Exercise - 13A

1. Draw a line segment AB of length 7 cm. Using ruler and compasses, find a point P on AB such that $\frac{AP}{AB}=\frac{3}{5}$.

Sol:

Steps of Construction:

Step 1: Draw a line segment $AB = 7\ cm$

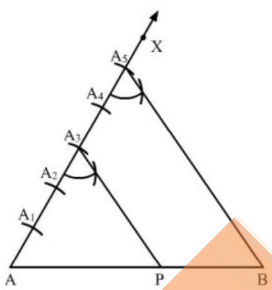
Step 2: Draw a ray AX, making an acute angle $\angle BAX$.

Step 3: Along AX, mark 5 points (greater of 3 and 5) A_1, A_2, A_3, A_4 and A_5 such that

$AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5$

Step 4: Join A_5B.

Step 5: From A_3, draw A_3P parallel to A_5B (draw an angle equal to $\angle AA_5B$), meeting AB in P.



Here, P is the point on AB such that $\frac{AP}{PB}=\frac{3}{2}$ or $\frac{AP}{AB}=\frac{3}{5}$.

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

Sol:

Steps of Construction:

Step 1: Draw a line segment $AB = 7.6 cm$

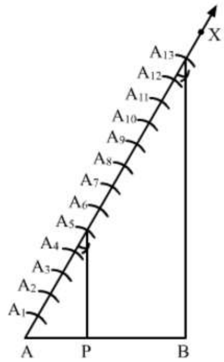
Step 2: Draw a ray AX, making an acute angle $\angle BAX$.

Step 3: Along AX, mark $(5+8=)13$ points $A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10}, A_{11}, A_{12}$ and A_{13} such that

$AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5 = A_6A_7 = A_8A_9 = A_9A_{10} = A_{10}A_{11} = A_{11}A_{12} - A_{12}A_{13}$.

Step 4: Join $A_{13}B$.

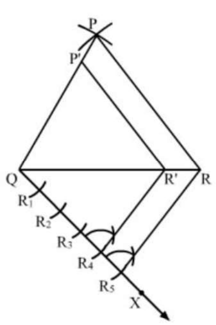
Step 5: From A_5, draw A_5P parallel to $A_{13}B$ (draw an angle equal to $\angle AA_{13}B$), meeting AB in P.



Here, P is the point on AB which divides it in the ratio $5:8$.
$\therefore$ Length of $AP = 2.9 \ cm$ (Approx)
Length of $BP = 4.7 \ cm$ (Approx)

3. Construct a ΔPQR, in which PQ = 6 cm, QR = 7 cm and PR =- 8 cm. Then, construct another triangle whose sides are $\frac{4}{5}$ times the corresponding sides of ΔPQR

Sol:
Steps of Construction
Step 1: Draw a line segment $QR = 7 \, cm$.
Step 2: With Q as center and radius 6 cm, draw an arc.
Step 3: With R as center and radius 8cm, draw an arc cutting the previous arc at P
Step 4: Join PQ and PR. Thus, ΔPQR is the required triangle.
Step 5: Below QR, draw an acute angle $\angle RQX$.
Step 6: Along OX, mark five points R_1, R_2, R_3, R_4 and R_5 such that
$QR_1 = R_1R_2 = R_2R_3 = R_3R_4 = R_4R_5$.
Step 7: Join RR_5.
Step 8: From R_4, draw $R_4R' \parallel RR_5$ meeting QR at R'.
Step 9: From R', draw $P'R' \parallel PR$ meeting PQ in P'.



Here, $\Delta P'QR'$ is the required triangle, each of whose sides are $\frac{4}{5}$ times the corresponding sides of ΔPQR.

4. Construct a triangle with sides 5 cm, 6 cm, and 7 cm and then another triangle whose sides are $\frac{7}{5}$ of the corresponding sides of the first triangle.

Sol:

Steps of Construction :

Step 1: Draw a line segment $BC = 4cm$.

Step 2: With B as center, draw an angle of $90°$.

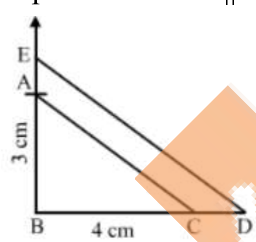
Step 3: With B as center and radius equal to 3 cm, cut an arc at the right angle and name it A.

Step 4: Join AB and AC.

Thus, Δ ABC is obtained.

Step 5: Extend BC to D, such that $BD = \frac{7}{5}BC = 75(4)cm = 5.6cm$.

Step 6: Draw $DE \parallel CA$, cutting AB produced to E.



Thus, ΔEBD is the required triangle, each of whose sides is $\frac{7}{5}$ the corresponding sides of ΔABC.

5. Construct a ΔABC with BC = 7 cm, $\angle B = 60°$ and AB = 6 cm. Construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of ΔABC

Sol:

Steps of Construction

Step 1: Draw a line segment $BC = 7cm$.

Step 2: At B, draw $\angle XBC = 60°$.

Step 3: With B as center and radius 6 cm, draw an arc cutting the ray BX at A.

Step 4: Join AC. Thus, ΔABC is the required triangle.

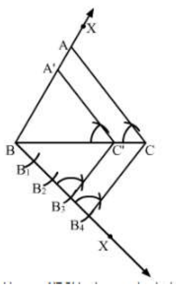
Step 5: Below BC, draw an acute angle $\angle YBC$.

Step 6: Along BY, mark four points B_1, B_2, B_3 and B_4 such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.

Step 7: Join CB_4.

Step 8: From B_3, draw $B_3C' \| CB_4$ meeting BC at C''.

Step 9: From C', Draw $A'C' \| AC$ meeting AB in A'.



Here. $\Delta A'BC'$ is the required triangle whose sides are $\frac{3}{4}$ times the corresponding sides of ΔABC.

6. Construct a ΔABC in which AB = 6 cm, $\angle A = 30°$ and $\angle AB = 60°$. Construct another $\Delta AB'C'$ similar to ΔABC with base AB' = 8 cm.

Sol:

Steps of Construction

Step 1: Draw a line segment $AB = 6cm$.

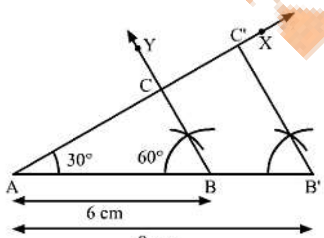
Step 2: At A, draw $\angle XAB = 30°$.

Step 3: At B, draw $\angle YBA = 60°$. Suppose AX and BY intersect at C.

Thus, ΔABC is the required triangle.

Step 4: Produce AB to B' such that $AB' = 8cm$.

Step 5: From B', draw $B'C' \| BC$ meeting AX at C'.



Here. AB'C' is the required triangle similar to ΔABC.

7. Construct a ΔABC in which BC = 8 cm, $\angle B = 45°$ and $\angle C = 60°$. Construct another triangle similar to ΔABC **such that its sides are** $\frac{3}{5}$ of the corresponding sides of ΔABC.

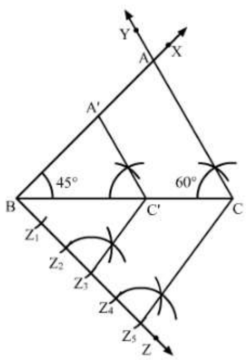
Sol:

Steps of Construction

Step 1: Draw a line segment $BC = 8cm$.

Step 2: At B, draw $\angle XBC = 45°$.

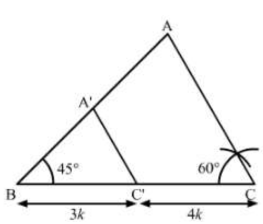
Step 3: At C, draw $\angle YCB = 60°$. Suppose BX and CY intersect at A.
Thus, ΔABC is the required triangle
Step 4: Below BC, draw an acute angle $\angle ZBC$.
Step 5: Along BZ, mark five points Z_1, Z_2, Z_3, Z_4 *and* Z_5 such that
$BZ_1 = Z_1Z_2 = Z_2Z_3 = Z_3Z_4 = Z_4Z_5.$
Step 6: Join CZ_5.
Step 7: From Z_3, draw $Z_3C' \parallel CZ_5$ meeting BC at C'.
Step 8: From C', draw $A'C' \parallel AC$ meeting AB in A'.



Here, $\Delta A'BC'$ is the required triangle whose sides are $\frac{3}{5}$ of the corresponding sides of ΔABC.

8. To construct a triangle similar to ΔABC in which BC = 4.5 cm, $\angle B = 45°$ and $\angle C = 60°$, using a scale factor of $\frac{3}{7}$, BC will be divided in the ratio

(a) 3 : 4 (b) 4 : 7 (c) 3 : 10 (d) 3 : 7
Answer: (a) 3 : 4
Sol:
To construct a triangle similar to ΔABC in which $BC = 4.5\,cm$, $\angle B = 45°$ *and* $\angle C = 60°$, using a scale factor of $\frac{3}{7}$, BC will be divided in the ratio $3:4$.



Here, $\Delta ABC \sim \Delta A'BC'$
$BC' : C'C = 3:4$
or $BC' : BC = 3:7$
Hence, the correct answer is option A.

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

Sol:

Steps of Construction

Step 1: Draw a line segment $BC = 8cm.$

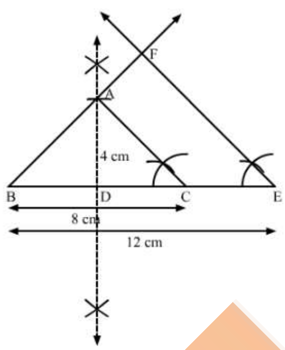
Step 2: Draw the perpendicular bisector XY of BC, cutting BC at D.

Step 3: With D as center and radius 4 cm, draw an arc cutting XY at A.

Step 4: Join AB and AC. Thus, an isosceles ΔABC whose base is 8 cm and altitude 4 cm is obtained.

Step 5: Extend BC to E such that $BE = \frac{3}{2}BC = \frac{3}{2}\times 8cm = 12cm.$

Step 6: Draw $EF \| CA$, cutting BA produced in F.



Here, ΔBEF is the required triangle similar to ΔABC such that each side of ΔBEF is $1\frac{1}{2}$ (or $\frac{3}{2}$) times the corresponding side of ΔABC.

10. 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 $\frac{5}{3}$ times the corresponding sides of the given triangle.

Sol:

Steps of Construction

Step 1: Draw a line segment $BC = 3cm.$

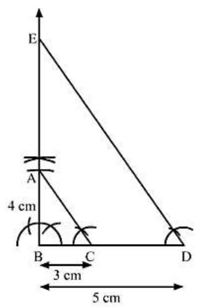
Step 2: At B, draw $\angle XBC = 90°$.

Step 3: With B as center and radius 4 cm, draw an arc cutting BX at A.

Step 4: Join AC. Thus, a right ΔABC is obtained.

Step 5: Extend BC to D such that $BD = \frac{5}{3}BC = \frac{5}{3}\times 3\,cm = 5\,cm.$

Step 6: Draw $DE \| CA$, cutting BX in E.



Here. ΔBDE is the required triangle similar to ΔABC such that each side of ΔBDE is $\frac{5}{3}$ times the corresponding side of ΔABC.