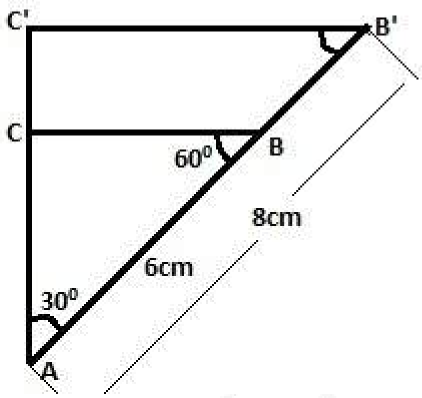
Practice Challenge - Objective

Subject: Mathematics

Topic : Constructions Theory
Session 1

Class: X

1. A ΔABC with AB = 6 cm, $\angle A = 30^\circ$ and $\angle B = 60^\circ$ is given. Another $\Delta AB'C'$ similar to ΔABC with AB' = 8 cm is constructed as shown below:



The reason why we don't construct a ray making an acute angle at A is

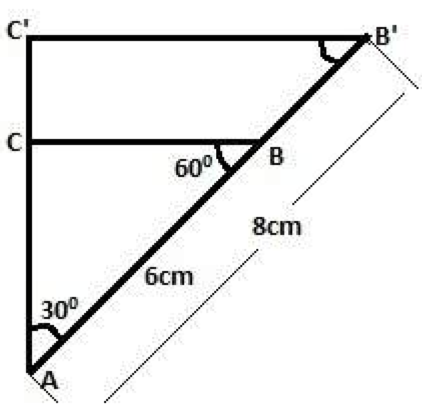
A. ΔABC is a right-angled triangle.

B. Length of AB' is given.

C. Scale is not given.

D. $\angle A = 30^\circ$

As the length AB' is given, we can construct B'C' by using corresponding angle. Hence, we don't require to construct a ray making an acute angle at A.



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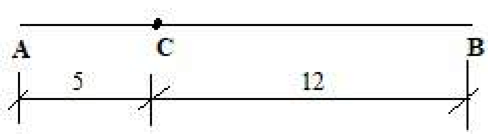
2. What will the ratio $AB : AC$ be if C divides the line segment AB in the ratio $5 : 12$?

- **A.** $5 : 12$
- **B.** $17 : 12$
- **C.** $12 : 17$
- **D.** $17 : 5$



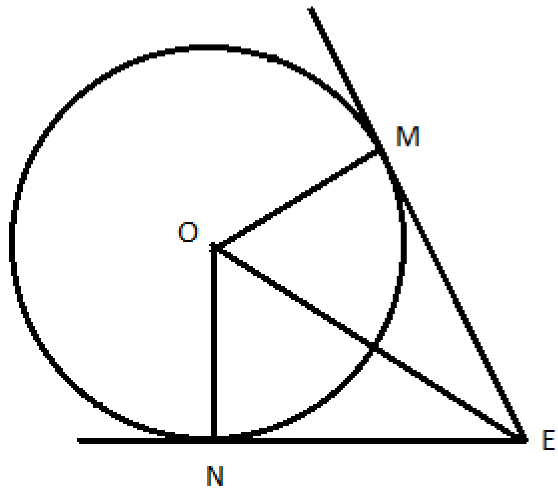
Given $\frac{AC}{BC} = \frac{5}{12}$

Therefore, $\frac{BC}{AC} = \frac{12}{5}$

$\frac{AB}{AC} = \frac{AC+BC}{AC} = 1 + \frac{BC}{AC} = 1 + \frac{12}{5} = \frac{17}{5}$

So, the required ratio $= 17 : 5$

3. You are given a circle with radius 'r' and centre 'O'. You are asked to draw a pair of tangents which are inclined at an angle of 60° with each other, from a point E.
Refer to the figure and select the option which would lead you to the required construction. The distance d is the distance OE.



- **A.** Using trigonometry, arrive at d = r and mark E.
- **B.** Construct the $\triangle$MNO as it is equilateral triangle.
- **C.** Mark M and N on the circle such that $\angle$MOE = 60° and $\angle$NOE = 60°.
- **D.** Mark M and N on the circle such that $\angle$MOE = 120° and $\angle$NOE = 120°.

Since the angle between the tangents is 60°, we get $\angle MON = 120^{\circ}$ (As MONE is a quadrilateral and sum of angles of a quadrilateral is 360°). Hence, ΔMNO is NOT equilateral.

Since E is outside the circle, d can not be equal to r.

We know that ∠MOE = 60°, following are the steps of construction:

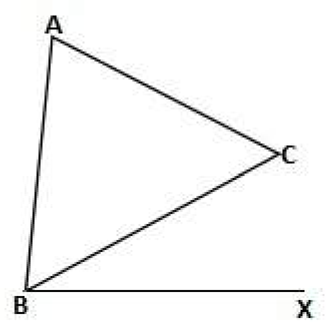
1. Draw a ray from the centre O.

2. With O as centre, construct ∠MOE = 60° .

3. Now extend OM and from M, draw a line perpendicular to OM. This intersects the ray at E. This is the point from where the tangents should be drawn and EM is one tangent.

4. Similarly, EN is another tangent.

4. Initial step for constructing a similar triangle of ΔABC is given below $\angle CBX$ is a/an:



- ✔ **A.** acute angle
- ✖ **B.** right angle
- ✖ **C.** obtuse angle
- ✖ **D.** reflex angle

For the construction of similar triangle, we draw a ray BX making an **acute angle** with BC on the side opposite to to the vertex A.

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5. Match the following based on the construction of similar triangles, if scale factor $(\frac{m}{n})$ is

$I. \quad > 1$	$a)$ *The similar triangle is smaller than the original triangle.*
$II. \quad < 1$	$b)$ *The two triangles are congruent triangles.*
$III. \quad = 1$	$c)$ *The similar triangle is larger than the original triangle.*

A. $I - c, II - a, III - b$

B. $I - b, II - a, III - c$

C. $I - a, II - c, III - b$

D. $I - a, II - b, III - c$

Scale factor basically defines the ratio between the sides of the constructed triangle to that of the original triangle.

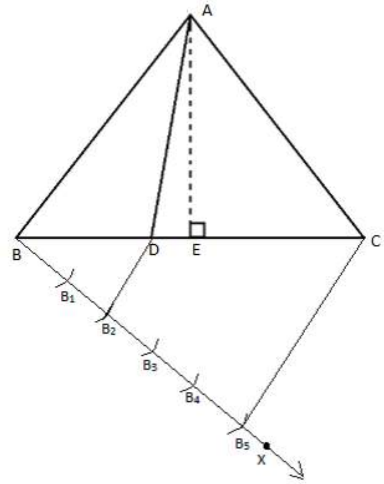
So when we see the scale factor $(\frac{m}{n}) > 1$, it means the sides of the constructed triangle is larger than the original triangle i.e., the triangle constructed is larger than the original triangle.

Similarly, if scale factor $(\frac{m}{n}) < 1$, then the sides of the constructed triangle is smaller than that of the original triangle i.e., the constructed triangle is smaller than the original triangle.

When we have scale factor $(\frac{m}{n}) = 1$, then the sides of both the constructed triangle and that of the original triangle is equal.

When a pair of similar triangles have equal corresponding sides, then the pair of similar triangles can be called as congruent because then the triangles will have equal corresponding sides and equal corresponding angles.

6. Find the ratio in which D divides side BC if:
$\frac{Ar(\Delta ABD)}{Ar(\Delta ADC)} = \frac{2}{3}$.

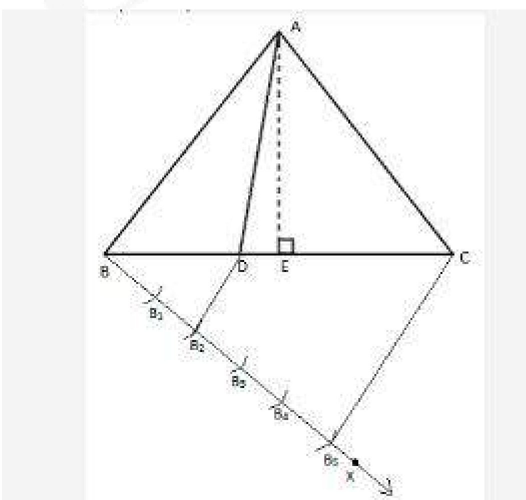


A. 4 : 3

B. 4 : 5

C. 2 : 3

D. 1 : 1



In ΔABD and ΔADC,
the height is common as it is the perpendicular distance from point A to side BC.

$\frac{Ar(ABD)}{Ar(ADC)} = \frac{(\frac{1}{2})(Base BD)(Height AE)}{(\frac{1}{2})(Base DC)(Height AE)} = \frac{BD}{DC} = \frac{2}{3}$ i.e. D divides BC in the ratio 2 : 3.

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7. For a scale factor greater than 1, the ratio of the area of triangle to be constructed to the area of the given triangle will always be

- **A.** Equal to 1
- **B.** Equal to 2
- **C.** Less than 1
- **D.** Greater than 1

Let the scale factor be m : n. Then, $\frac{m}{n} > 1$.
$\Rightarrow m > n$
Let the triangle to be constructed be ΔABC and the given triangle be ΔPQR.
As $\Delta ABC \sim \Delta PQR$
$\Rightarrow \Delta ABC$ is a triangle whose sides are $\frac{m}{n}$ of the corresponding sides of ΔPQR
Thus, $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{RP} = \frac{m}{n}$.......(ii) (Ratio of corresponding sides of similar tringales are equal)

Now, $\frac{Area(\Delta ABC)}{Area(\Delta PQR)} = \left(\frac{AB}{PQ}\right)^2$ (Ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.)

$\Rightarrow \frac{Area(\Delta ABC)}{Area(\Delta PQR)} = \left(\frac{m}{n}\right)^2$.......(iii) [Using (ii)]
Also, $m > n$ [From (i)]

Squaring both sides, we get
$m^2 > n^2$
$\Rightarrow \frac{m}{n} > 1$

$\Rightarrow \left(\frac{m}{n} > 1\right)$

$\Rightarrow \frac{Area(\Delta ABC)}{Area(\Delta PQR)} > 1$ [From (iii)]

Thus, the ratio of the area of triangle to be constructed (ΔABC) to the area of triangle given (ΔPQR) is greater than 1.
Hence, the correct answer is option d.

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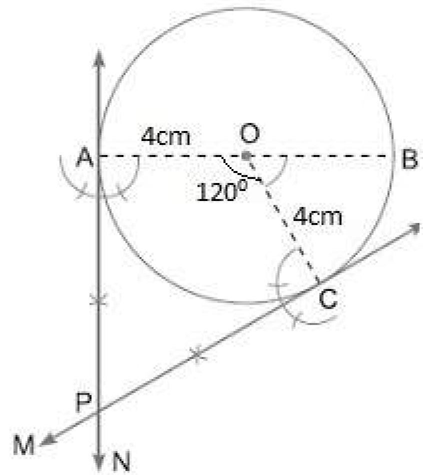
8. Which of the following is not true for a point P on the circle?

- **A.** Perpendicular to the tangent passes through the centre
- **B.** There are 2 tangents to the circle from point P
- **C.** Only 1 tangent can be drawn from point P
- **D.** None of these

Only one tangent can be drawn from a point on the circle and the tangent is always perpendicular to the radius.

9. In the figure below, two tangents are drawn from a point P to a circle meeting it at points A and C.
If $\angle AOC = 120^\circ$, what is the value of $\angle APC$?



A. 120°

B. 30°

C. 60°

D. 80°

AOCP forms a quadrilateral.
Sum of angles of a quadrilateral = 360°
$\angle OAP = 90^\circ$ (Angle between radius and tangent at the point of contact is a right angle)
Similarly, $\angle OCP = 90^\circ$

$$\angle CPA + \angle OCP + \angle OAP + \angle AOC = 360^\circ$$
$$\angle CPA + 90^\circ + 90^\circ + 120^\circ = 360^\circ$$
$$\angle CPA + 300^\circ = 360^\circ$$
$$\angle CPA = 360^\circ - 300^\circ$$
$$\angle CPA = 60^\circ$$

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10. For which of the following can a perpendicular bisector be drawn?

- ✗ **A.** Line
- ✗ **B.** Ray
- ✓ **C.** Line segment
- ✗ **D.** Both Line and Ray

A perpendicular bisector can be drawn only if a figure has end points. Only a line segment has a definite length and hence it can be bisected by a perpendicular bisector.