

CONSTRUCTIONS

(A) Main Concepts and Results

- To bisect a given angle,
- To draw the perpendicular bisector of a line segment,
- To construct angles of 15° , 30° , 45° , 60° , 90° , etc.
- To construct a triangle given its base, a base angle and the sum of other two sides,
- To construct a triangle given its base, a base angle and the difference of other two sides,
- To construct a triangle given its perimeter and the two base angles
- Geometrical construction means using only a ruler and a pair of compasses as geometrical instruments.

(B) Multiple Choice Questions

Sample Question 1: With the help of a ruler and a compass, it is possible to construct an angle of :

- (A) 35° (B) 40° (C) 37.5° (D) 47.5°

Solution : Answer (C)

Sample Question 2: The construction of a triangle ABC in which $AB = 4$ cm, $\angle A = 60^\circ$ is not possible when difference of BC and AC is equal to:

- (A) 3.5 cm (B) 4.5 cm (C) 3 cm (D) 2.5 cm

Solution : Answer (B)

EXERCISE 11.1

- 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°
- The construction of a triangle ABC, given that $BC = 6$ cm, $\angle B = 45^\circ$ is not possible when difference of AB and AC is equal to:
(A) 6.9 cm (B) 5.2 cm (C) 5.0 cm (D) 4.0 cm
- The construction of a triangle ABC, given that $BC = 3$ cm, $\angle C = 60^\circ$ is possible when difference of AB and AC is equal to :
(A) 3.2 cm (B) 3.1 cm (C) 3 cm (D) 2.8 cm

(C) Short Answer Questions with Reasoning

Write **True** or **False** and give reasons for your answer.

Sample Question 1 : An angle of 67.5° can be constructed.

Solution : True. As $67.5^\circ = \frac{135^\circ}{2} = \frac{1}{2} (90^\circ + 45^\circ)$.

EXERCISE 11.2

Write **True** or **False** in each of the following. Give reasons for your answer:

- An angle of 52.5° can be constructed.
- An angle of 42.5° can be constructed.
- A triangle ABC can be constructed in which $AB = 5$ cm, $\angle A = 45^\circ$ and $BC + AC = 5$ cm.
- A triangle ABC can be constructed in which $BC = 6$ cm, $\angle C = 30^\circ$ and $AC - AB = 4$ cm.
- A triangle ABC can be constructed in which $\angle B = 105^\circ$, $\angle C = 90^\circ$ and $AB + BC + AC = 10$ cm.
- A triangle ABC can be constructed in which $\angle B = 60^\circ$, $\angle C = 45^\circ$ and $AB + BC + AC = 12$ cm.

(D) Short Answer Questions

Sample Question 1 : Construct a triangle ABC in which $BC = 7.5$ cm, $\angle B = 45^\circ$ and $AB - AC = 4$ cm.

Solution : See Mathematics Textbook for Class IX.

EXERCISE 11.3

1. Draw an angle of 110° with the help of a protractor and bisect it. Measure each angle.
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?
3. Draw an angle of 80° with the help of a protractor. Then construct angles of (i) 40° (ii) 160° and (iii) 120° .
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.
5. Construct a triangle ABC in which $BC = 5$ cm, $\angle B = 60^\circ$ and $AC + AB = 7.5$ cm.
6. Construct a square of side 3 cm.
7. Construct a rectangle whose adjacent sides are of lengths 5 cm and 3.5 cm.
8. Construct a rhombus whose side is of length 3.4 cm and one of its angles is 45° .

(E) Long Answer Questions

Sample Question 1 : Construct an equilateral triangle if its altitude is 6 cm. Give justification for your construction.

Solution : Draw a line XY. Take any point D on this line. Construct perpendicular PD on XY. Cut a line segment AD from D equal to 6 cm.

Make angles equal to 30° at A on both sides of AD, say $\angle CAD$ and $\angle BAD$ where B and C lie on XY. Then ABC is the required triangle.

Justification

Since $\angle A = 30^\circ + 30^\circ = 60^\circ$ and $AD \perp BC$, $\triangle ABC$ is an equilateral triangle with altitude $AD = 6$ cm.

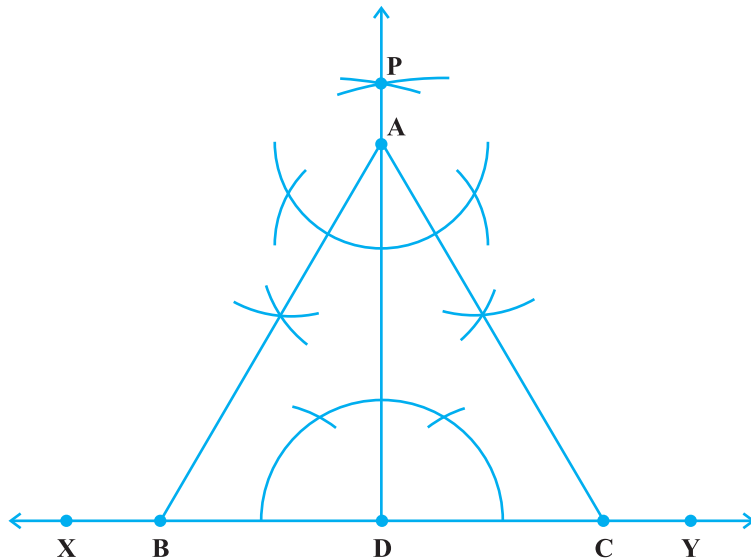


Fig. 11.1

EXERCISE 11.4

Construct each of the following and give justification :

1. A triangle if its perimeter is 10.4 cm and two angles are 45° and 120° .
2. A triangle PQR given that $QR = 3\text{cm}$, $\angle PQR = 45^\circ$ and $QP - PR = 2\text{ cm}$.
3. A right triangle when one side is 3.5 cm and sum of other sides and the hypotenuse is 5.5 cm.
4. An equilateral triangle if its altitude is 3.2 cm.
5. A rhombus whose diagonals are 4 cm and 6 cm in lengths.