

# Triangles

## Exercise 16A

Q1

**Answer :**

We get a triangle by joining the three non-collinear points A, B and C.

- (i) The side opposite to  $\angle C$  is AB.
- (ii) The angle opposite to the side BC is  $\angle A$ .
- (iii) The vertex opposite to the side CA is B.
- (iv) The side opposite to the vertex B is AC.

Q2

**Answer :**

The measures of two angles of a triangle are  $72^\circ$  and  $58^\circ$ .

Let the third angle be  $x$ .

Now, the sum of the measures of all the angles of a triangle is  $180^\circ$ .

$$\therefore x + 72^\circ + 58^\circ = 180^\circ$$

$$\Rightarrow x + 130^\circ = 180^\circ$$

$$\Rightarrow x = 180^\circ - 130^\circ$$

$$\Rightarrow x = 50^\circ$$

The measure of the third angle of the triangle is  $50^\circ$ .

**Answer :**

The angles of a triangle are in the ratio 1:3:5.

Let the measures of the angles of the triangle be  $(1x)$ ,  $(3x)$  and  $(5x)$

Sum of the measures of the angles of the triangle =  $180^\circ$

$$\therefore 1x + 3x + 5x = 180^\circ$$

$$\Rightarrow 9x = 180^\circ$$

$$\Rightarrow x = 20^\circ$$

$$1x = 20^\circ$$

$$3x = 60^\circ$$

$$5x = 100^\circ$$

The measures of the angles are  $20^\circ$ ,  $60^\circ$  and  $100^\circ$ .

Q4

**Answer :**

In a right angle triangle, one of the angles is  $90^\circ$ .

It is given that one of the acute angles of the right angled triangle is  $50^\circ$ .

We know that the sum of the measures of all the angles of a triangle is  $180^\circ$ .

Now, let the third angle be  $x$ .

Therefore, we have:

$$90^\circ + 50^\circ + x = 180^\circ$$

$$\Rightarrow 140^\circ + x = 180^\circ$$

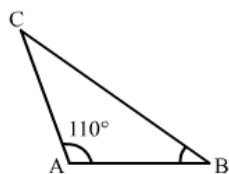
$$\Rightarrow x = 180^\circ - 140^\circ$$

$$\Rightarrow x = 40^\circ$$

The third acute angle is  $40^\circ$ .

Q5

**Answer :**



Given:

$\angle A = 110^\circ$  and  $\angle B = \angle C$

Now, the sum of the measures of all the angles of a triangle is  $180^\circ$ .

$$\angle A + \angle B + \angle C = 180^\circ$$

$$\Rightarrow 110^\circ + \angle B + \angle B = 180^\circ$$

$$\Rightarrow 110^\circ + 2\angle B = 180^\circ$$

$$\Rightarrow 2\angle B = 180^\circ - 110^\circ$$

$$\Rightarrow 2\angle B = 70^\circ$$

$$\Rightarrow \angle B = 70^\circ / 2$$

$$\Rightarrow \angle B = 35^\circ$$

$$\therefore \angle C = 35^\circ$$

The measures of the three angles:

$\angle A = 110^\circ$ ,  $\angle B = 35^\circ$ ,  $\angle C = 35^\circ$

Q6

**Answer :**

Given:

$$\angle A = \angle B + \angle C$$

We know:

$$\angle A + \angle B + \angle C = 180^\circ$$

$$\Rightarrow \angle B + \angle C + \angle B + \angle C = 180^\circ$$

$$\Rightarrow 2\angle B + 2\angle C = 180^\circ$$

$$\Rightarrow 2(\angle B + \angle C) = 180^\circ$$

$$\Rightarrow \angle B + \angle C = 180/2$$

$$\Rightarrow \angle B + \angle C = 90^\circ$$

$$\therefore \angle A = 90^\circ$$

This shows that the triangle is a right angled triangle.

Q7

**Answer :**

$$\text{Let } 3\angle A = 4\angle B = 6\angle C = x$$

Then, we have:

$$\angle A = \frac{x}{3}, \angle B = \frac{x}{4}, \angle C = \frac{x}{6}$$

$$\text{But, } \angle A + \angle B + \angle C = 180^\circ$$

$$\therefore \frac{x}{3} + \frac{x}{4} + \frac{x}{6} = 180^\circ$$

$$\text{or } \frac{4x + 3x + 2x}{12} = 180^\circ$$

$$\text{or } 9x = 180^\circ \times 12 = 2160^\circ$$

$$\text{or } x = 240^\circ$$

$$\therefore \angle A = \frac{240}{3} = 80^\circ, \angle B = \frac{240}{4} = 60^\circ, \angle C = \frac{240}{6} = 40^\circ$$

Q9

**Answer :**

Equilateral Triangle: A triangle whose all three sides are equal in length and each of the three angles measures  $60^\circ$ .

Isosceles Triangle: A triangle whose two sides are equal in length and the angles opposite them are equal to each other.

Scalene Triangle: A triangle whose all three sides and angles are unequal in measure.

(i) Isosceles

$$AC = CB = 2 \text{ cm}$$

(ii) Isosceles

$$DE = EF = 2.4 \text{ cm}$$

(iii) Scalene

All the sides are unequal.

(iv) Equilateral

$$XY = YZ = ZX = 3 \text{ cm}$$

(v) Equilateral

All three angles are  $60^\circ$ .

(vi) Isosceles

Two angles are equal in measure.

(vii) Scalene

All the angles are unequal.

Q10

**Answer :**

In  $\triangle ABC$ , if we take a point D on BC, then we get three triangles, namely  $\triangle ADB$ ,  $\triangle ADC$  and  $\triangle ABC$ .

Q11

**Answer :**

(i) No

If the two angles are  $90^\circ$  each, then the sum of two angles of a triangle will be  $180^\circ$ , which is not possible.

(ii) No

For example, let the two angles be  $120^\circ$  and  $150^\circ$ . Then, their sum will be  $270^\circ$ , which cannot form a triangle.

(iii) Yes

For example, let the two angles be  $50^\circ$  and  $60^\circ$ , which on adding, gives  $110^\circ$ . They can easily form a triangle whose third angle is  $180^\circ - 110^\circ = 70^\circ$ .

(iv) No

For example, let the two angles be  $70^\circ$  and  $80^\circ$ , which on adding, gives  $150^\circ$ . They cannot form a triangle whose third angle is  $180^\circ - 150^\circ = 30^\circ$ , which is less than  $60^\circ$ .

(v) No

For example, let the two angles be  $50^\circ$  and  $40^\circ$ , which on adding, gives  $90^\circ$ . Thus, they cannot form a triangle whose third angle is  $180^\circ - 90^\circ = 90^\circ$ , which is greater than  $60^\circ$ .

(vi) Yes

$$\text{Sum of all angles} = 60^\circ + 60^\circ + 60^\circ = 180^\circ$$

Q12

**Answer :**

(i) A triangle has 3 sides 3 angles and 3 vertices.

(ii) The sum of the angles of a triangle is  $180^\circ$ .

(iii) The sides of a scalene triangle are of different lengths.

(iv) Each angle of an equilateral triangle measures  $60^\circ$ .

(v) The angles opposite to equal sides of an isosceles triangle are equal.

(vi) The sum of the lengths of the sides of a triangle is called its perimeter.

# Triangles

## Exercise 16B

Q1

**Answer :**

Correct option: (c)

A triangle has 6 parts: three sides and three angles.

Q2

**Answer :**

Correct option: (b)

(a) Sum =  $30^\circ + 60^\circ + 70^\circ = 160^\circ$

This is not equal to the sum of all the angles of a triangle.

(b) Sum =  $50^\circ + 70^\circ + 60^\circ = 180^\circ$

Hence, it is possible to construct a triangle with these angles.

(c) Sum =  $40^\circ + 80^\circ + 65^\circ = 185^\circ$

This is not equal to the sum of all the angles of a triangle.

(d) Sum =  $72^\circ + 28^\circ + 90^\circ = 190^\circ$

This is not equal to the sum of all the angles of a triangle.

Q3

**Answer :**

(b)  $80^\circ$

Let the measures of the given angles be  $(2x)^\circ$ ,  $(3x)^\circ$  and  $(4x)^\circ$ .

$$\therefore (2x)^\circ + (3x)^\circ + (4x)^\circ = 180^\circ$$

$$\Rightarrow (9x)^\circ = 180^\circ$$

$$\Rightarrow x = 180 / 9$$

$$\Rightarrow x = 20^\circ$$

$$\therefore 2x = 40^\circ, 3x = 60^\circ, 4x = 80^\circ$$

Hence, the measures of the angles of the triangle are  $40^\circ$ ,  $60^\circ$ ,  $80^\circ$ .

Thus, the largest angle is  $80^\circ$ .

Q4

**Answer :**

Correct option: (d)

The measure of two angles are complimentary if their sum is  $90^\circ$  degrees.

Let the two angles be  $x$  and  $y$ , such that  $x + y = 90^\circ$ .

Let the third angle be  $z$ .

Now, we know that the sum of all the angles of a triangle is  $180^\circ$ .

$$x + y + z = 180^\circ$$

$$\Rightarrow 90^\circ + z = 180^\circ$$

$$\Rightarrow z = 180^\circ - 90^\circ$$

$$= 90^\circ$$

The third angle is  $90^\circ$ .

Q5

**Answer :**

Correct option: (c)

Let  $\angle A = 70^\circ$

The triangle is an isosceles triangle.

We know that the angles opposite to the equal sides of an isosceles triangle are equal.

$$\therefore \angle B = 70^\circ$$

We need to find the vertical angle  $\angle C$ .

Now, sum of all the angles of a triangle is  $180^\circ$ .

$$\angle A + \angle B + \angle C = 180^\circ$$

$$\Rightarrow 70^\circ + 70^\circ + \angle C = 180^\circ$$

$$\Rightarrow 140^\circ + \angle C = 180^\circ$$

$$\Rightarrow \angle C = 180^\circ - 140^\circ$$

$$\Rightarrow \angle C = 40^\circ$$

Q6

**Answer :**

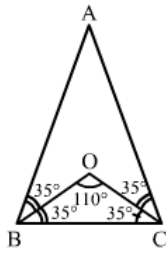
Correct option: (c)

A triangle having sides of different lengths is called a scalene triangle.

Q7

**Answer :**

Correct option: (a)



In the isosceles  $\triangle ABC$ , the bisectors of  $\angle B$  and  $\angle C$  meet at point  $O$ .

Since the triangle is isosceles, the angles opposite to the equal sides are equal.

$$\angle B = \angle C$$

$$\therefore \angle A + \angle B + \angle C = 180^\circ$$

$$\Rightarrow 40^\circ + 2\angle B = 180^\circ$$

$$\Rightarrow 2\angle B = 140^\circ$$

$$\Rightarrow \angle B = 70^\circ$$

Bisectors of an angle divide the angle into two equal angles.

So, in  $\triangle BOC$ :

$$\angle OBC = 35^\circ \text{ and } \angle OCB = 35^\circ$$

$$\angle BOC + \angle OBC + \angle OCB = 180^\circ$$

$$\Rightarrow \angle BOC + 35^\circ + 35^\circ = 180^\circ$$

$$\Rightarrow \angle BOC = 180^\circ - 70^\circ$$

$$\Rightarrow \angle BOC = 110^\circ$$

Q8

**Answer :**

Correct option: (b)

The sides of a triangle are in the ratio 3:2:5.

Let the lengths of the sides of the triangle be  $(3x)$ ,  $(2x)$ ,  $(5x)$ .

We know:

Sum of the lengths of the sides of a triangle = Perimeter

$$(3x) + (2x) + (5x) = 30$$

$$\Rightarrow 10x = 30$$

$$\Rightarrow x = \frac{30}{10}$$

$$10$$

$$\Rightarrow x = 3$$

First side =  $3x = 9$  cm

Second side =  $2x = 6$  cm

Third side =  $5x = 15$  cm

The length of the longest side is 15 cm.

Q9

**Answer :**

Correct option: (d)

Two angles of a triangle measure  $30^\circ$  and  $25^\circ$ , respectively.

Let the third angle be  $x$ .

$$x + 30^\circ + 25^\circ = 180^\circ$$

$$x = 180^\circ - 55^\circ$$

$$x = 125^\circ$$

Q10

**Answer :**

Correct option: (c)

Each angle of an equilateral triangle measures  $60^\circ$ .

Q11

**Answer :**

Correct option: (c)

Point  $P$  lies on  $\triangle ABC$ .