

## CONSTRUCTIONS

### (A) Main Concepts and Results

- To bisect a given angle,
- To draw the perpendicular bisector of a line segment,
- To construct angles of  $15^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ ,  $90^\circ$ , 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)  $35^\circ$       (B)  $40^\circ$       (C)  $37.5^\circ$       (D)  $47.5^\circ$

**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

1. With the help of a ruler and a compass it is not possible to construct an angle of :  
(A)  $37.5^\circ$       (B)  $40^\circ$       (C)  $22.5^\circ$       (D)  $67.5^\circ$
2. 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
3. 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  $67.5^\circ$  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:

1. An angle of  $52.5^\circ$  can be constructed.
2. An angle of  $42.5^\circ$  can be constructed.
3. A triangle ABC can be constructed in which  $AB = 5$  cm,  $\angle A = 45^\circ$  and  $BC + AC = 5$  cm.
4. A triangle ABC can be constructed in which  $BC = 6$  cm,  $\angle C = 30^\circ$  and  $AC - AB = 4$  cm.
5. A triangle ABC can be constructed in which  $\angle B = 105^\circ$ ,  $\angle C = 90^\circ$  and  $AB + BC + AC = 10$  cm.
6. 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  $110^\circ$  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  $80^\circ$  with the help of a protractor. Then construct angles of (i)  $40^\circ$  (ii)  $160^\circ$  and (iii)  $120^\circ$ .
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  $45^\circ$ .

#### (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  $30^\circ$  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  $AD \perp BC$ ,  $\Delta ABC$  is an equilateral triangle with altitude  $AD = 6$  cm.

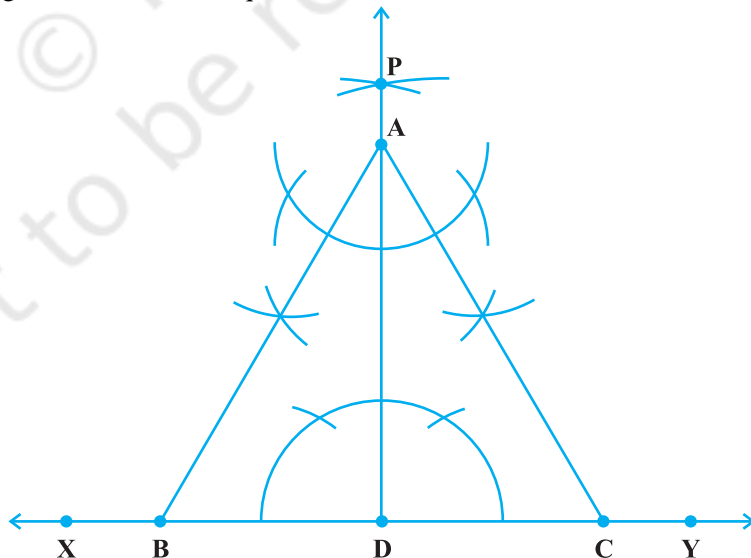


Fig. 11.1

### 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  $45^\circ$  and  $120^\circ$ .
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.

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