BYJU'S The Learning App

CBSE Board Class 10 Maths Chapter 11- Constructions
Objective Questions

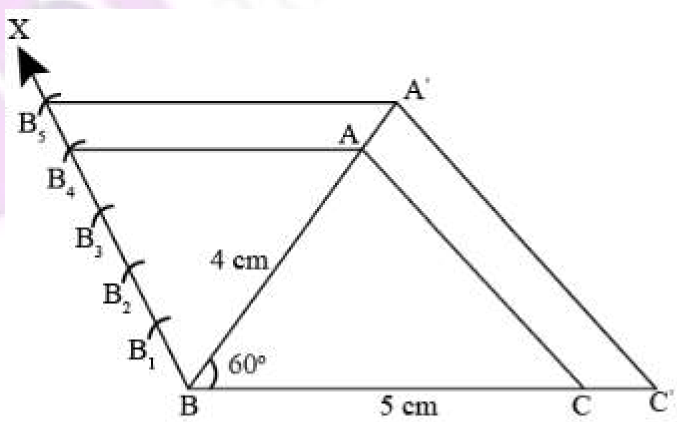
Constructing Similar Triangles

1. The ratio of corresponding sides for the pair of triangles whose construction is given as follows:
Triangle ABC of dimensions AB=4cm, BC= 5 cm and ∠B= 60°.
A ray BX is drawn from B making an acute angle with AB.
5 points B1,B2,B3,B4 and B5 are located on the ray such that BB1=B1B2=B2B3=B3B4=B4B5.
B4 is joined to A and a line parallel to B4A is drawn through B5 to intersect the extended line AB at A'.
Another line is drawn through A' parallel to AC, intersecting the extended line BC at C'. Find the ratio of the corresponding sides of ΔABC and ΔA'BC'.

(A) 1:5
(B) 1:4
(C) 4:5
(D) 4:1

Answer: (C) 4:5

Solution:

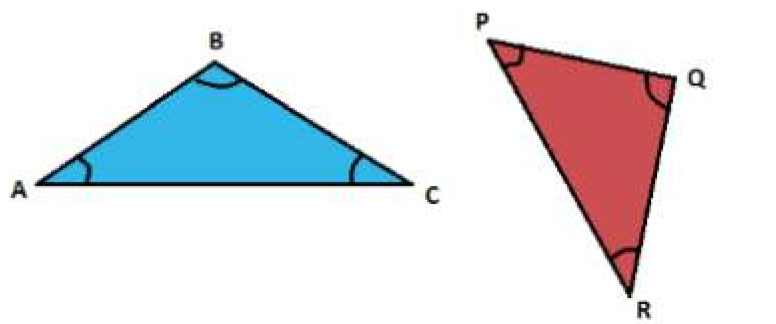


According to the construction, $\Delta BB_4A \sim \Delta BB_5A'$

And for similar triangles, the ratio of corresponding sides is AB/A'B.

The ratio of corresponding sides is 4:5.

2. If I ask you to construct △PQR ~ △ABC exactly (when we say exactly, we mean the exact relative positions of the triangles) as given in the figure, (Assuming I give you the dimensions of △ABC and the Scale Factor for △PQR) what additional information would you ask for?



(A) The information given is sufficient.
(B) We cannot construct the triangle because there is no connection between two triangles.
(C) Perpendicular distance between AC and Point P and angle between AC and PR.
(D) Dimensions of PQR.

Answer: (C) Perpendicular distance between AC and Point P and angle between AC and PR.

Solution: Consider we need to draw a triangle △PQR ~ △ABC. But △PQR is at an isolated position w.r.t. △ABC. Therefore we will need to know the **perpendicular distance between AC and point P** and the **angle between AC and PR.**

Now let us reframe the question with the required information.

Construct a triangle △PQR similar to △ABC, such that point P is at a perpendicular distance 5 cm from the line AC, PR makes an angle of 60° and which is 23rd of △ABC. In triangle △ABC, AB = 6 cm, AC = 7 cm, and ∠ABC = 30°

Steps of construction:

1. Draw a straight line AC = 7 cm.

2. Measure an angle of 30° w.r.t AC and draw a straight line

3. Set the compass at 6 cm length and with A as centre mark the length on the line, name the point of intersection as B.

Reason: This is done to draw the line AB. i.e. we are marking the length of 6 cm on the line 30^{o} inclined to AC

4. Connect the points to BC to complete the triangle.

5. Draw a line perpendicular to AC at A.

Reason: We are drawing this step to identify the line on which the point P might lie.

6. For the given length of AP, cut the perpendicular at P Reason: We are drawing the arc to identify the exact position of point P on the line perpendicular to AC

7. Extrapolate line segment AC. Reason:

8. Draw a Ray XY 60^{o} to AC, such that the line passes through the point P.

9. Measure the distance AC with a compass and draw an arc with point P as centre and radius equal to AC, the point of intersection is R'.

10. Measure z.BAC and draw a similar angle on PR'.

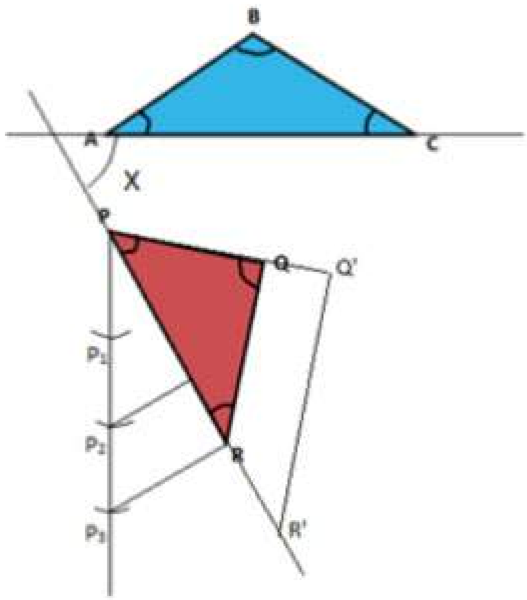
11. Measure AB and mark on PZ as PQ. Join QR'.

12. Draw a ray PM, mark 3 points $P_1P_2P_3$ such that $PP_1=P_1P_2=P_2P_3$

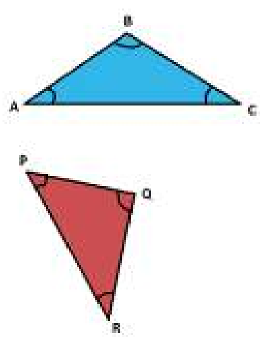
. 13. Join $R'P_3$

14. Through P2 draw a line parallel to P3R', let the point of intersection of the line with PR' is R.

15. Through the point R, draw a line parallel to R'Q'. Let the point of intersection of the line with line PO! is Q. The triangle △PQR which is similar to &△ABC such that, the angle between PR and AC is 120^{o} and perpendicular distance of point P from AC is 5 cm.



3. If the perpendicular distance between AP is given, which vertices of the similar triangle would you find first?

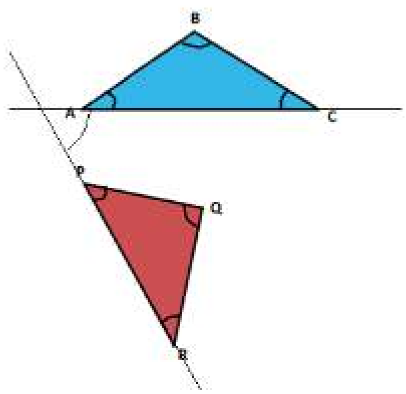


(A) R
(B) Q
(C) P
(D) A

Answer: (C) P

Solution: If the perpendicular distance of AP is given then, we would start the construction of similar triangle by finding the position of the point P.

4. If you need to construct a triangle with point P as one of its vertices, which is the angle that you need to construct a side of the triangle?



(A) ∠QPR
(B) ∠RQP
(C) ∠PRQ
(D) Angle PR makes with AC

Answer: (D) Angle PR makes with AC

Solution: Once we know the position of Point P, we need to find the orientation of the △PQR w.r.t △ABC. For that purpose we need to know the angle of any one side that makes with the original triangle. Therefore, among the given options we will be able to determine the orientation of the △PQR if we know the angle which side PR makes with side AC.

5. Match the following based on the construction of similar triangles, if scale factor (m/n) is

I. >1	a) The similar triangle is smaller than the original triangle.
II. <1	b) The two triangles are congruent triangles.
III. =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

Answer: (A) I- c, II - a, III – b

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

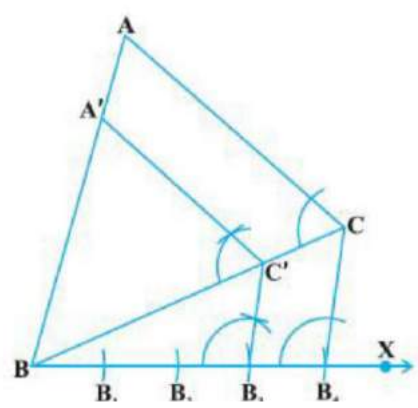
So when we see the scale factor (m/n)>1, it means the sides of the constructed triangle is larger than the original triangle i.e. the triangle constructed is larger than the original triangle.

Similarly, if scale factor (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 (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. The image of construction of A'C'B a similar triangle of ΔACB is given below. Then choose the correct option:



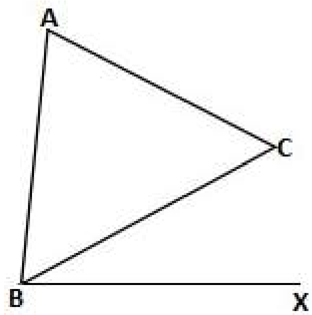
(A) ∠BA′C′ =∠BAC
(B) ∠CAB=∠ACB
(C) ∠A′BC′≠∠CBA

(D) BA′/A′C′=BC/BC

Answer: (A) ∠BA′C′ =∠BAC

Solution: As ΔABC∼ΔA′BC′
∠BA′C′=∠BAC (corresponding angles of similar triangles)

7. If a triangle similar to given ΔABC with sides equal to 3/4 of the sides of ΔABC is to be constructed, then the number of points to be marked on ray BX is __.



(A) 3
(B) 4
(C) 7
(D) 6

Answer: (B) 4

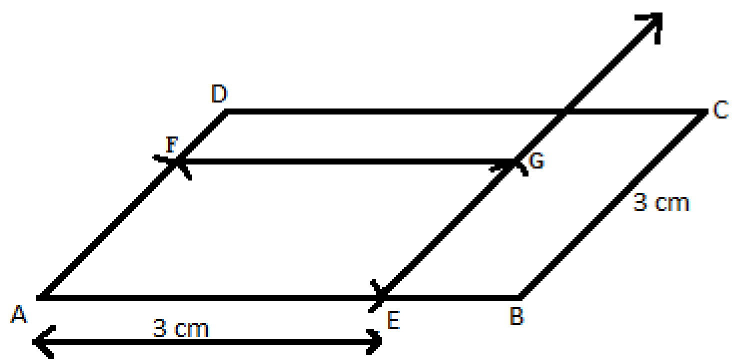
Solution: In the ratio between sides 3/4, 4>3
⇒ The number of points to be marked on BX to construct similar triangles is 4.

8. Construction of similar polygons is similar to that of construction of similar triangles. If you are asked to construct a parallelogram similar to a given parallelogram with a given scale factor, which of the given steps will help you construct a similar parallelogram?

(A) Find a point on the larger side which divides it in the ratio of the given scale factor and using the smaller side as the other parallel side to construct the parallelogram.
(B) Find two points one on the larger side and other on the smaller side using the given scale factor and use these scaled lengths to construct a similar parallelogram.
(C) With one of the vertices as center and radius - (scale factor multiplied with the length of the larger side). Draw two arcs on the larger and smaller sides. Use these 2 points to construct the parallelogram.
(D) None of these helps in constructing a similar parallelogram.

Answer: (B) Find two points one on the larger side and other on the smaller side using the given scale factor and use these scaled lengths to construct a similar parallelogram.

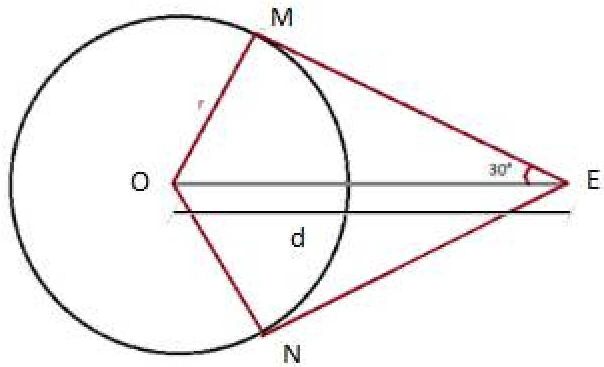
Solution:



The following steps will give you the information on how to construct a similar parallelogram to ABCD.
Step 1: Find points E and F on longer and smaller sides respectively using the given scale factor.
Step 2: Draw a line from E parallel to smaller side AD.
Step 3: Taking the length of AF and E as center cut an arc on the line parallel to AD and let this new point be G.
Step 4: Join EG and FG.
Step 5: AEFG is the required parallelogram.
Now we have constructed the parallelogram AEFG ~ ABCD.

Construction of Tangents to a Circle

9. You are given a circle with radius 'r' and center O. You are asked to draw a pair of tangents which are inclined at an angle of 60∘ with each other. Refer to the figure and select the option which would lead us to the required construction. d is the distance OE.



(A) Using trigonometry, arrive at $d = \sqrt{5}$ and mark E.

(B) Using trigonometry, arrive at $d = \sqrt{3}$ and mark E.
(C) Mark M and N on the circle such that ∠MOE = 60 ° and ∠NOE = 60 °
(D) Construct the △MNO as it is equilateral

Answer: (C) Mark M and N on the circle such that ∠MOE = 60 ° and ∠NOE = 60 °

Solution: Since the angle between the tangents is 60° and OE bisects ∠MEN, ∠MEO = 30°.

Now, since △OME is a right angled triangle, right angled at M, we realise that the ∠MOE = 60°. Since ∠MOE = 60°, we must have ∠NOE =60° and hence ∠MON = 120°. Hence △MNO is NOT equilateral.

Next, since in △OME, sin30°= 1/2 = OM/OE = r/d, we have d = 2r.

Recalling 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° [constructing angle 60° is easy]

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, EM is one tangent.

4. Similarly, EN is another tangent.

10. In the above scenario, after drawing the circle with radius R, what is the next thing to be constructed?

(A) The point B
(B) The point O
(C) Circle with radius ‘r’
(D) Tangent PO

Answer: (B) The point O

Solution: Since we need to draw a circle with radius ‘r’, we need the following points:

i) Centre of the smaller circle

ii) Radius of the smaller circle.

We have the radius ‘r’ but we need to adjust the centre on the line OA.

Realising that the tangents are common to both the circles, the radius of each circle at their point of contact being perpendicular to the common tangent, we can say that the radii are parallel. So we also have the ratio PQ: QO because we have a pair of similar triangles.

But before we can do all this, we first need to have the line AO and even before that, the point O. Only then we can draw tangents and then the inner circle. So the next step would be determining the point ‘O’.

11. In reference to the above question, what would be the first thing to determine?

(A) None of these
(B) Radius of the circle ‘C’
(C) Radius of the circle ‘D’
(D) Centre of the circle ‘C’

Answer: (D) Centre of the circle ‘C’

Solution: Since we need to finally construct a circle of radius ‘R’ concentric to the previous circle, we need to determine the centre of these circles first, before proceeding with anything else.

Radius of the circle ‘D’ can be figured out after we get the radius of the first circle and using the centre.

Radius of the circle ‘C’ can be found after finding the centre of this circle.

Drawing Tangents to a Circle

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

(A) None of these
(B) Only 1 tangent can be drawn from point P
(C) There are 2 tangents to the circle from point P
(D) Perpendicular to the tangent passes through the center

Answer: (C) There are 2 tangents to the circle from point P

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

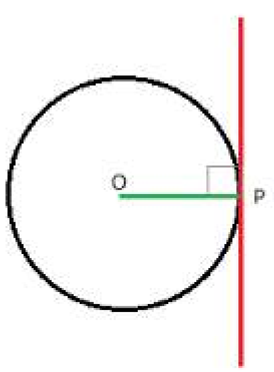
13. There is a circle with center O. P is a point from where only one tangent can be drawn to this circle. What can we say about P?

(A) O and P are co-incident points.
(B) P is on the circle.
(C) P is inside the circle.
(D) P is outside the circle

Answer: (B) P is on the circle.

Solution: Since only one tangent can be drawn, this point P should be present on the circle.

Any point on the circle is at a distance equal to the radius of the circle. So OP is equal to the radius of the circle.



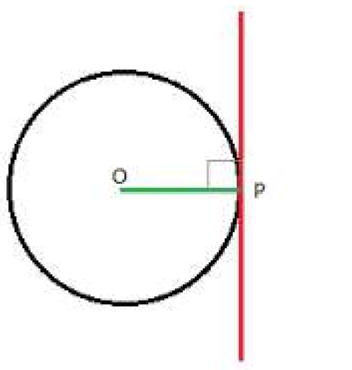
14. A circle of radius r has a center O. What is first step to construct a tangent from a generic point P which is at a distance r from O?

(A) With P as center and radius > r, draw a circle and then join OP.
(B) With P as center and radius < r, draw a circle and then join OP.
(C) With P as center and radius = r, draw a circle and then join OP.
(D) Join OP.

Answer: (D) Join OP

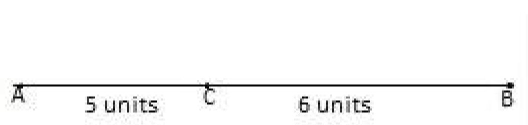
Solution: P is a point on the circle. We know that only one tangent can be drawn and it is perpendicular to the line joining the centre of the circle O and the point of contact P.

So our first step would be to join OP.



Dividing a Line Segment

15. A point C divides a line segment AB in the ratio 5:6. The ratio of lengths AB: BC is:



(A) 11:5
(B) 11:6
(C) 6:11
(D) 5:11

Answer: (B) 11: 6

Solution: Given AC/BC = 5/6

AB/BC= (AC+BC)/BC = (AC/BC) +1 = 5/6+1 = 11/6

So, ratio is 11:6.

16. The point W divides the line XY in the ratio m: n. Then, the ratio of lengths of the line segments XY:WX is

(A) m+n:m
(B) m+n:n
(C) m:m+n
(D) m:n

Answer: (A) m+n: m

Solution:

XY/ XW= (XW/XW) + (WY/XW) = 1 + (n/m) = (m+n)/m = m+n: m

17. What is the ratio AC/BC for the line segment AB following the construction method below?
Step 1. A ray is extended from A and 30 arcs of equal lengths are cut, cutting the ray at $A_1, A_2, \ldots A_{30}$
Step 2. A line is drawn from A_{30} to B and a line parallel to $A_{30}B$ is drawn, passing through the point A_{17} and meet AB at C.

(A) 13:30
(B) 13:17
(C) 17:13
(D) 17:30

Answer: (C) 17:30

Solution: Here the total number of arcs is equal to m+n in the ratio m: n.

The triangles △ $AA_{17}C$ and △ $AA_{30}B$ are similar.

Hence, $AC/AB = AA_{17}/AA_{30} = 17/30$

BC/AB = (AB−AC)/AB
BC/AB = 1 - 17/30 = 13/30

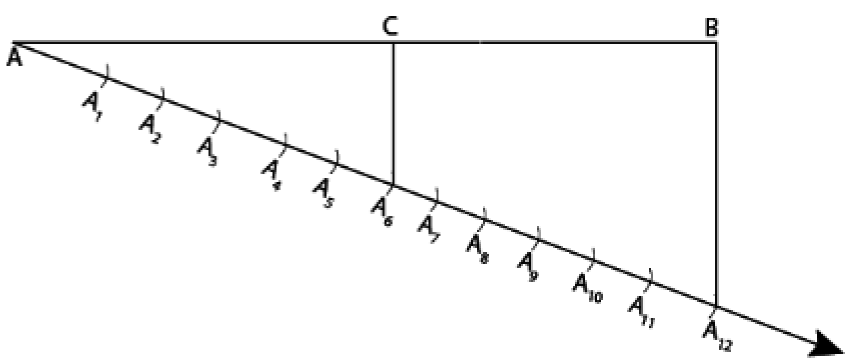
Hence, AC/BC = 17/13 = 17:13.

18. What is the ratio AC/BC for the following construction:
A line segment AB is drawn.
A single ray is extended from A and 12 arcs of equal lengths are cut, cutting the ray at A1, A2… A12.
A line is drawn from A12 to B and a line parallel to A12B is drawn, passing through the point A6 and cutting AB at C.

(A) 1:2
(B) 1:1
(C) 2:1
(D) 3:1

Answer: (B) 1:1

Solution:



In the construction process given, triangles $\triangle AA_{12}B$ $\triangle AA_6C$ are similar.

Hence, we get AC/AB = 6/12 = 1/2.

By construction BC/AB = 6/12 = 1/2.

AC/BC = (AC/AB)/ (BC/AB)

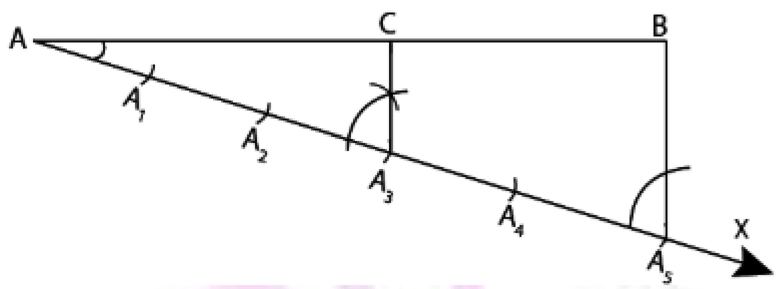
= (½)/ (½) = 1.

19. The basic principle used in dividing a line segment is:

(A) None of these
(B) Tangent to a circle
(C) Congruency of triangles
(D) Similarity of triangles

Answer: (D) Similarity of triangles

Solution:



Similarity of triangles is the basic principle used in dividing a line segment.
In this case, similar triangles ACA_3 and ABA_5 have been constructed to divide the line segment AB.

20. To divide a line segment, the ratio of division must be:

(A) Negative and Rational
(B) Greater than 1
(C) Less than 1
(D) Positive and Rational

Answer: (D) Positive and Rational

Solution: The ratio of division must always be positive and rational. It can be greater than or less than 1.