EXERCISE 11.1 PAGE: 220

In each of the following, give the justification for the construction also.

1. Draw a line segment of length 7.6 cm and divide it in the ratio 5:8. Measure the two parts.

Construction Procedure

A line segment with a measure of 7.6 cm length is divided in the ratio of 5:8 as follows.

1. Draw line segment AB with a length measure of 7.6 cm.

2. Draw a ray AX that makes an acute angle with line segment AB.

3. Locate the points, i.e.,13 (= 5+8) points, such as A1, A2, A3, A4 …….. A13, on the ray AX, such that it becomes AA1 = A1A2 = A2A3 and so on.

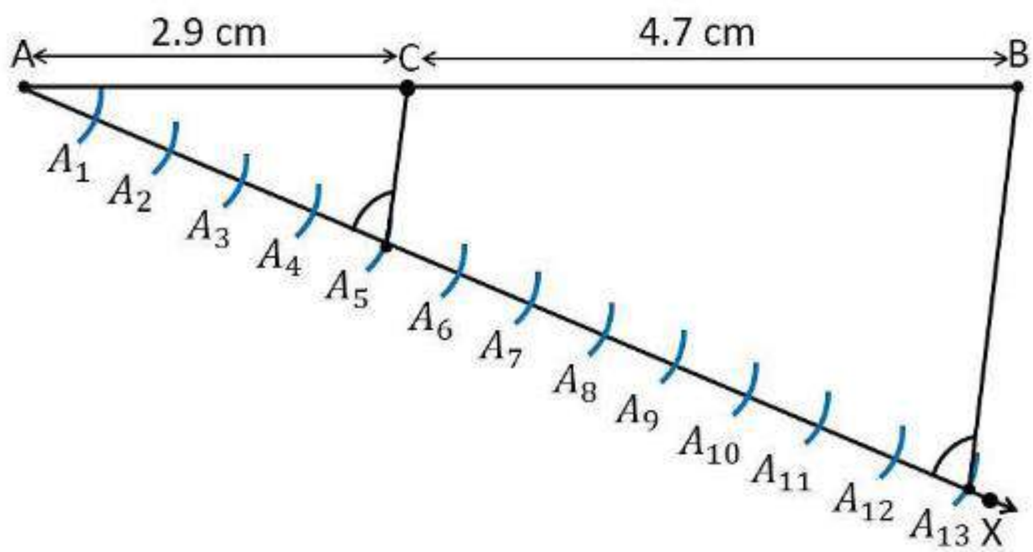
4. Join the line segment and the ray, BA13.

5. Through the point A5, draw a line parallel to BA13 which makes an angle equal to ∠AA13B.

6. Point A5, which intersects line AB at point C.

7. C is the point that divides line segment AB of 7.6 cm in the required ratio of 5:8.

8. Now, measure the lengths of the line AC and CB. It becomes the measure of 2.9 cm and 4.7 cm, respectively.



Justification:

The construction of the given problem can be justified by proving that

AC/CB = 5/ 8

By construction, we have A5C || A13B. From the Basic proportionality theorem for the triangle AA13B, we get

AC/CB =AA_5/A_5A_{13}….. (1)

From the figure constructed, it is observed that AA5 and A5A13 contain 5 and 8 equal divisions of line segments, respectively.

Therefore, it becomes

$AA_5/A_5A_{13}=5/8$… (2)

Compare the equations (1) and (2), we obtain

AC/CB = 5/ 8

Hence, justified.

2. Construct a triangle of sides 4 cm, 5 cm and 6 cm and then a triangle similar to it whose sides are 2/3 of the corresponding sides of the first triangle.

Construction Procedure

1. Draw a line segment AB which measures 4 cm, i.e., AB = 4 cm.

2. Take point A as the centre, and draw an arc of radius 5 cm.

3. Similarly, take point B as its centre, and draw an arc of radius 6 cm.

4. The arcs drawn will intersect each other at point C.

5. Now, we have obtained AC = 5 cm and BC = 6 cm, and therefore, ∆ABC is the required triangle.

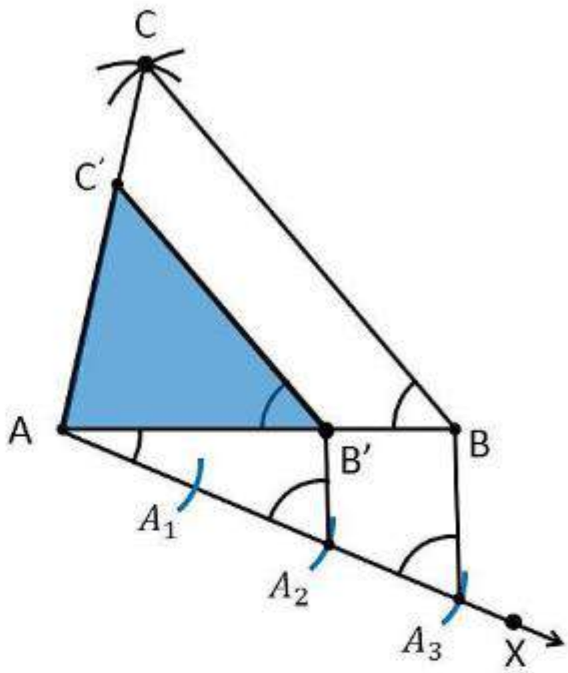
6. Draw a ray AX which makes an acute angle with the line segment AB on the opposite side of vertex C.

7. Locate 3 points such as A1, A2, and A3 (as 3 is greater between 2 and 3) on line AX such that it becomes AA1= A1A2 = A2A3.

8. Join point BA3 and draw a line through A2, which is parallel to the line BA3 that intersects AB at point B'.

9. Through the point B', draw a line parallel to line BC that intersects the line AC at C'.

10. Therefore, ∆AB'C' is the required triangle.



Justification

The construction of the given problem can be justified by proving that

AB’ = (2/3)AB

B’C’ = (2/3)BC

AC’= (2/3)AC

From the construction, we get B’C’ || BC

∴ ∠AB’C’ = ∠ABC (Corresponding angles)

In ΔAB’C’ and ΔABC,

∠ABC = ∠AB’C (Proved above)

∠BAC = ∠B’AC’ (Common)

∴ ΔAB’C’ ∼ ΔABC (From AA similarity criterion)

Therefore, AB’/AB = B’C’/BC= AC’/AC …. (1)

In ΔAAB’ and ΔAAB,

∠A_2AB’ =∠A_3AB (Common)

From the corresponding angles, we get

∠AA_2B’ =∠AA_3B

Therefore, from the AA similarity criterion, we obtain

ΔAA_2B’ and AA_3B

So, AB’/AB = AA_2/AA_3

Therefore, AB’/AB = 2/3 ……. (2)

From equations (1) and (2), we get

AB’/AB=B’C’/BC = AC’/ AC = 2/3

This can be written as

AB’ = (2/3)AB

B’C’ = (2/3)BC

AC’= (2/3)AC

Hence, justified.

3. Construct a triangle with sides 5 cm, 6 cm and 7 cm and then another triangle whose sides are 7/5 of the corresponding sides of the first triangle

Construction Procedure

1. Draw a line segment AB =5 cm.

2. Take A and B as the centre, and draw the arcs of radius 6 cm and 7 cm, respectively.

3. These arcs will intersect each other at point C, and therefore, ΔABC is the required triangle with the length of sides as 5 cm, 6 cm, and 7 cm, respectively.

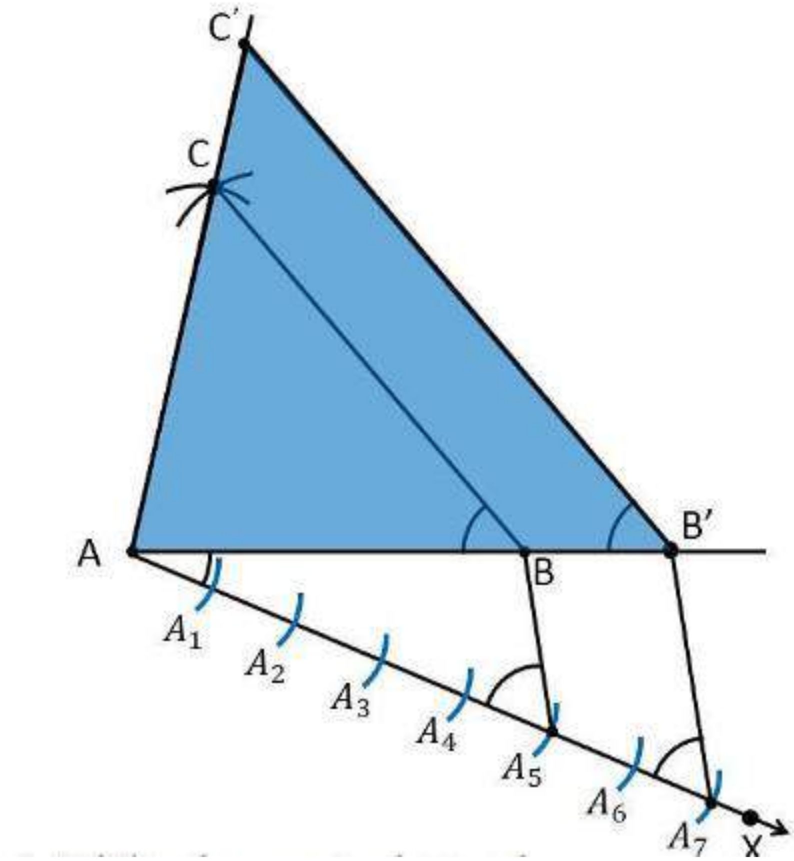
4. Draw a ray AX which makes an acute angle with the line segment AB on the opposite side of vertex C.

5. Locate the 7 points, such as A_1, A_2, A_3, A_4, A_5, A_6, A_7 (as 7 is greater between 5 and 7), on line AX such that it becomes $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5 = A_5A_6 = A_6A_7$

6. Join the points BA_5 and draw a line from A_7 to BA_5, which is parallel to the line BA_5 where it intersects the extended line segment AB at point B’.

7. Now, draw a line from B’ to the extended line segment AC at C’, which is parallel to the line BC, and it intersects to make a triangle.

8. Therefore, ΔAB’C’ is the required triangle.



Justification

The construction of the given problem can be justified by proving that

AB' = (7/5)AB

B'C' = (7/5)BC

AC'= (7/5)AC

From the construction, we get B'C' || BC

∴ ∠AB'C' = ∠ABC (Corresponding angles)

In ΔAB'C' and ΔABC,

∠ABC = ∠AB'C (Proved above)

∠BAC = ∠B'AC' (Common)

∴ ΔAB'C' ~ ΔABC (From AA similarity criterion)

Therefore, AB'/AB = B'C'/BC= AC'/AC …. (1)

In $\Delta AA_7B'$ and ΔAA_5B,

$\angle A_7AB' = \angle A_5AB$ (Common)

From the corresponding angles, we get

$\angle A\ A_7B' = \angle A\ A_5B$

Therefore, from the AA similarity criterion, we obtain

$\Delta A\ A_2B'$ and $A\ A_3B$

So, $AB'/AB = AA_5/AA_7$

Therefore, $AB/AB' = 5/7$ ……. (2)

From equations (1) and (2), we get

$AB'/AB = B'C'/BC = AC'/AC = 7/5$

This can be written as

$AB' = (7/5)AB$

$B'C' = (7/5)BC$

$AC' = (7/5)AC$

Hence, justified.

4. Construct an isosceles triangle whose base is 8 cm and altitude 4 cm and then another tr sides are $1\frac{1}{2}$ times the corresponding sides of the isosceles triangle

Construction Procedure:

1. Draw a line segment BC with a measure of 8 cm.

2. Now, draw the perpendicular bisector of the line segment BC and intersect at point D.

3. Take the point D as the centre and draw an arc with a radius of 4 cm, which intersects the perpendicular bisector at the point A.

4. Now, join the lines AB and AC, and the triangle is the required triangle.

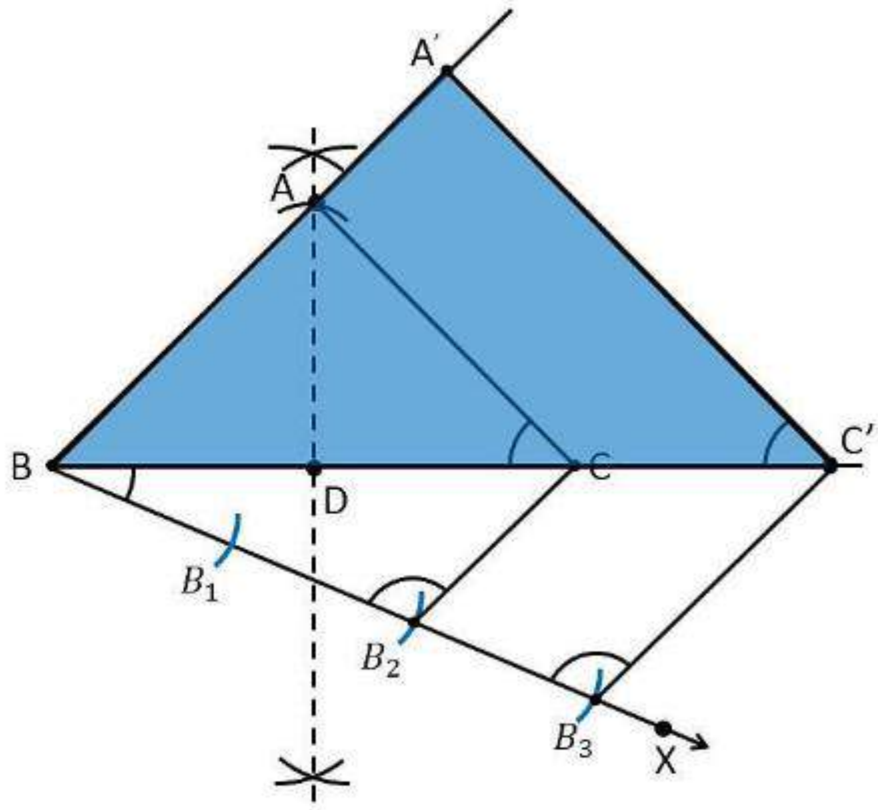
5. Draw a ray BX which makes an acute angle with the line BC on the side opposite to the vertex A.

6. Locate the 3 points B_1, B_2 and B_3 on the ray BX such that $BB_1 = B_1B_2 = B_2B_3$

7. Join the points B_2C and draw a line from $B_{3,}$ which is parallel to the line B_2C where it intersects the extended line segment BC at point C'.

8. Now, draw a line from C' to the extended line segment AC at A', which is parallel to the line AC, and it intersects to make a triangle.

9. Therefore, $\Delta A'BC'$ is the required triangle.



Justification

The construction of the given problem can be justified by proving that

A'B = (3/2)AB

BC' = (3/2)BC

A'C'= (3/2)AC

From the construction, we get A'C' || AC

∴ ∠ A'C'B = ∠ACB (Corresponding angles)

In ΔA'BC' and ΔABC,

∠B = ∠B (Common)

∠A'BC' = ∠ACB

∴ ΔA'BC' ~ ΔABC (From AA similarity criterion)

Therefore, A'B/AB = BC'/BC= A'C'/AC

Since the corresponding sides of the similar triangle are in the same ratio, it becomes

A'B/AB = BC'/BC= A'C'/AC = 3/2

Hence, justified.

5. Draw a triangle ABC with side BC = 6 cm, AB = 5 cm and ∠ABC = 60°. Then construct a triangle whose sides are 3/4 of the corresponding sides of the triangle ABC.

Construction Procedure

1. Draw a ΔABC with base side BC = 6 cm, and AB = 5 cm and ∠ABC = 60°.

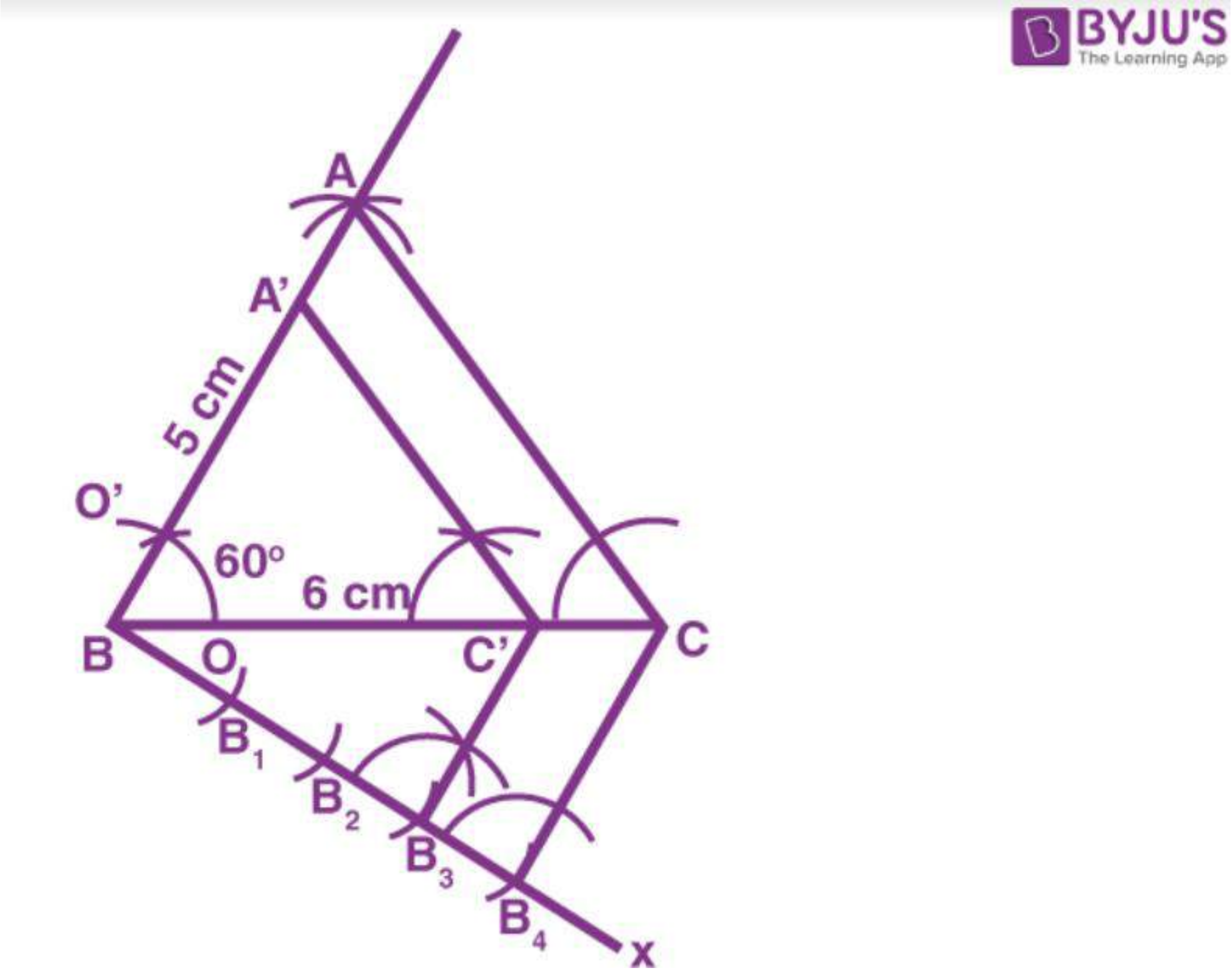
2. Draw a ray BX which makes an acute angle with BC on the opposite side of vertex A.

3. Locate 4 points (as 4 is greater in 3 and 4), such as B1, B2, B3, B4, on line segment BX.

4. Join the points B4C and also draw a line through B3, parallel to B4C intersecting the line segment BC at C'.

5. Draw a line through C' parallel to the line AC, which intersects the line AB at A'.

6. Therefore, ΔA'BC' is the required triangle.



Justification

The construction of the given problem can be justified by proving that

Since the scale factor is 3/4, we need to prove

A'B = (3/4)AB

BC' = (3/4)BC

A'C'= (3/4)AC

From the construction, we get A'C' || AC

In ΔA'BC' and ΔABC,

∴ ∠ A'C'B = ∠ACB (Corresponding angles)

∠B = ∠B (Common)

∴ ΔA'BC' ~ ΔABC (From AA similarity criterion)

Since the corresponding sides of the similar triangle are in the same ratio, it becomes

Therefore, A'B/AB = BC'/BC= A'C'/AC

So, it becomes A'B/AB = BC'/BC= A'C'/AC = 3/4

Hence, justified.

6. Draw a triangle ABC with side BC = 7 cm, ∠ B = 45°, ∠ A = 105°. Then, construct a triangle whose sides are 4/3 times the corresponding sides of Δ ABC.

To find ∠C:

Given:

∠B = 45°, ∠A = 105°

We know that,

The sum of all interior angles in a triangle is 180°.

∠A+∠B +∠C = 180°

105°+45°+∠C = 180°

∠C = 180° − 150°

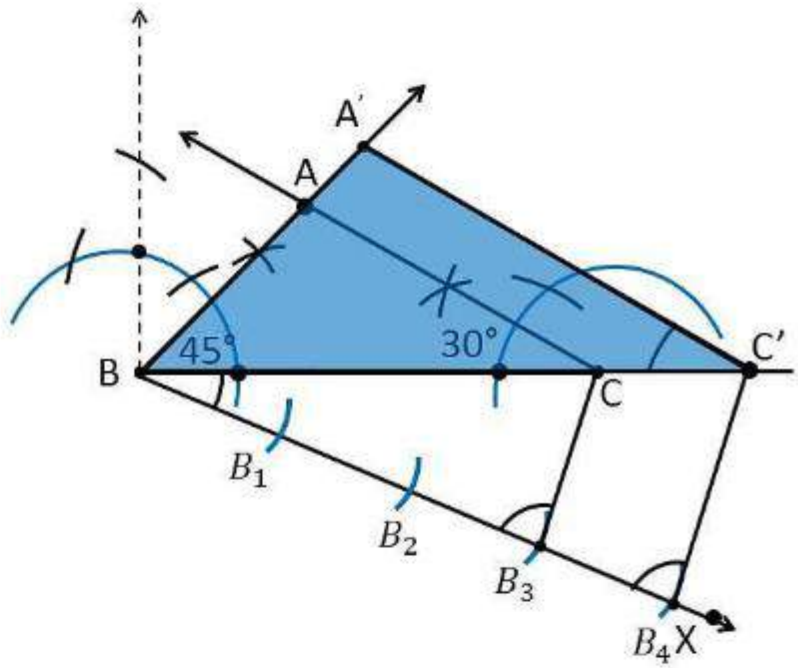
∠C = 30°

So, from the property of the triangle, we get ∠C = 30°

Construction Procedure

The required triangle can be drawn as follows.

1. Draw a ΔABC with side measures of base BC = 7 cm, ∠B = 45°, and ∠C = 30°.
2. Draw a ray BX that makes an acute angle with BC on the opposite side of vertex A.
3. Locate 4 points (as 4 is greater in 4 and 3), such as B1, B2, B3, B4, on the ray BX.
4. Join the points B3C.
5. Draw a line through B4 parallel to B3C, which intersects the extended line BC at C'.
6. Through C', draw a line parallel to the line AC that intersects the extended line segment at C'.
7. Therefore, ΔA'BC' is the required triangle.



Justification

The construction of the given problem can be justified by proving that

Since the scale factor is 4/3, we need to prove

A'B = (4/3)AB

BC' = (4/3)BC

A'C'= (4/3)AC

From the construction, we get A'C' || AC

In ΔA'BC' and ΔABC,

∴ ∠A'C'B = ∠ACB (Corresponding angles)

∠B = ∠B (Common)

∴ ΔA'BC' ~ ΔABC (From AA similarity criterion)

Since the corresponding sides of the similar triangle are in the same ratio, it becomes

Therefore, A'B/AB = BC'/BC= A'C'/AC

So, it becomes A'B/AB = BC'/BC= A'C'/AC = 4/3

Hence, justified.

7. Draw a right triangle in which the sides (other than hypotenuse) are of lengths 4 cm and 3 cm. Then construct another triangle whose sides are 5/3 times the corresponding sides of the given triangle.

Given:

The sides other than the hypotenuse are of lengths 4cm and 3cm. It defines that the sides are perpendicular to each other

Construction Procedure

The required triangle can be drawn as follows.

1. Draw a line segment BC =3 cm.

2. Now, measure and draw an angle 90°

3. Take B as the centre and draw an arc with a radius of 4 cm, and intersects the ray at point B.

4. Now, join the lines AC, and the triangle ABC is the required triangle.

5. Draw a ray BX that makes an acute angle with BC on the opposite side of vertex A.

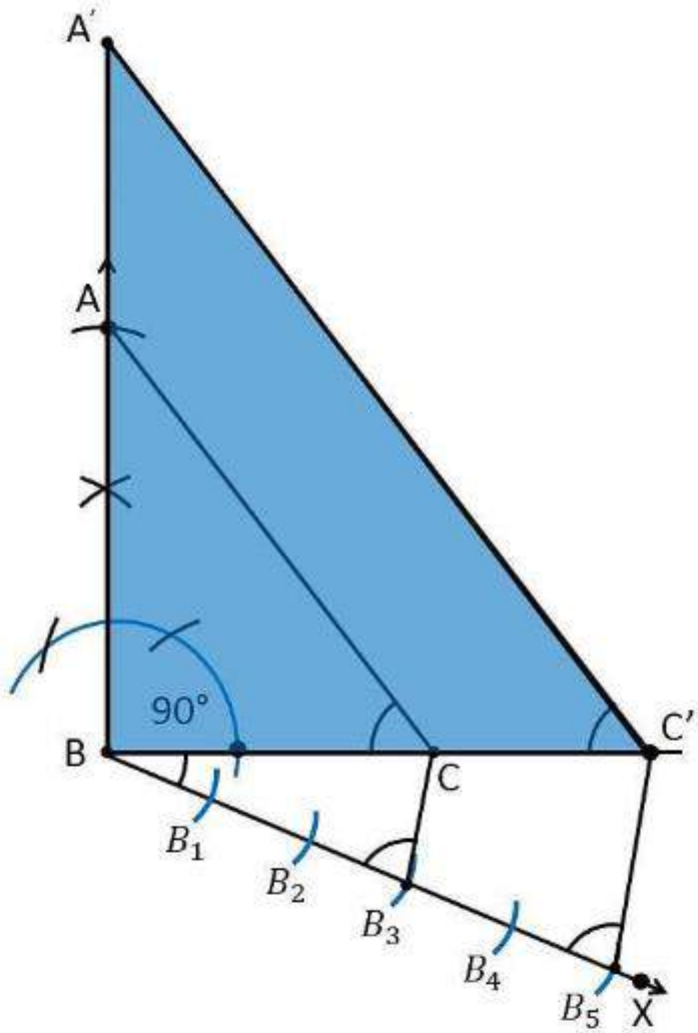
6. Locate 5 such as B1, B2, B3, B4, on the ray BX, such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5$

7. Join the points B3C.

8. Draw a line through B5 parallel to B3C, which intersects the extended line BC at C'.

9. Through C', draw a line parallel to the line AC that intersects the extended line AB at A'.

10. Therefore, ΔA'BC' is the required triangle.



Justification

The construction of the given problem can be justified by proving that

Since the scale factor is 5/3, we need to prove

A'B = (5/3)AB

BC' = (5/3)BC

A'C'= (5/3)AC

From the construction, we get A'C' || AC

In ΔA'BC' and ΔABC,

∴ ∠ A'C'B = ∠ACB (Corresponding angles)

∠B = ∠B (Common)

∴ ΔA'BC' ~ ΔABC (From AA similarity criterion)

Since the corresponding sides of the similar triangle are in the same ratio, it becomes

Therefore, A’B/AB = BC’/BC= A’C’/AC

So, it becomes A’B/AB = BC’/BC= A’C’/AC = 5/3

Hence, justified.