
Exercise – 9.1

1. In a $\triangle ABC$, if $\angle A = 55^\circ$, $\angle B = 40^\circ$, find $\angle C$.

Sol:

Given $\angle A = 55^\circ$, $\angle B = 40^\circ$ then $\angle C = ?$

We know that

In $\triangle ABC$ sum of all angles of triangle is 180°

$$\text{i.e., } \angle A + \angle B + \angle C = 180^\circ$$

$$\Rightarrow 55^\circ + 40^\circ + \angle C = 180^\circ$$

$$\Rightarrow 95^\circ + \angle C = 180^\circ$$

$$\Rightarrow \angle C = 180^\circ - 95^\circ$$

$$\Rightarrow \angle C = 85^\circ$$

2. If the angles of a triangle are in the ratio 1 : 2 : 3, determine three angles.

Sol:

Given that the angles of a triangle are in the ratio 1 : 2 : 3

Let the angles be $a, 2a, 3a$

\therefore We know that

Sum of all angles of triangles is 180°

$$a + 2a + 3a = 180^\circ$$

$$\Rightarrow 6a = 180^\circ$$

$$\Rightarrow a = \frac{180^\circ}{6}$$

$$\Rightarrow a = 30^\circ$$

Since $a = 30^\circ$

$$2a = 2(30)^\circ = 60^\circ$$

$$3a = 3(30)^\circ = 90^\circ$$

\therefore angles are $a = 30^\circ, 2a = 60^\circ, 3a = 90^\circ$

\therefore Hence angles are $30^\circ, 60^\circ$ and 90°

3. The angles of a triangle are $(x - 40)^\circ$, $(x - 20)^\circ$ and $(\frac{1}{2}x - 10)^\circ$. Find the value of x .

Sol:

Given that

The angles of a triangle are

$$(x - 40)^\circ, (x - 20)^\circ \text{ and } \left(\frac{x}{2} - 10\right)^\circ$$

We know that

Sum of all angles of triangle is 180°

$$\therefore x - 40^\circ + x - 20^\circ + \frac{x}{2} - 10^\circ = 180^\circ$$

$$2x + \frac{x}{2} - 70^\circ = 180^\circ$$

$$\frac{5x}{2} = 180 + 70^\circ$$

$$5x = 250^\circ (2)$$

$$x = 50^\circ (2)$$

$$x = 100^\circ$$

$$\therefore x = 100^\circ$$

4. The angles of a triangle are arranged in ascending order of magnitude. If the difference between two consecutive angles is 10° , find the three angles.

Sol:

Given that,

The difference between two consecutive angles is 10°

Let $x, x+10, x+20$ be the consecutive angles differ by 10°

$W \cdot K \cdot T$ sum of all angles of triangle is 180°

$$x + x + 10 + x + 20 = 180^\circ$$

$$3x + 30 = 180^\circ$$

$$\Rightarrow 3x = 180 - 30^\circ \Rightarrow 3x = 150^\circ$$

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

$$\therefore x = 50^\circ$$

\therefore The required angles are

$x, x+10$ and $x+20$

$$x = 50$$

$$x + 10 = 50 + 10 = 60$$

$$x + 20 = 50 + 10 + 10 = 70$$

The difference between two consecutive angles is 10° then three angles are $50^\circ, 60^\circ$ and 70° .

5. Two angles of a triangle are equal and the third angle is greater than each of those angles by 30° . Determine all the angles of the triangle.

Sol:

Given that,

Two angles are equal and the third angle is greater than each of those angles by 30° .

Let $x, x, x+30$ be the angles of a triangle

We know that

Sum of all angles of a triangle is 180°

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

$$3x + 30 = 180^\circ$$

$$\Rightarrow 3x = 180^\circ - 30^\circ$$

$$\Rightarrow 3x = 150^\circ$$

$$\Rightarrow x = \frac{150^\circ}{3}$$

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

\therefore The angles are $x, x, x + 30$

$$x = 50^\circ$$

$$x + 30 = 80^\circ$$

\therefore The required angles are $50^\circ, 50^\circ, 80^\circ$

6. If one angle of a triangle is equal to the sum of the other two, show that the triangle is a right triangle.

Sol:

If one angle of a triangle is equal to the sum of other two

i.e., $\angle B = \angle A + \angle C$

Now, in $\triangle ABC$

(Sum of all angles of triangle 180°)

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

$$\angle B + \angle B = 180^\circ \quad [\because \angle B = \angle A + \angle C]$$

$$2\angle B = 180^\circ$$

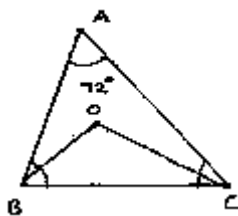
$$\angle B = \frac{180^\circ}{2}$$

$$\angle B = 90^\circ$$

$\therefore ABC$ is a right angled a triangle.

7. ABC is a triangle in which $\angle A = 72^\circ$, the internal bisectors of angles B and C meet in O . Find the magnitude of $\angle ROC$.

Sol:



Given,

ABC is a triangle

$\angle A = 72^\circ$ and internal bisector of angles B and C meeting O

In $\triangle ABC = \angle A + \angle B + \angle C = 180^\circ$

$$\Rightarrow 72^\circ + \angle B + \angle C = 180^\circ$$

$$\Rightarrow \angle B + \angle C = 180^\circ - 72^\circ \text{ divide both sides by '2'}$$

$$\Rightarrow \frac{\angle B}{2} + \frac{\angle C}{2} = \frac{108^\circ}{2} \quad \dots\dots(1)$$

$$\Rightarrow \angle OBC + \angle OCB = 54^\circ \quad \dots\dots(1)$$

Now in $\triangle BOC \Rightarrow \angle OBC + \angle OCB + \angle BOC = 180^\circ$

$$\Rightarrow 54^\circ + \angle BOC = 180^\circ$$

$$\Rightarrow \angle BOC = 180^\circ - 54^\circ = 126^\circ$$

$$\therefore \angle BOC = 126^\circ$$

8. The bisectors of base angles of a triangle cannot enclose a right angle in any case.

Sol:

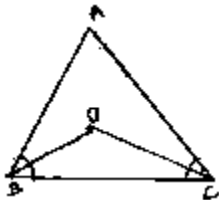
In a $\triangle ABC$

Sum of all angles of triangles is 180°

i.e., $\angle A + \angle B + \angle C = 180^\circ$ divide both sides by '2'

$$\Rightarrow \frac{1}{2} \angle A + \frac{1}{2} \angle B + \frac{1}{2} \angle C = 90^\circ$$

$$\Rightarrow \frac{1}{2} \angle A + \angle OBC + \angle OCB = 90^\circ \quad [\because OB, OC \text{ bisect } \angle B \text{ and } \angle C]$$



$$\Rightarrow \angle OBC + \angle OCB = 90^\circ - \frac{1}{2} \angle A$$

Now in $\triangle BOC$

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

$$\Rightarrow \angle BOC + 90^\circ - \frac{1}{2} \angle A = 180^\circ$$

$$\Rightarrow \angle BOC = 90^\circ - \frac{1}{2} \angle A$$

Hence, bisectors of a base angle cannot enclose right angle.

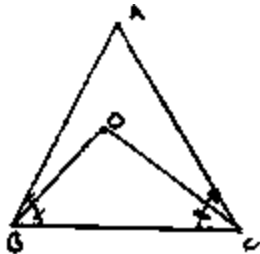
9. If the bisectors of the base angles of a triangle enclose an angle of 135° , prove that the triangle is a right triangle.

Sol:

Given the bisectors the base angles of an triangle enclose an angle of 135°

i.e., $\angle BOC = 135^\circ$

But, W.K.T



$$\angle BOC = 90^\circ + \frac{1}{2} \angle A$$

$$\Rightarrow 135^\circ = 90^\circ + \frac{1}{2} \angle A$$

$$\Rightarrow \frac{1}{2} \angle A = 135^\circ - 90^\circ$$

$$\Rightarrow \angle A = 45^\circ (2)$$

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

$\therefore \triangle ABC$ is right angled triangle right angled at A.

10. In a $\triangle ABC$, $\angle ABC = \angle ACB$ and the bisectors of $\angle ABC$ and $\angle ACB$ intersect at O such that $\angle BOC = 120^\circ$. Show that $\angle A = \angle B = \angle C = 60^\circ$.

Sol:

Given,

In $\triangle ABC$

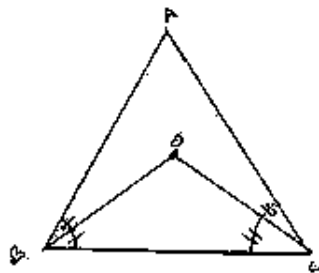
$$\angle ABC = \angle ACB$$

Divide both sides by '2'

$$\frac{1}{2} \angle ABC = \frac{1}{2} \angle ACB$$

$$\Rightarrow \angle OBC = \angle OCB$$

[$\because OB, OC$ bisects $\angle B$ and $\angle C$]



Now

$$\angle BOC = 90^\circ + \frac{1}{2} \angle A$$

$$\Rightarrow 120^\circ - 90^\circ = \frac{1}{2} \angle A$$

$$\Rightarrow 30^\circ \times (2) = \angle A$$

$$\Rightarrow \angle A = 60^\circ$$

Now in $\triangle ABC$

$$\angle A + \angle ABC + \angle ACB = 180^\circ \quad (\text{Sum of all angles of a triangle})$$

$$\Rightarrow 60^\circ + 2\angle ABC = 180^\circ \quad [\because \angle ABC = \angle ACB]$$

$$\Rightarrow 2\angle ABC = 180^\circ - 60^\circ$$

$$\Rightarrow \angle ABC = \frac{120^\circ}{2} = 60^\circ$$

$$\Rightarrow \angle ABC = \angle ACB$$

$$\therefore \angle ACB = 60^\circ$$

Hence proved.

11. Can a triangle have:

- | | |
|-------------------------|--|
| (i) Two right angles? | (iv) All angles more than 60° ? |
| (ii) Two obtuse angles? | (v) All angles less than 60° ? |
| (iii) Two acute angles? | (vi) All angles equal to 60° ? |

Justify your answer in each case.

Sol:

(i) No,

Two right angles would up to 180° , So the third angle becomes zero. This is not possible, so a triangle cannot have two right angles.

[Since sum of angles in a triangle is 180°]

(ii) No,

A triangle can't have 2 obtuse angles. Obtuse angle means more than 90° So that the sum of the two sides will exceed 180° which is not possible. As the sum of all three angles of a triangle is 180° .

(iii) Yes

A triangle can have 2 acute angle. Acute angle means less the 90° angle

(iv) No,

Having angles-more than 60° make that sum more than 18° . Which is not possible

[\because The sum of all the internal angles of a triangle is 180°]

- (v) No,
Having all angles less than 60° will make that sum less than 180° which is not possible.
[\because The sum of all the internal angles of a triangle is 180°]
- (vi) Yes
A triangle can have three angles are equal to 60° . Then the sum of three angles equal to the 180° . Which is possible such triangles are called as equilateral triangle.
[\because The sum of all the internal angles of a triangle is 180°]

12. If each angle of a triangle is less than the sum of the other two, show that the triangle is acute angled.

Sol:

Given each angle of a triangle less than the sum of the other two

$$\therefore \angle A + \angle B + \angle C$$

$$\Rightarrow \angle A + \angle A < \angle A + \angle B + \angle C$$

$$\Rightarrow 2\angle A < 180^\circ \quad [\text{Sum of all angles of a triangle}]$$

$$\Rightarrow \angle A < 90^\circ$$

Similarly $\angle B < 90^\circ$ and $\angle C < 90^\circ$

Hence, the triangles acute angled.