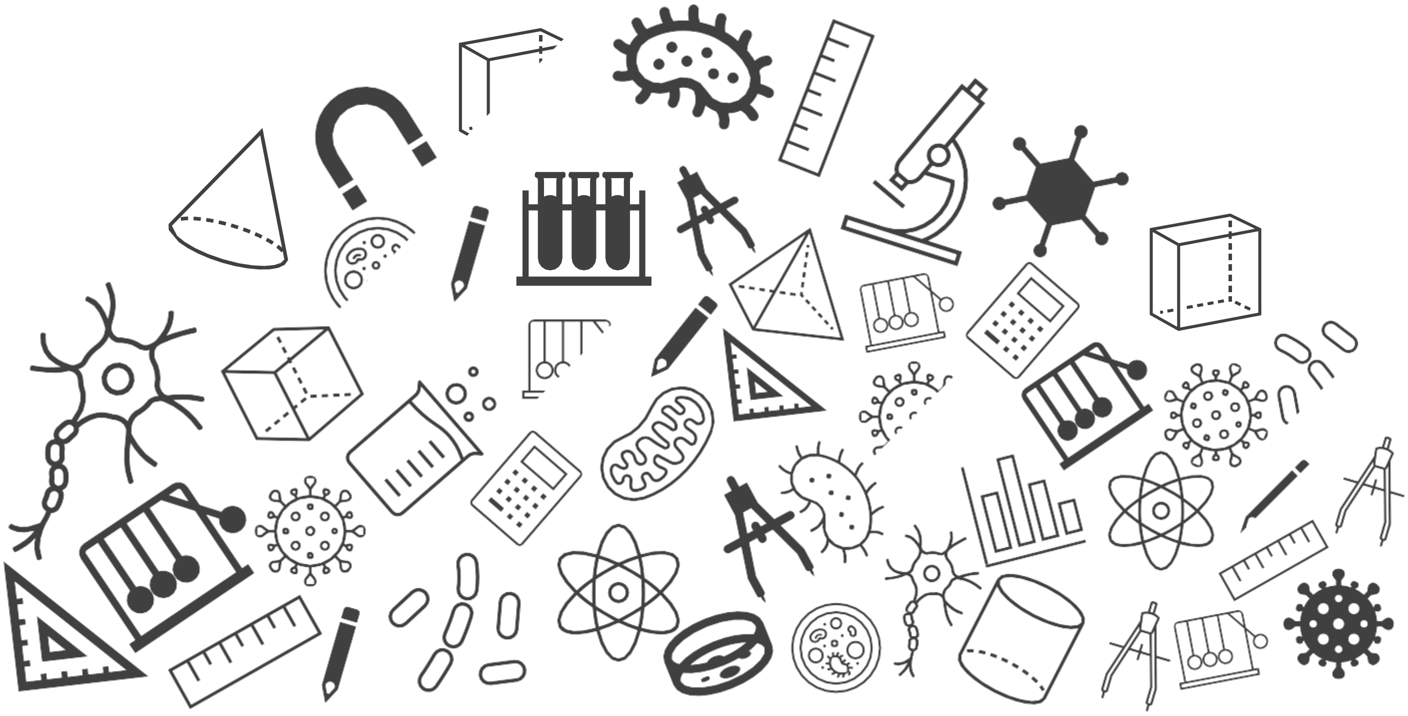
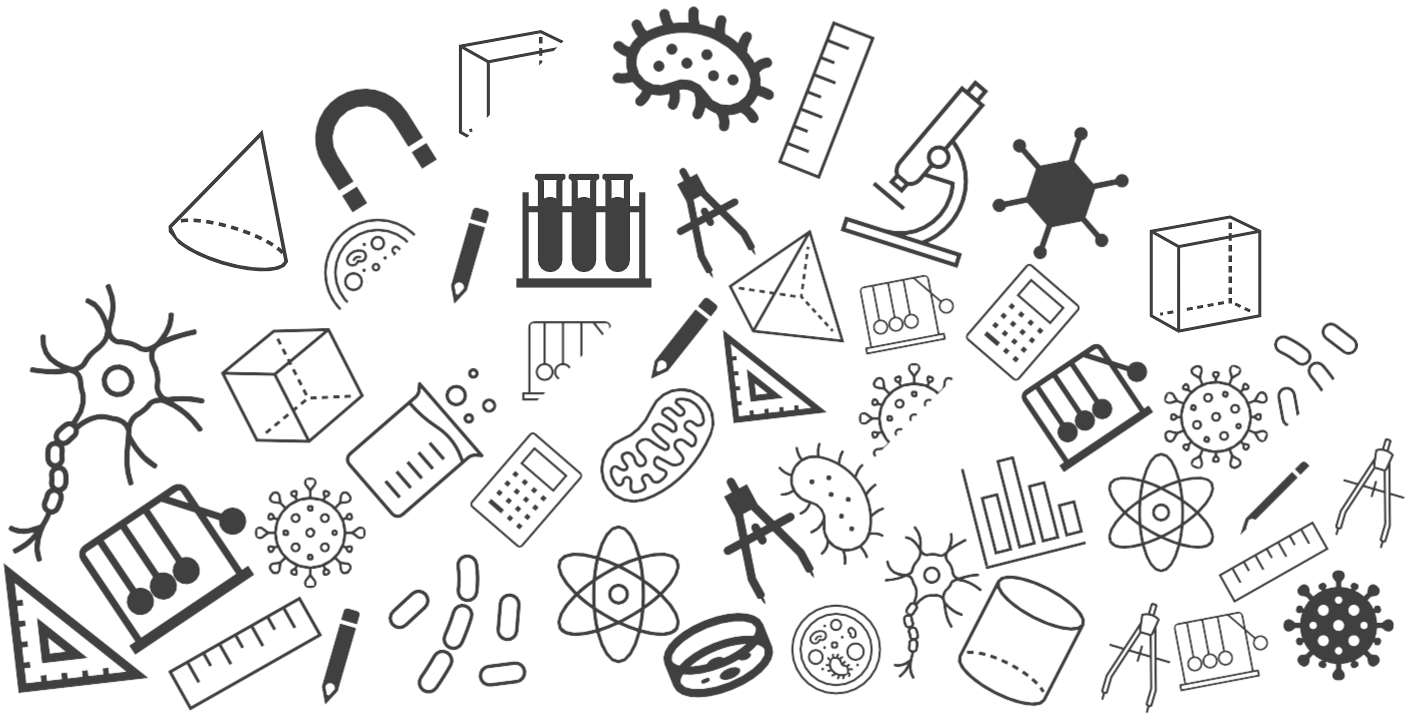
Grade 07: Maths
Exam Important Questions

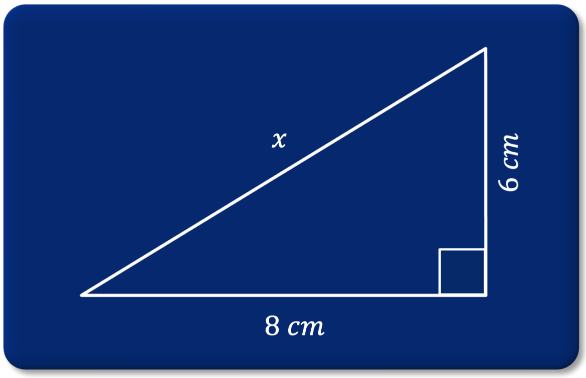


The Triangle and Its Properties



Topic : Exam Important Questions

1. Find the value of x in the given figure.



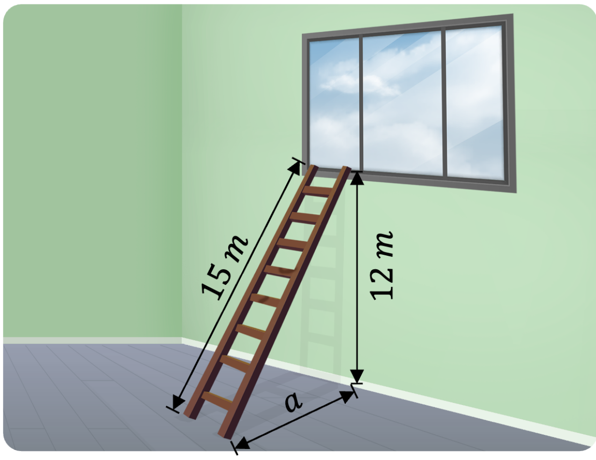
[2 marks]

- A. 10 cm ✓
- B. 8 cm
- C. 6 cm
- D. 20 cm

By applying Pythagoras' property:
$x^2 = (6\ cm)^2 + (8\ cm)^2$
$\Rightarrow x^2 = 100\ cm^2$
$\Rightarrow x = 10\ cm$
[2 marks]

The Triangle and Its Properties

2. A 15 m long ladder reached a window 12 m high from the ground on placing it against a wall at a distance a. Find the distance of the foot of the ladder from the wall.

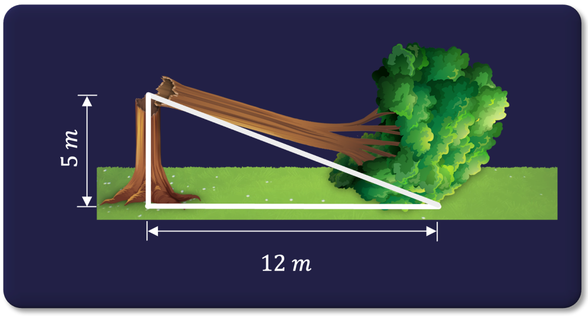


[2 marks]

Let the distance of the foot of the ladder from the wall be a.
Now applying Pythagoras' property:
$(a)^2 + (12\ m)^2 = (15\ m)^2$
[0.5 mark]

$(a)^2 + (12\ m)^2 = (15\ m)^2$
$\Rightarrow a^2 = 225\ m^2 - 144\ m^2$
$\Rightarrow a^2 = 81\ m^2$
$\Rightarrow a = 9\ m$
[1.5 marks]
Hence, the distance of the foot of the ladder from the wall is 9 m.

3. A tree is broken at a height of 5 m from the ground and its top touches the ground at a distance of 12 m from the base of the tree. Find the original height of the tree.



[3 marks]

Let, the length of the broken part (inclined to the ground) be x.
[0.5 mark]

Applying Pythagoras' theorem in the triangle formed,
$\Rightarrow (5\ m)^2 + (12\ m)^2 = x^2 \Rightarrow 25\ m^2 + 144\ m^2 = x^2$
$\Rightarrow x^2 = 169\ m^2$
$\Rightarrow x = 13\ m$
[1.5 marks]

Hence, the original height of the tree
$= 5\ m + 13\ m = \mathbf{18\ m}$
[1 mark]

4. Which of the following can be the sides of a right-angled triangle?

(i) 2.5 cm, 6.5 cm, 6 cm

(ii) 2 cm, 2 cm, 5 cm

In the case of right-angled triangles, identify the right angles.

[4 marks]

(i) The sides of a right-angled triangle always follow Pythagoras' property.
[0.5 mark]
Now, $(2.5\ cm)^2 + (6\ cm)^2$
$= 6.25\ cm^2 + 36\ cm^2$
$= 42.25\ cm^2$
$= (6.5\ cm)^2$
So, $(2.5\ cm)^2 + (6\ cm)^2 = (6.5\ cm)^2$
Hence, these are the sides of a right-angled triangles.

The length of the hypotenuse is 6.5 cm.
[1.5 marks]

(ii) The sides of a right-angled triangle always follow Pythagoras' property.
[0.5 mark]
Now, $(2\ cm)^2 + (2\ cm)^2$
$= 4\ cm^2 + 4\ cm^2$
$= 8\ cm^2$
$= (4\sqrt{2}\ cm)^2$

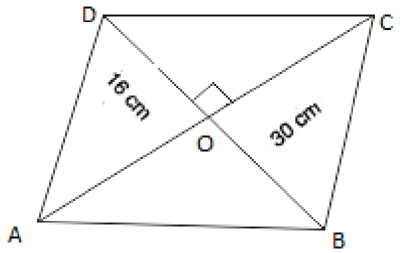
So, $(2.5\ cm)^2 + (6\ cm)^2 = (4\sqrt{2}\ cm)^2 \neq 5\ cm$

Hence, these are not the sides of a right-angled triangles.
[1.5 marks]

The Triangle and Its Properties

5. The diagonals of a rhombus measure 16 cm and 30 cm. Find its perimeter.
   [4 marks]

   Given: Diagonals AC = 30 cm and DB = 16cm.
   Since the diagonals of the rhombus bisect at right angle to each other.



$Therefore,\ OD = \frac{DB}{2} = \frac{16}{2} = 8\ cm$

$And,\ OC = \frac{AC}{2} = \frac{30}{2} = 15\ cm$

[1 mark]

Now, in right angle triangle DOC,

$(DC)^2 = (OD)^2 + (OC)^2$

$\Rightarrow (DC)^2 = (8)^2 +)(15)^2$

$\Rightarrow (DC)^2 = 64 + 225 = 289$

$\Rightarrow DC = \sqrt{289} = 17\ cm$

[2 marks]

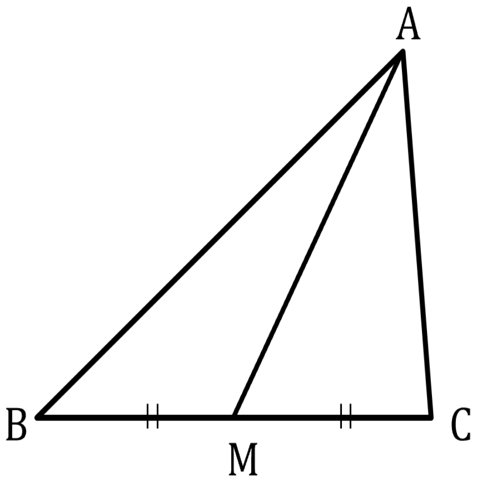
Perimeter of rhombus = $4 \times side$

$= 4 \times 17 = 68\ cm$

Thus, the perimeter of rhombus is 68 cm.

[1 mark]

6. AM is the median of triangle ABC. Is AB $+$ BC $+$ CA $>$ 2AM?



[2 marks]

In $\triangle$ABC we have two sub triangles $\triangle$ABM and $\triangle$AMC.

So, in triangle $\triangle$ABM using the inequality of the triangle that the sum of any two sides is always greater than or equal to the third side.

We have, AB$+$BM$>$AM ....(1)
[0.5 mark]

Using the same in $\triangle$AMC, MC$+$CA$>$AM ....(2)
[0.5 mark]

Adding equation (1) and (2), We get
AB$+$(BM$+$MC)+AC$>$ 2AM
AB$+$BC$+$CA$>$ 2AM

Hence AB$+$BC$+$CA$>$ 2AM is proved to be true.
[1 mark]

The Triangle and Its Properties

7. The lengths of two sides of a triangle are 13 cm and 16 cm. The third side should lie between 'a' cm and 'b' cm for the triangle to be formed. What will be the value of a + b?

   - ✗ **A.** 26
   - ✗ **B.** 29
   - ✓ **C.** 32
   - ✗ **D.** 35

   The third side of a triangle must be greater than the difference between the other two sides.

   That is, third side $>$ (16 - 13) which is 3.

   Also, the sum of lengths of any two sides of a triangle is always greater than the third side.

   That is, third side $<$ (16 + 13) which is 29.

   Hence, a + b = 3 + 29 = 32.

8. The lengths of two sides of a triangle are 6 cm and 8 cm. Between which two numbers can length of the third side fall?
   [3 marks]

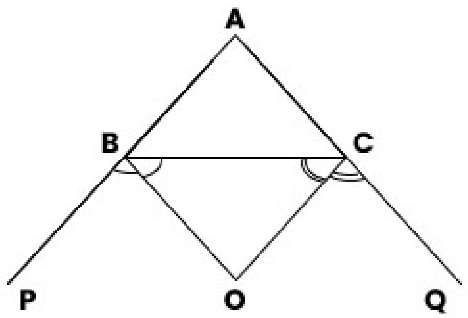
   We know that the sum of two sides of a triangle is always greater than the third.

   Therefore, third side has to be less than the sum of the two sides. The third side is thus, less than 8 cm $+6$ cm $= 14$ cm.
   [1 mark]

   The side cannot be less than the difference of the two sides. Thus, the third side has to be more than 8 cm -6 cm $= 2$ cm.
   [1 mark]

   The length of the third side could be any length greater than 2 and less than 14 cm.
   [1 mark]

9. The sides AB and AC of △ABC are produced to P and Q respectively.
The bisectors of exterior angle at B and C of △ABC meet at O.
Prove that : $\angle BOC = 90^\circ - \frac{1}{2}\angle A$.



The Triangle and Its Properties

Solution:
According to the given figure and question, we have:

$\angle CBP = 180^\circ - \angle ABC$
(BO is the bisector of ∠CBP)

$\angle CBO = \frac{1}{2}\angle CBP$

$\angle CBO = \frac{1}{2}(180^\circ - \angle ABC)$

$\angle CBO = 90^\circ - \frac{1}{2}\angle ABC \quad \ldots\ldots\ldots\ldots. (1)$

Similarly, $\angle BCQ = 180^\circ - \angle ACB$
(CO is the bisector os ∠BCQ)

$\angle BCO = \frac{1}{2}\angle BCQ$

$\angle BCO = \frac{1}{2}(180^\circ - \angle ACB)$

$\angle BCO = 90^\circ - \frac{1}{2}\angle ACB \quad \ldots\ldots\ldots\ldots. (2)$

$\angle BOC = 180^\circ - (\angle CBO + \angle BCO)$

$\angle BOC = 180^\circ - (90^\circ - \frac{1}{2}\angle ABC + 90^\circ - \frac{1}{2}\angle ACB)$

$\angle BOC = 180^\circ - 180^\circ + \frac{1}{2}\angle ABC + \frac{1}{2}\angle ACB$

$\angle BOC = \frac{1}{2}(\angle ABC + \angle ACB)$

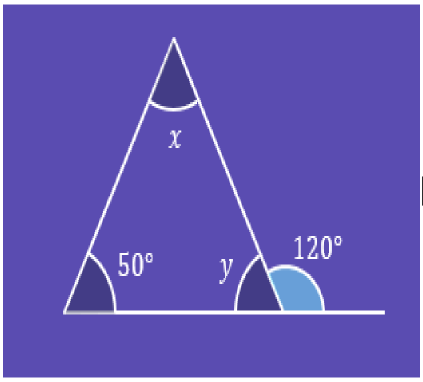
(We have : $180^\circ - \angle BAC = \angle ABC + \angle ACB$ by triangle property)

$\Rightarrow \ \angle BOC = \frac{1}{2}(180^\circ - \angle BAC)$

$\therefore \ \angle BOC = 90^\circ - \frac{1}{2}\angle BAC$

Hence proved.

10. Find the value of the unknowns x and y in the given triangle.



[2 marks]

Using Exterior Angle Property of a triangle.

$\Rightarrow 50^\circ + x = 120^\circ$

$\Rightarrow x = 120^\circ - 50^\circ$

$\Rightarrow x = 70^\circ$ [1 mark]

Using the angle sum property of a triangle.

$\Rightarrow 50^\circ + x + y = 180^\circ$

$\Rightarrow y = 180^\circ - 50^\circ - 70^\circ$

$\Rightarrow y = 60^\circ$ [1 mark]

11. Think and answer the following questions.

$I)$ Can you think of a triangle in which two altitudes of the triangle are two of its sides?

$II)$ Will an altitude always lie in the interior of a triangle?

[2 marks]

Right-angled triangle is the triangle in which two altitudes of the triangle are two of its sides.
[1 mark]
No, altitude may lie in the interior or the exterior of a triangle.
[1 mark]