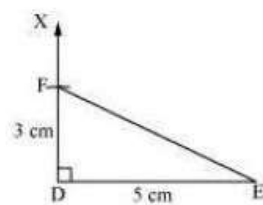
- (ii) At point D , draw a ray DX making an angle of 90° with DE .



(iii) Taking D as centre, draw an arc of 3 cm radius. It will intersect DX at point F.



(iv) Join F to E. $\triangle DEF$ is the required triangle.

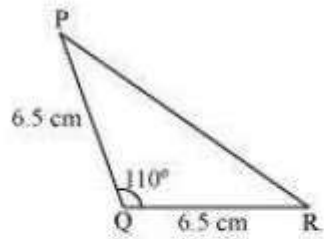


Question 2:

Construct an isosceles triangle in which the lengths of each of its equal sides is 6.5 cm and the angle between them is 110° .

Answer:

An isosceles triangle PQR has to be constructed with $PQ = QR = 6.5\text{ cm}$. A rough sketch of the required triangle can be drawn as follows.

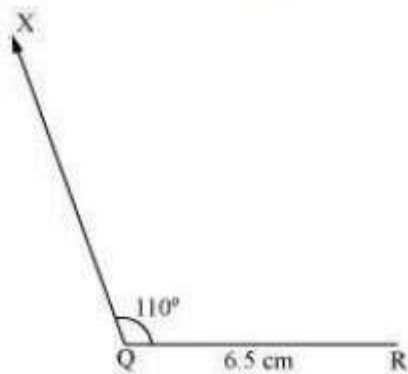


The steps of construction are as follows.

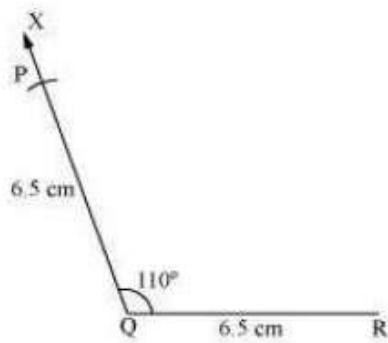
- (i) Draw the line segment QR of length 6.5 cm.



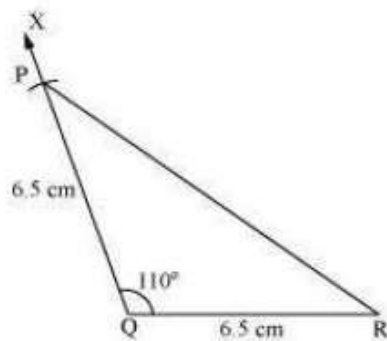
- (ii) At point Q, draw a ray QX making an angle 110° with QR.



(iii) Taking Q as centre, draw an arc of 6.5 cm radius. It intersects QX at point P.



(iv) Join P to R to obtain the required triangle PQR.

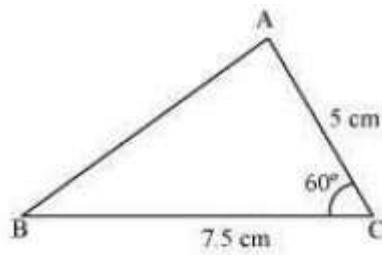


Question 3:

Construct $\triangle ABC$ with $BC = 7.5$ cm, $AC = 5$ cm and $m\angle C = 60^\circ$.

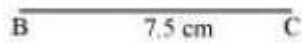
Answer:

A rough sketch of the required triangle is as follows.

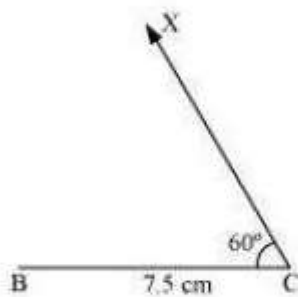


The steps of construction are as follows.

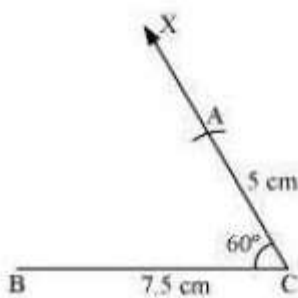
- (i) Draw a line segment BC of length 7.5 cm.



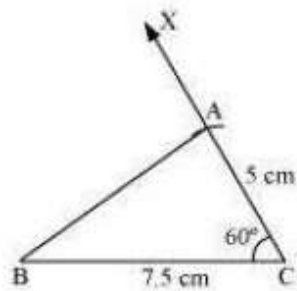
- (ii) At point C, draw a ray CX making 60° with BC.



- (iii) Taking C as centre, draw an arc of 5 cm radius. It intersects CX at point A.



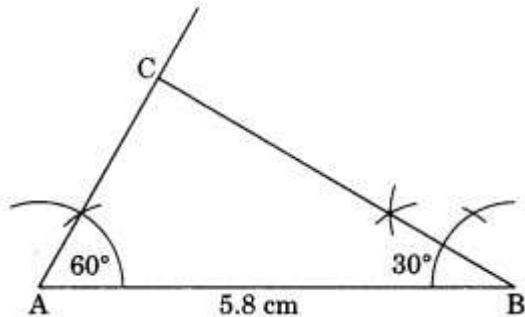
- (iv) Join A to B to obtain triangle ABC.



Ex 10.4:-

Question 1

Construct $\triangle ABC$, given $m\angle A = 60^\circ$, $m\angle B = 30^\circ$ and $AB = 5.8$ cm.



Solution:

Steps of construction:

- (i) Draw $AB = 5.8$ cm.
- (ii) Draw $\angle A = 60^\circ$ and $\angle B = 30^\circ$ to meet each other at C.
- (iii) ABC is the required triangle.

Using ASA criterion

Question 2

Construct $\triangle PQR$ if $PQ = 5$ cm, $m\angle PQR = 105^\circ$ and $m\angle QRP = 40^\circ$. (Hint: Recall angle-sum property of a triangle)

Solution:

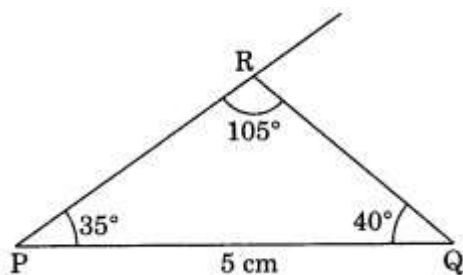
Given: $m\angle PQR = 40^\circ$, $m\angle QRP = 105^\circ$

$\therefore m\angle PQR + m\angle QRP + \angle QPR = 180^\circ$ (Angle sum property of a triangle)

$$105^\circ + 40^\circ + \angle QPR = 180^\circ$$

$$145^\circ + \angle QPR = 180^\circ$$

$$\therefore \angle QPR = 180^\circ - 145^\circ = 35^\circ$$



Steps of construction:

- (i) Draw $PQ = 5$ cm.
- (ii) Draw $\angle QPR = 35^\circ$ and $\angle PQR = 40^\circ$ to meet each other at R.
- (iii) $\triangle PQR$ is the required triangle.

[Using AAS or ASA criterion]

Question 3

Examine whether you can construct $\triangle DEF$ such that $EF = 7.2$ cm, $m\angle E = 110^\circ$ and $m\angle F = 80^\circ$. Justify your answer.

Solution:

To construct $\triangle DEF$ with the given measurement, is not possible.

$$\because m\angle E + m\angle F = 110^\circ + 80^\circ$$

$$= 190^\circ > 180^\circ \text{ [Sum of the angles of a triangle} = 180^\circ] \therefore$$

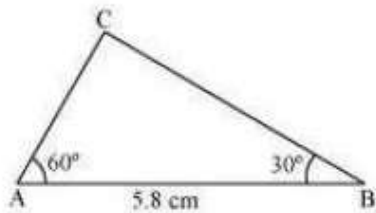
$\triangle DEF$ is not possible to construct.

Question 1:

Construct $\triangle ABC$, given $m\angle A = 60^\circ$, $m\angle B = 30^\circ$ and $AB = 5.8$ cm.

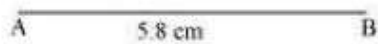
Answer:

A rough sketch of the required $\triangle ABC$ is as follows.

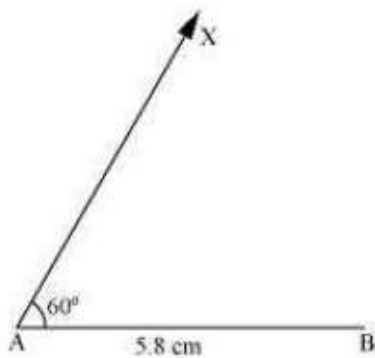


The steps of construction are as follows.

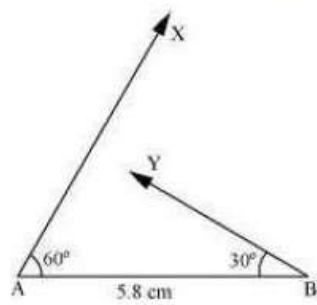
(i) Draw a line segment AB of length 5.8 cm.



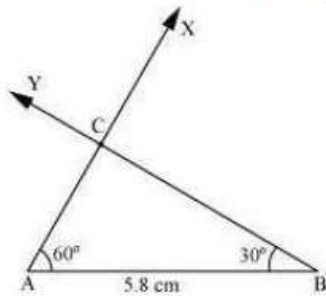
(ii) At point A, draw a ray AX making 60° angle with AB.



(iii) At point B, draw a ray BY, making 30° angle with AB.



(iv) Point C has to lie on both the rays, AX and BY. Therefore, C is the point of intersection of these two rays.



This is the required triangle ABC.

Question 2:

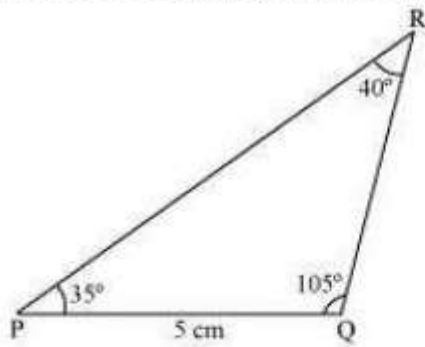
Construct $\triangle PQR$ if $PQ = 5$ cm, $m\angle PQR = 105^\circ$ and $m\angle QRP = 40^\circ$.

(Hint: Recall angle sum property of a triangle).

Answer:

A rough sketch of the required $\triangle PQR$ is as follows.

A rough sketch of the required $\triangle PQR$ is as follows.



In order to construct $\triangle PQR$, the measure of $\angle RPQ$ has to be calculated.

According to the angle sum property of triangles,

$$\angle PQR + \angle PRQ + \angle RPQ = 180^\circ$$

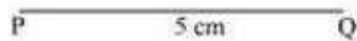
$$105^\circ + 40^\circ + \angle RPQ = 180^\circ$$

$$145^\circ + \angle RPQ = 180^\circ$$

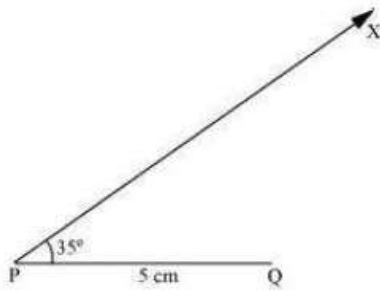
$$\angle RPQ = 180^\circ - 145^\circ = 35^\circ$$

The steps of construction are as follows.

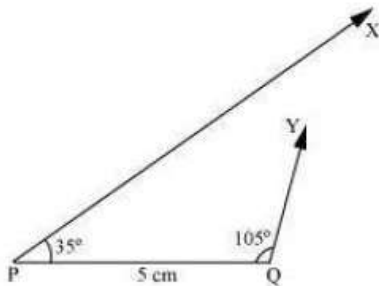
(i) Draw a line segment PQ of length 5 cm.



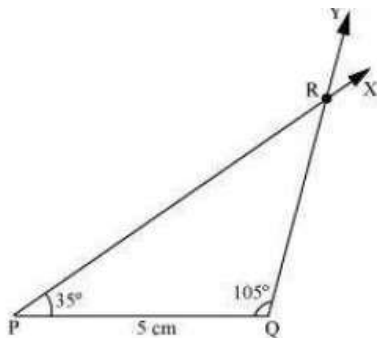
(ii) At P, draw a ray PX making an angle of 35° with PQ.



(iii) At point Q, draw a ray QY making an angle of 105° with PQ.



(iv) Point R has to lie on both the rays, PX and QY. Therefore, R is the point of intersection of these two rays.



This is the required triangle PQR.

Question 3:

Examine whether you can construct $\triangle DEF$ such that $EF = 7.2$ cm, $m\angle E = 110^\circ$ and $m\angle F = 80^\circ$. Justify your answer.

Answer:

Given that,

$$m\angle E = 110^\circ \text{ and } m\angle F = 80^\circ$$

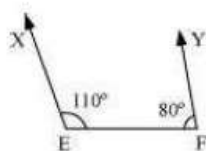
Therefore,

$$m\angle E + m\angle F = 110^\circ + 80^\circ = 190^\circ$$

However, according to the angle sum property of triangles, we should obtain

$$m\angle E + m\angle F + m\angle D = 180^\circ$$

Therefore, the angle sum property is not followed by the given triangle. And thus, we cannot construct $\triangle DEF$ with the given measurements.

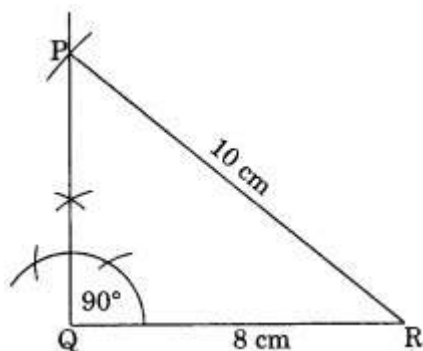


Also, it can be observed that point D should lie on both rays, EX and FY, for constructing the required triangle. However, both rays are not intersecting each other. Therefore, the required triangle cannot be formed

Ex 10.5:-

Question 1

Construct the right angled ΔPQR , where $m\angle Q = 90^\circ$, $QR = 8$ cm and $PR = 10$ cm.



Solution:

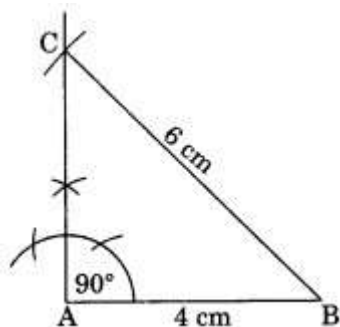
Steps of construction:

- (i) Draw $QR = 8$ cm.
- (ii) Draw $m\angle Q = 90^\circ$.
- (iii) Draw an arc with centre R and radius 10 cm to cut the perpendicular line at P.
- (iv) ΔPQR is the required triangle.

[Using RHS criterion]

Question 2

Construct a right-angled triangle whose hypotenuse is 6 cm long and one of the legs is 4 cm long.



Solution:

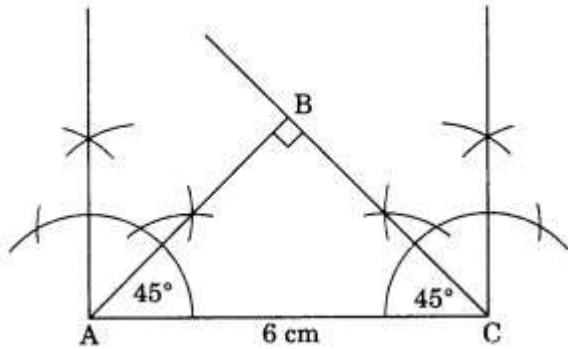
Steps of construction:

- (i) Draw $AB = 4$ cm.

- (ii) Draw $\angle A = 90^\circ$.
 - (iii) Cut $BC = 6$ cm.
 - (iv) $\triangle CAB$ is the required right-angled triangle.
- [Using RHS criterion]

Question 3

Construct an isosceles right-angled triangle ABC, where $m\angle ACB = 90^\circ$ and $AC = 6$ cm.



Solution:

Steps of construction:

- (i) Draw $AC = 6$ cm.
 - (ii) Draw $\angle A = \angle C = 45^\circ$ to meet each other at B such that $m\angle B = 90^\circ$.
 - (iii) $\triangle ABC$ is right-angled isosceles triangle which is the required triangle.
- [Using RHS criterion]

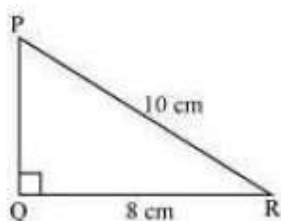
Exercise 10.5

Question 1:

Construct the right angled $\triangle PQR$, where $m\angle Q = 90^\circ$, $QR = 8\text{ cm}$ and $PR = 10\text{ cm}$.

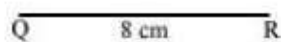
Answer:

A rough sketch of $\triangle PQR$ is as follows.

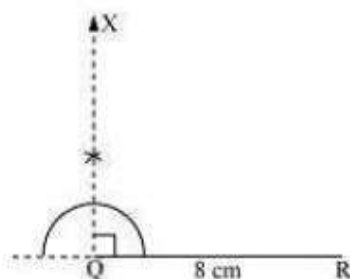


The steps of construction are as follows.

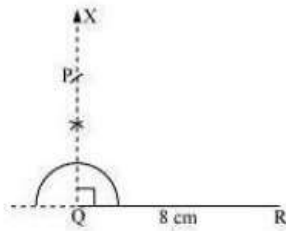
- (i) Draw a line segment QR of length 8 cm.



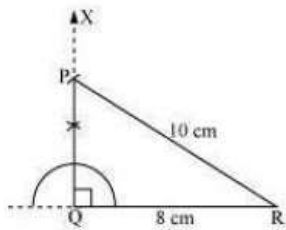
- (ii) At point Q, draw a ray QX making 90° with QR.



(iii) Taking R as centre, draw an arc of 10 cm radius to intersect ray QX at point P.



(iv) Join P to R. $\triangle PQR$ is the required right-angled triangle.

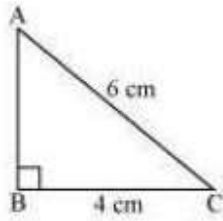


Question 2:

Construct a right-angled triangle whose hypotenuse is 6 cm long and one of the legs is 4 cm long.

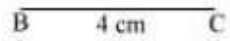
Answer:

A right-angled triangle ABC with hypotenuse 6 cm and one of the legs as 4 cm has to be constructed. A rough sketch of $\triangle ABC$ is as follows.

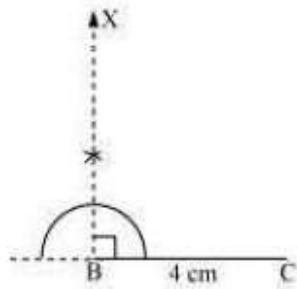


The steps of construction are as follows.

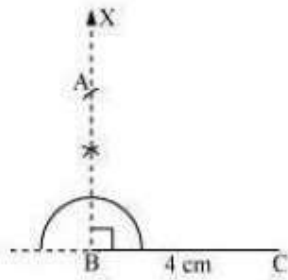
- (i) Draw a line segment BC of length 4 cm.



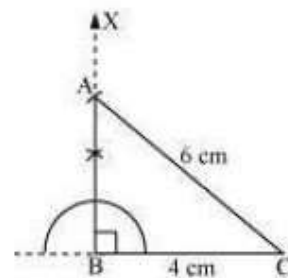
- (ii) At point B, draw a ray BX making an angle of 90° with BC.



(iii) Taking C as centre, draw an arc of 6 cm radius to intersect ray BX at point A.



(iv) Join A to C to obtain the required $\triangle ABC$.



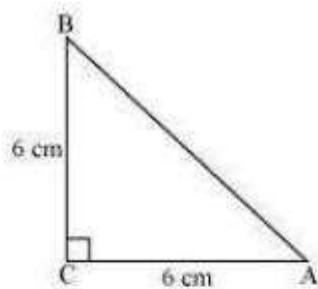
Question 3:

Construct an isosceles right-angled triangle ABC, where, $m\angle ACB = 90^\circ$ and $AC = 6$ cm.

Answer:

In an isosceles triangle, the lengths of any two sides are equal.

Let in $\triangle ABC$, $AC = BC = 6$ cm. A rough sketch of this $\triangle ABC$ is as follows.

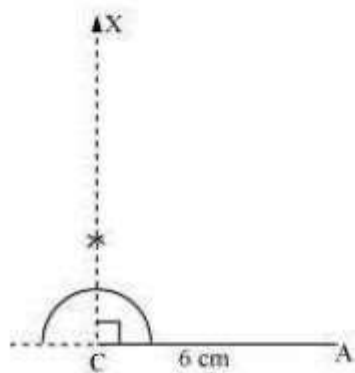


The steps of construction are as follows.

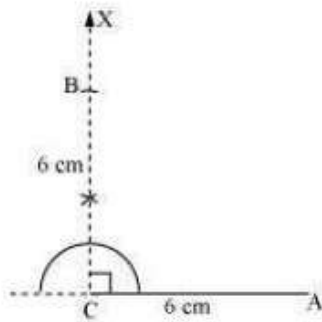
- (i) Draw a line segment AC of length 6 cm.



- (ii) At point C, draw a ray CX making an angle of 90° with AC.



(iii) Taking point C as centre, draw an arc of 6 cm radius to intersect CX at point B.



(iv) Join A to B to obtain the required $\triangle ABC$.

