

Chapter 10: Constructions

NCERT Exemplar · Class 10 · Maths

Exercise 10.1

Question 1

To divide a line segment AB in the ratio 5:7, first, a ray AX is drawn so that BAX is an acute angle, and then at equal distances, points are marked on the ray AX such that the minimum number of these points is

(A) 8 (B) 10 (C) 11 (D) 12

Solution

(D) 12

According to the question,

A line segment AB in the ratio 5:7

So, $A:B = 5:7$

Now,

Draw a ray AX making an acute angle $\angle BAX$,

Mark $A+B$ points at equal distance.

So, we have $A=5$ and $B=7$

Hence, minimum number of these points = $A+B = 5+7 = 12$

Question 2

To divide a line segment AB in the ratio 4:7, a ray AX is drawn first such that BAX is an acute angle and then points $A_1, A_2, A_3, \dots$ are located at equal distances on the ray AX, and the point B is joined to

(A) A_{12} (B) A_{11} (C) A_{10} (D) A_9

Solution

(B) A_{11}

According to the question,

A line segment AB in the ratio 4:7

So, $A:B = 4:7$

Now,

Draw a ray AX making an acute angle BAX

Minimum number of points located at equal distances on the ray,

$AX = A+B = 4+7 = 11$

$A_1, A_2, A_3, \dots$ are located at equal distances on the ray AX.

Point B is joined to the last point is A_{11} .

Question 3

To divide a line segment AB in the ratio 5 : 6, draw a ray AX such that $\angle BAX$ is an acute angle, then draw a ray BY parallel to AX and the points $A_1, A_2, A_3, \dots$ and $B_1, B_2, B_3, \dots$ are located at equal distances on ray AX and BY, respectively. Then the points joined are

(A) A_5 and B_6 (B) A_6 and B_5 (C) A_4 and B_5 (D) A_5 and B_4

Solution

(A) A_5 and B_6

According to the question,

A line segment AB in the ratio 5:7

So, $A:B = 5:7$

Steps of construction:

1. Draw a ray AX, an acute angle BAX.
2. Draw a ray BY $\parallel$ AX, angle ABY = angle BAX.

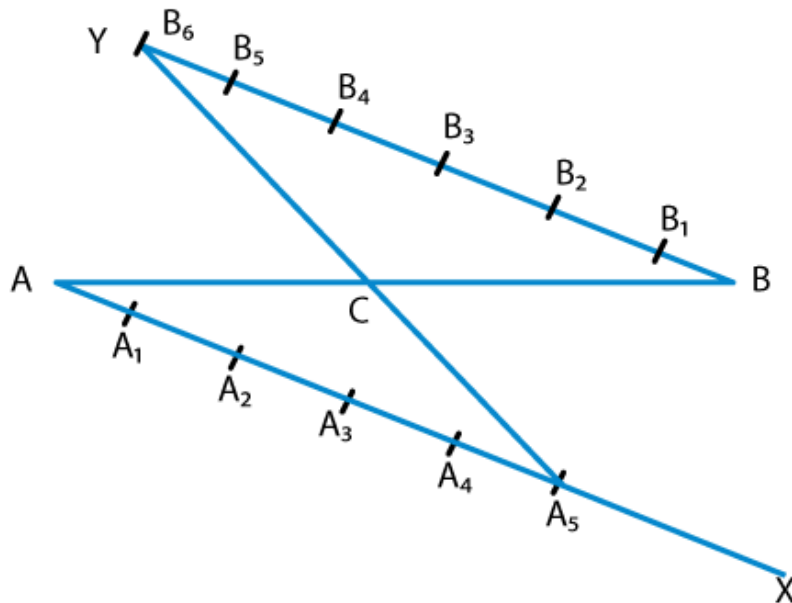
3. Now, locate the points A_1, A_2, A_3, A_4 and A_5 on AX and B_1, B_2, B_3, B_4, B_5 and B_6

(Because $A:B = 5:7$)

4. Join A_5B_6 .

A_5B_6 intersect AB at a point C .

$AC:BC = 5:6$



Exercise 10.2

Question 1

By geometrical construction, it is possible to divide a line segment in the ratio $\sqrt{3}:(1/\sqrt{3})$

Solution

True

Justification:

According to the question,

Ratio = $\sqrt{3} : (1/\sqrt{3})$

On simplifying we get,

$$\sqrt{3} / (1/\sqrt{3}) = (\sqrt{3} \times \sqrt{3})/1 = 3:1$$

Required ratio = 3:1

Hence,

Geometrical construction is possible to divide a line segment in the ratio 3:1.

Question 2

To construct a triangle similar to a given $\triangle ABC$ with its sides $7/3$ of the corresponding sides of $\triangle ABC$, draw a ray BX making an acute angle with BC and X lying on the opposite side of A with respect to BC . The points $B_1, B_2, \dots, B_7$ are located at equal distances on BX , B_3 is joined to C , and then a line segment B_6C' is drawn parallel to B_3C where C' lies on BC produced. Finally, line segment $A'C'$ is drawn parallel to AC .

Solution

False

Justification:

Let us try to construct the figure as given in the question.

Steps of construction,

1. Draw a line segment BC .
2. With B and C as centres, draw two arcs of suitable radius intersecting each other at A .
3. Join BA and CA and we get the required triangle $\triangle ABC$.
4. Draw a ray BX from B downwards to make an acute angle $\angle CBX$.
5. Now, mark seven points $B_1, B_2, B_3 \dots B_7$ on BX , such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5 = B_5B_6 = B_6B_7$.
6. Join B_3C and draw a line $B_7C' \parallel B_3C$ from B_7 such that it intersects the extended line segment BC at C' .
7. Draw $C'A' \parallel CA$ in such a way that it intersects the extended line segment BA at A' .

Then, $\triangle A'BC'$ is the required triangle whose sides are $7/3$ of the corresponding sides of $\triangle ABC$.

5. Join BA_8 .

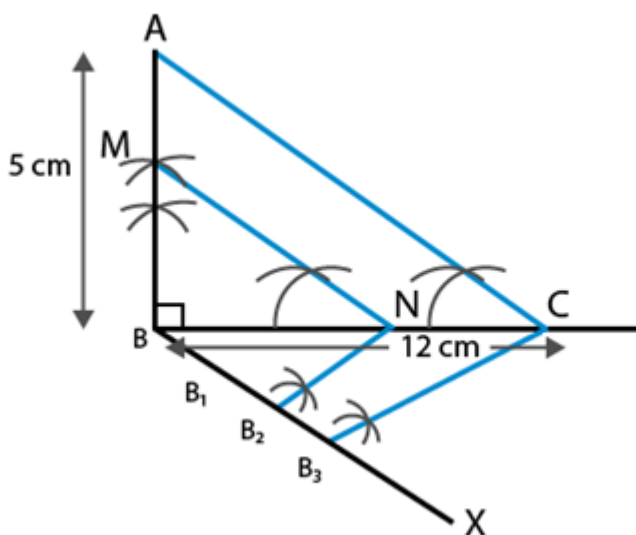
6. Draw a line parallel to BA_8 through the point A_3 , to meet AB on P .

Hence $AP:PB = 3:5$

Question 2

Draw a right triangle ABC in which $BC = 12$ cm, $AB = 5$ cm and $\angle B = 90^\circ$. Construct a triangle similar to it and of scale factor $2/3$. Is the new triangle also a right triangle?

Solution



Steps of construction:

1. Draw a line segment $AB = 5$ cm. Construct a right angle SAB at point A .
2. Draw an arc of radius 12 cm with B as its centre to intersect SA at C .
3. Join BC to obtain ABC .
4. Draw a ray AX making an acute angle with AB , opposite to vertex C .
5. Locate 3 points, A_1, A_2, A_3 on line segment AX such that $AA_1 = A_1A_2 = A_2A_3$.
6. Join A_3B .
7. Draw a line through A_2 parallel to A_3B intersecting AB at B' .
8. Through B' , draw a line parallel to BC intersecting AC at C' .

9. Triangle $AB'C'$ is the required triangle.

Exercise 10.4

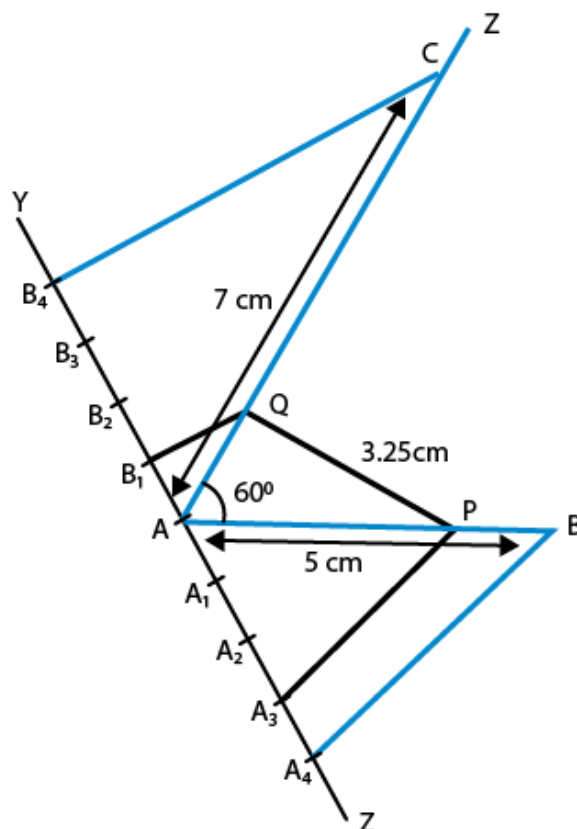
Question 1

Two line segments AB and AC include an angle of 60° where $AB = 5$ cm and $AC = 7$ cm. Locate points P and Q on AB and AC , respectively such that $AP = \frac{3}{4} AB$ and $AQ = \frac{1}{4} AC$. Join P and Q and measure the length PQ .

Solution

Steps of construction:

1. Draw a line segment $AB = 5$ cm.



2. Draw $\angle BAZ = 60^\circ$.

3. With centre A and radius 7 cm, draw an arc cutting the line AZ at C .

4. Draw a ray AX , making an acute $\angle BAX$.

5. Divide AX into four equal parts, namely $AA_1 = A_1A_2 = A_2A_3 = A_3A_4$.
6. Join A_4B .
7. Draw $A_3P \parallel A_4B$ meeting AB at P.
8. Hence, we obtain, P is the point on AB such that $AP = \frac{3}{4} AB$.
9. Next, draw a ray AY, such that it makes an acute $\angle CAY$.
10. Divide AY into four parts, namely $AB_1 = B_1B_2 = B_2B_3 = B_3B_4$.
11. Join B_4C .
12. Draw $B_1Q \parallel B_4C$ meeting AC at Q. We get, Q is the point on AC such that $AQ = \frac{1}{4} AC$.
13. Join PQ and measure it.
14. $PQ = 3.25$ cm.

Question 2

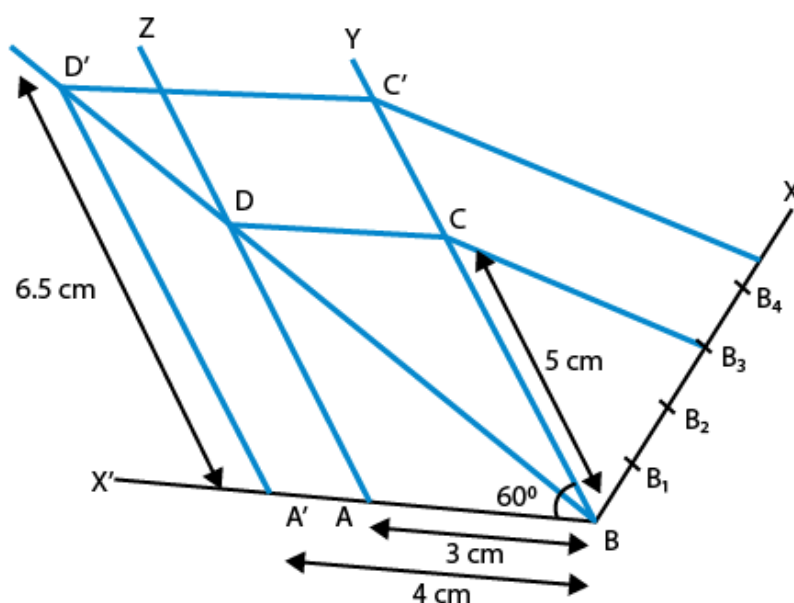
Draw a parallelogram ABCD in which $BC = 5$ cm, $AB = 3$ cm and angle $ABC = 60^\circ$, divide it into triangles BCD and ABD by the diagonal BD. Construct the triangle $BD'C'$ similar to triangle BDC with scale factor $\frac{4}{3}$. Draw the line segment $D'A'$ parallel to DA where A' lies on extended side BA. Is $A'BC'D'$ a parallelogram?

Solution

Steps of constructions:

1. Draw a line $AB=3$ cm.
2. Draw a ray BY making an acute $\angle ABY=60^\circ$.
3. With centre B and radius 5 cm, draw an arc cutting the point C on BY.
4. Draw a ray AZ making an acute $\angle ZAX'=60^\circ$. ($BY \parallel AZ$, $\therefore \angle YBX' = \angle ZAX' = 60^\circ$)
5. With centre A and radius 5 cm, draw an arc cutting the point D on AZ.
6. Join CD
7. Thus we obtain a parallelogram ABCD.
8. Join BD, the diagonal of parallelogram ABCD.

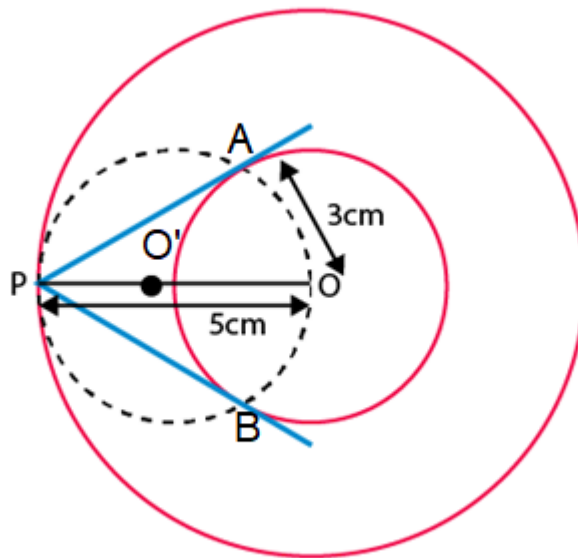
9. Draw a ray BX downwards making an acute $\angle CBX$.
10. Locate 4 points B_1, B_2, B_3, B_4 on BX, such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.
11. Join B_4C and from B_3C draw a line $B_4C' \parallel B_3C$ intersecting the extended line segment BC at C' .
12. Draw $C'D' \parallel CD$ intersecting the extended line segment BD at D' . Then, $\triangle D'BC'$ is the required triangle whose sides are $\frac{4}{3}$ of the corresponding sides of $\triangle DBC$.
13. Now draw a line segment $D'A' \parallel DA$, where A' lies on the extended side BA.
14. Finally, we observe that $A'BC'D'$ is a parallelogram in which $A'D' = 6.5$ cm, $A'B = 4$ cm and $\angle A'BD' = 60^\circ$ divide it into triangles $BC'D'$ and $A'BD'$ by the diagonal BD' .



Question 3

Draw two concentric circles of radii 3 cm and 5 cm. Taking a point on outer circle construct the pair of tangents to the other. Measure the length of a tangent and verify it by actual calculation.

Solution



Steps of constructions:

1. Draw a circle with centre O and radius 3 cm.
2. Draw another circle with centre O and radius 5 cm.
3. Take a point P on the circumference of larger circle and join OP.
4. Draw another circle with diameter OP such that it intersects the smallest circle at A and B.
5. Join A to P and B to P.

Hence AP and BP are the required tangents.