CHAPTER 11

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, $\angle A = 60°$ 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

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°

2. The construction of a triangle ABC, given that BC = 6 cm, $\angle B = 45°$ 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

3. The construction of a triangle ABC, given that BC = 3 cm, $\angle C = 60°$ 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 $67.5° = \frac{135°}{2} = \frac{1}{2}(90° + 45°)$.

EXERCISE 11.2

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

1. An angle of 52.5° can be constructed.

2. An angle of 42.5° can be constructed.

3. A triangle ABC can be constructed in which AB = 5 cm, $\angle A = 45°$ and BC + AC = 5 cm.

4. A triangle ABC can be constructed in which BC = 6 cm, $\angle C = 30°$ and AC – AB = 4 cm.

5. A triangle ABC can be constructed in which $\angle B = 105°$, $\angle C = 90°$ and AB + BC + AC = 10 cm.

6. A triangle ABC can be constructed in which $\angle B = 60°$, $\angle C = 45°$ and AB + BC + AC = 12 cm.

(D) Short Answer Questions

Sample Question 1 : Construct a triangle ABC in which BC = 7.5 cm, $\angle B = 45°$ 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, ∠B = 60° 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 ∠CAD and ∠BAD where B and C lie on XY. Then ABC is the required triangle.

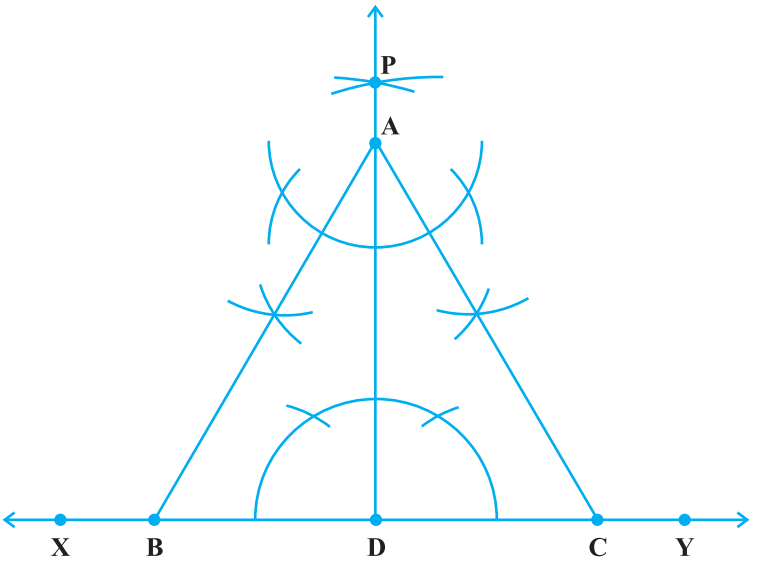

Fig. 11.1

Justification

Since ∠A = 30° + 30° = 60° and AD ⊥BC, ΔABC is an equilateral triangle with altitude AD = 6 cm.

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 = 3cm, ∠ PQR = 45° and QP – PR = 2 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.