

Chapter 11: Constructions

NCERT Exemplar · Class 9 · Maths

Exercise 11.1 · Textbook page 109

Question 1

With the help of a ruler and a compass, it is not possible to construct an angle of :

- (A) 37.5°
- (B) 40°
- (C) 22.5°
- (D) 67.5°

Solution

(B) 40°

Explanation:

Considering Option (A):

$$37.5^\circ = \frac{1}{2} \times 75^\circ$$

75° can be constructed with the help of a ruler and a compass.

Considering Option (B):

$$40^\circ = \frac{1}{2} \times 20^\circ$$

This is not possible.

20° cannot be constructed with the help of a ruler and a compass.

Considering Option (C):

$$22.5^\circ = \frac{1}{2} \times 45^\circ$$

45° can be constructed with the help of a ruler and a compass.

Considering Option (D):

$$67.5^\circ = \frac{1}{2} \times 135^\circ = \frac{1}{2} \times (90^\circ + 45^\circ)$$

Both 90° and 45° can be constructed with the help of a ruler and a compass.

Hence, option (B), is not possible to construct an angle of 40° with the help of a ruler and compass is the correct answer.

Exercise 11.2 · Textbook page 109

Question 1

An angle of 52.5° can be constructed.

Solution

True

Justification:

$$52.5^\circ = \frac{1}{2} \times 105^\circ = \frac{1}{2} \times (90^\circ + 15^\circ)$$

We know that,

It is possible to construct both 90° and 15° with the help of a ruler and compass.

Therefore angle of 52.5° can be constructed.

Question 2

An angle of 42.5° can be constructed.

Solution

False

Justification:

$$42.5^\circ = \frac{1}{2} \times 85^\circ$$

We know that,

It is possible to construct 85° with the help of a ruler and compass.

Therefore, an angle of 42.5° cannot be constructed.

Question 3

A triangle ABC can be constructed in which $AB = 5 \text{ cm}$, $\angle A = 45^\circ$ and $BC + AC = 5 \text{ cm}$.

Solution

True

Justification:

We know that,

Sum of any two sides of a triangle must be greater than the third side.

Here,

$BC + AC = 5 \text{ cm} = AB$ which does not satisfy the above condition that the sum is equal to the third side.

Exercise 11.3 · Textbook page 110

Question 1

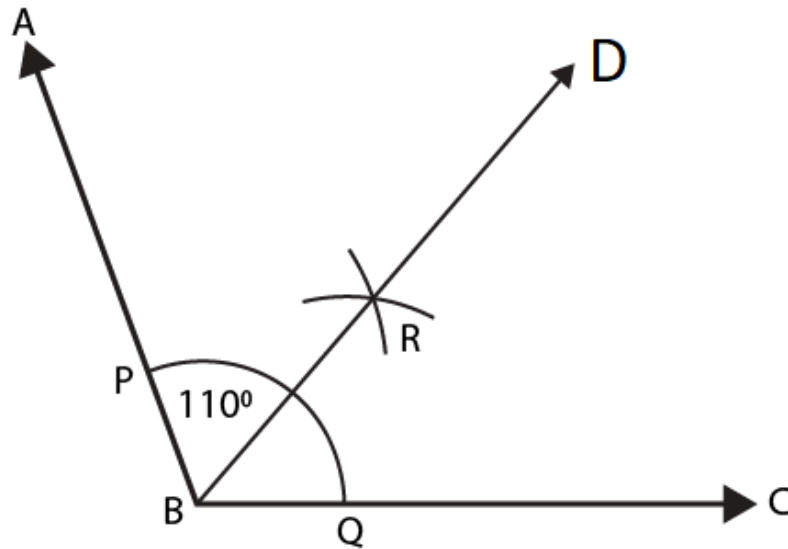
Draw an angle of 110° with the help of a protractor and bisect it. Measure each angle.

Solution

According to the question,

An angle $ABC = 110^\circ$.

To draw the bisector of $\angle ABC$



Steps of construction:

1. With B as the centre and a convenient radius, draw an arc to intersect the rays BA at P and BC at Q, respectively.
2. With centre P and a radius greater than half of PQ, draw an arc.
3. With centre Q and the same radius (as in step 2), draw another arc to cut the previous arc at R.
4. Draw ray BR.

The ray BR is the required bisector of $\angle ABC$.

$$\angle ABD = \angle CBD = 55^{\circ}$$

$$\angle ABD = \angle CBD = \frac{1}{2} \angle ABC = \frac{1}{2} \times 110^{\circ} = 55^{\circ}$$

Question 2

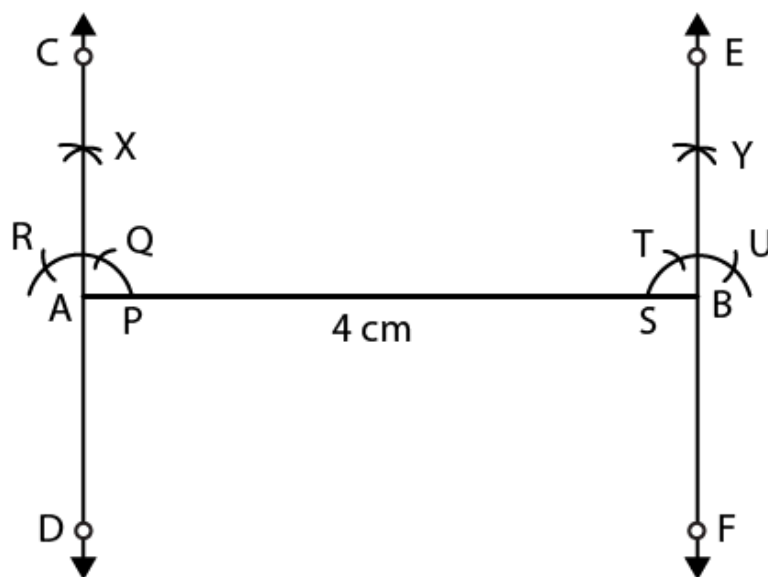
Draw a line segment AB of 4 cm in length. Draw a line perpendicular to AB through A and B, respectively. Are these lines parallel?

Solution

According to the question,

A line segment AB of length 4cm.

To draw a perpendicular to AB through A and B, respectively.



Steps of construction:

1. Draw $AB = 4$ cm.
2. With A as the centre, draw an arc, cutting AB at P.
3. With P as the centre and the same radius, draw an arc cutting the arc drawn in step 2 at Q.
4. With Q as the centre and the same radius, draw an arc, cutting the arc drawn in step 3 at R.
5. With R as the centre and the same radius, draw an arc, cutting the arc drawn in step 5 at X.
6. Draw OX and produce it to C and D.
7. Now, repeat the steps from 2 to 7 to draw the line EF perpendicular through B.

Yes, these lines are parallel because the sum of the interior angles on the same side of the transversal is 180° .

Question 3

Draw an angle of 80° with the help of a protractor. Then construct angles of

(i) 40°

(ii) 160°

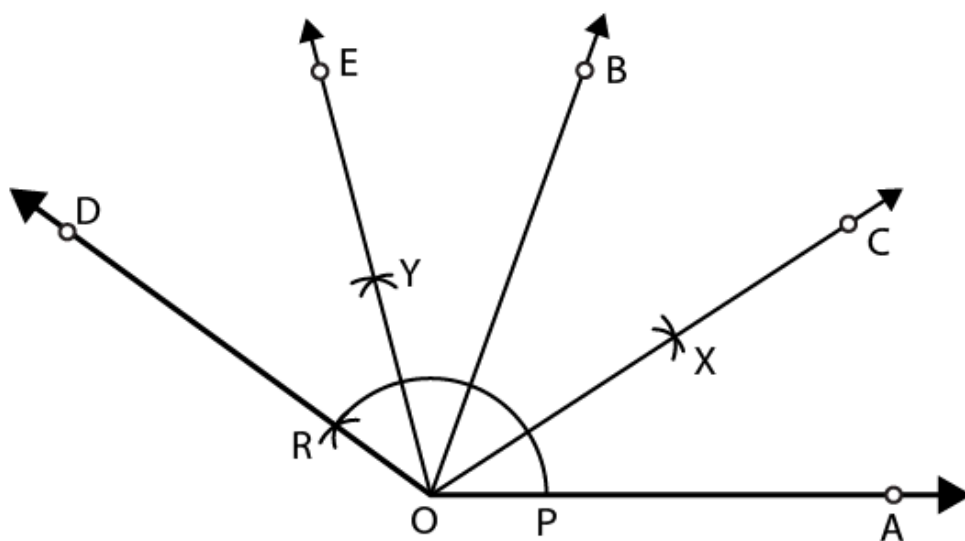
(iii) 120° .

Solution

According to the question:

We have to draw an angle of 80° with the help of a protractor. Then construct angles of

- (i) 40°
- (ii) 160°
- (iii) 120°



Steps of construction:

1. Draw a ray OA.
2. With the help of a protractor, construction $\angle BOA = 80^\circ$
3. Taking O as the centre and any suitable radius, draw an arc to intersect rays OA and OB at points P and Q, respectively.

4. Bisect $\angle BOA$ as done in Q1. Let ray OC be the bisector of $\angle BOA$, then

$$\angle ROA = \frac{1}{2} \angle BOA = \frac{1}{2} \times 80^\circ = 40^\circ$$

5. With Q as the centre and radius equal to PQ, draw an arc to cut the extended arc PQ at R.

Join OR and produce it to form ray OD, then $\angle DOA = 2\angle BOA = 2 \times 80 = 160$

6. Bisect $\angle DOB$ as in Q1. Let OE be the bisector of $\angle DOB$ is, then

$$\angle EOA = \angle EOB + \angle BOA = \frac{1}{2} \angle DOB + \angle BOA = \frac{1}{2} (80) + 80 = 40 + 80 = 120^\circ$$

Question 4

Construct a triangle whose sides are 3.6 cm, 3.0 cm and 4.8 cm. Bisect the smallest angle and measure each part.

Solution

According to the question,

We have to construct a triangle whose sides are 3.6 cm, 3.0 cm and 4.8 cm.

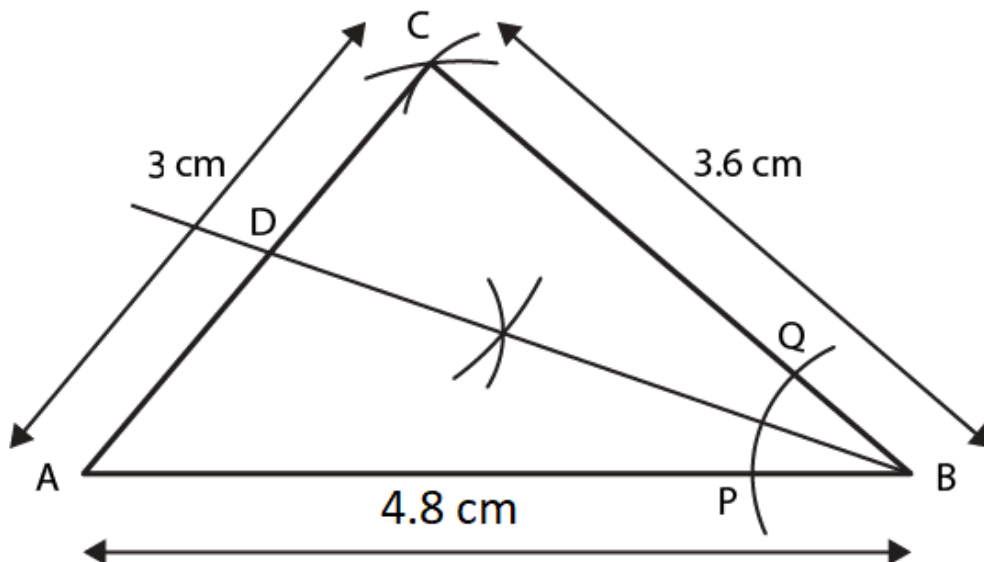
And to bisect the smallest angle and measure each part.

Steps of construction:

Step 1: Draw a line $AB = 4.8$ cm.

Step 2: Now, take a radius of 3 cm and centre 'A' and draw an arc. And take a radius of 3.6 cm and centre 'B', draw an arc that intersects our previous arc at 'C'.

Step 3: Join CA and CB we get the required triangle ABC.



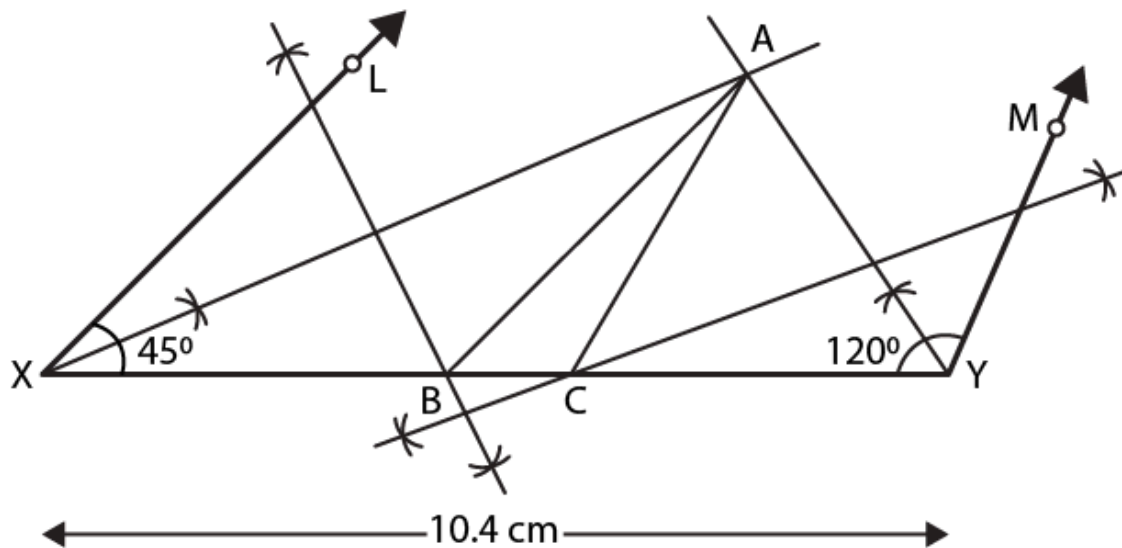
Exercise 11.4 · Textbook page 111**Question 1**

A triangle, if its perimeter is 10.4 cm and two angles are 45° and 120° .

Solution

According to the question,

We have to construct a triangle if its perimeter is 10.4 cm and two angles are 45° and 120°



Steps of construction:

1. Draw $XY = 10.4$ cm.
2. Draw $\angle LXY = 45^\circ$ and $\angle MYX = 120^\circ$
3. Draw the angle bisector of $\angle LXY$.
4. Draw the angle bisector of $\angle MYX$ such that it meets the angle bisector of $\angle LXY$ at point A .
5. Draw the perpendicular bisector of AX such that it meets XY at B .
6. Draw the perpendicular bisector of AY such that it meets XY at C .
7. Join AB and AC .

Thus, ABC is the required triangle.

Question 2

A triangle PQR given that $QR = 3\text{ cm}$, $\angle PQR = 45^\circ$ and $QP - PR = 2\text{ cm}$.

Solution

According to the question,

We have to draw a triangle PQR such that $QR = 3\text{ cm}$, $\angle PQR = 45^\circ$ and $QP - PR = 2\text{ cm}$

Steps of construction:

1. Draw a ray OX and cut off a line segment $QR = 3\text{ cm}$.
2. AT Q, construction $\angle YQR = 45^\circ$.
3. From QY, cut off $QS = 2\text{ cm}$.
4. Join RS.
5. Draw a perpendicular bisector of RS to Meet QY at P.
6. Join PR. Then PQR is the required triangle.

