

CHAPTER 11

Constructions

Introduction:

A geometrical figure can be drawn by using geometrical instruments such as ruler, protractor, pair of set – squares, pair of compasses etc. But a geometrical construction is the process of drawing a geometrical figure using only two of these instruments. i.e. ruler and pair of compasses.

Division of a line segment:

Division of a line segment internally in a given ratio $m : n$, $m > n$
(or) $m < n$:

Method 1:

Steps of construction:

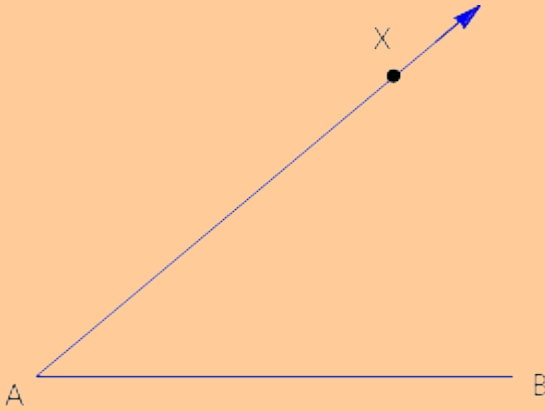
Step I:

Draw a line segment AB of given length.



Step II:

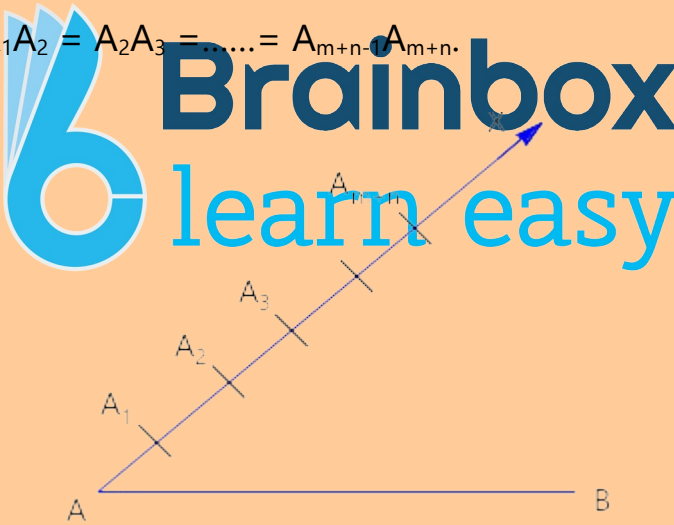
Draw a ray AX making an acute angle with the line segment AB.



Step III:

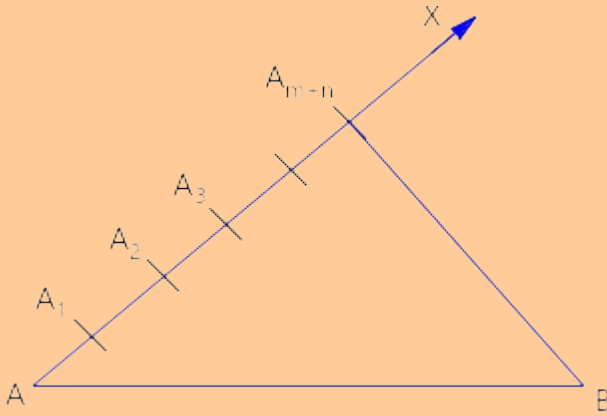
Locate $(m + n)$ points $A_1, A_2, A_3 \dots A_{m+n}$ on AX such that

$$AA_1 = A_1A_2 = A_2A_3 = \dots = A_{m+n-1}A_{m+n}$$



Step IV:

Join $A_{m+n}B$.

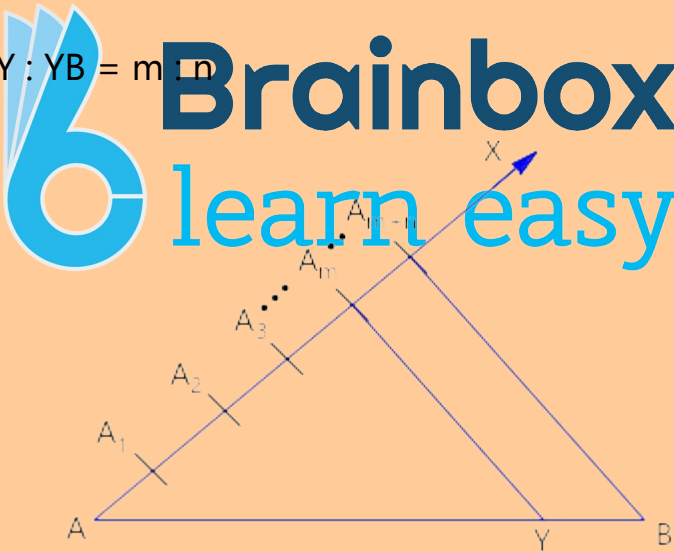


Step V:

Through A_m draw A_mY parallel to $A_{m+n}B$. Meeting AB in Y .

Such that $\angle A A_m Y = \angle A A_{m+n} B$.

Then, $AY : YB = m : n$



Method 2:

Steps of construction:

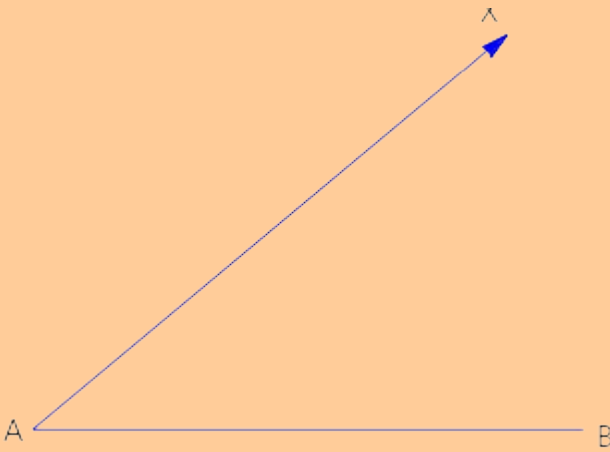
Step I:

Draw a line segment AB of given length.



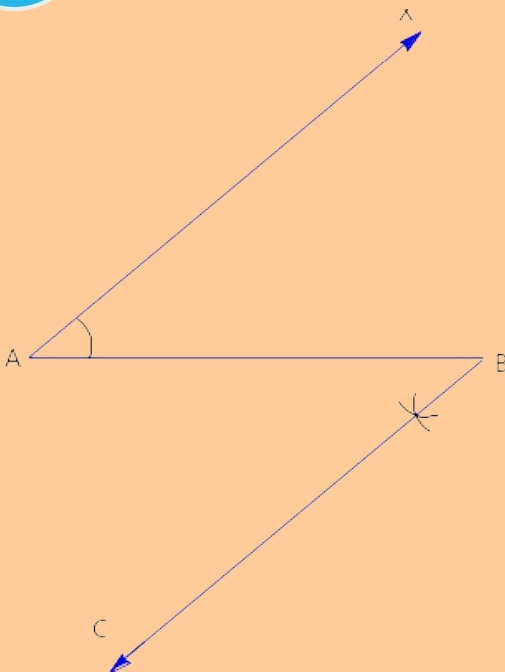
Step II:

Draw a ray AX making an acute angle with AB.



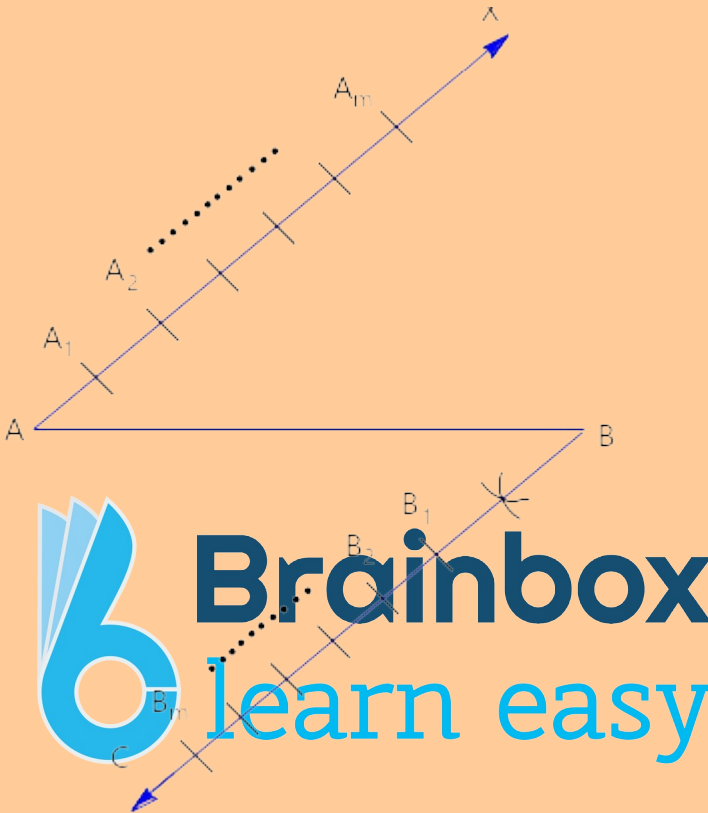
Step III:

Draw a ray BC parallel to AX such that $\angle ABC = \angle BAX$.



Step IV:

Locate the points $A_1, A_2 \dots A_m$ on AX and $B_1, B_2 \dots B_m$ on BC such that $AA_1 = A_1A_2 = A_2A_3 = \dots = A_{m-1}A_m = BB_1 = B_1B_2 = B_{m-1}B_m$.

**Step V:**

Join A_mB_n that intersects AB at Y . Then $AY : BY = 3 : 2$.



Brainbox

learn easy

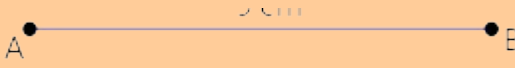
Divide a line segment of length 9cm internally in the ratio 4 : 3.
Also, give justification of the construction.

Method 1:

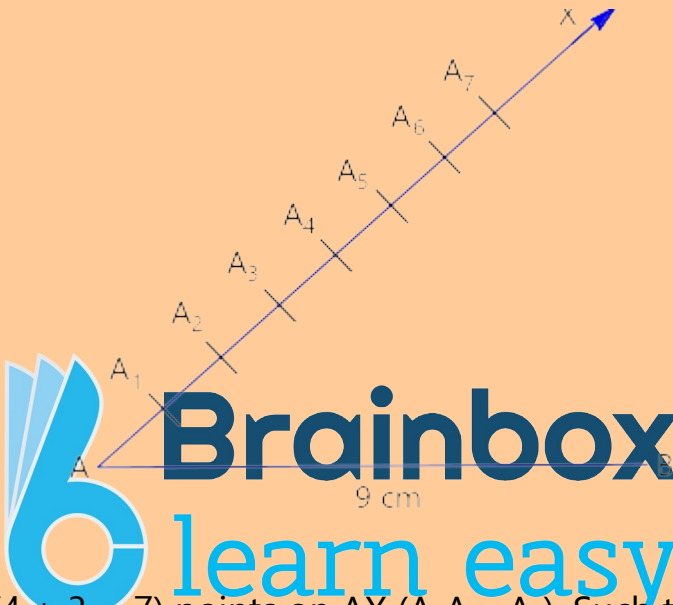
Steps of construction:

Step 1:

Draw a line segment $AB = 9\text{cm}$.

**Step 2:**

Draw a ray AX making an acute angle with AB.

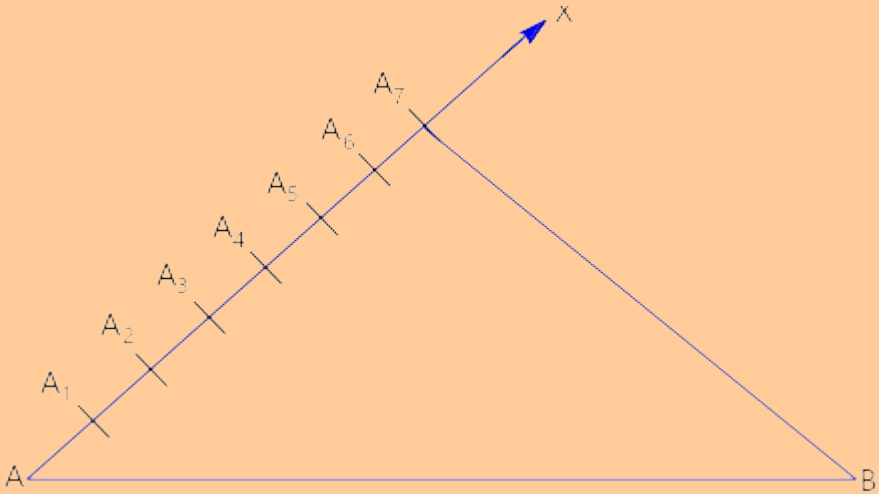
Step 3:

Locate $(4 + 3 = 7)$ points on AX ($A_1A_2...A_7$). Such that,

$$AA_1 = A_1A_2 = A_2A_3 = \dots = A_6A_7$$

Step 4:

Join A_7B .

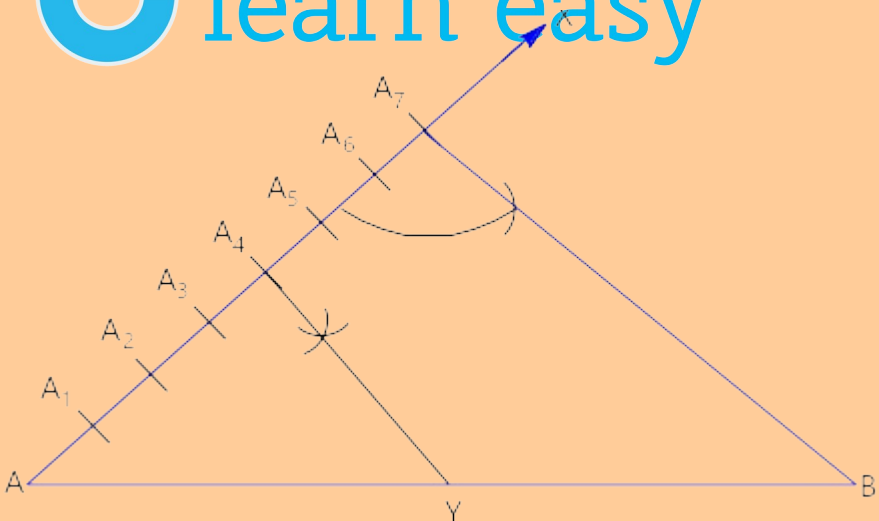


Step 5:

Through A_4 draw A_4Y parallel to A_7B , meeting AB at Y , such that

$$\frac{AA_4}{A_4B} = \frac{AA_4}{A_4Y}$$

Hence, $AY : YB = 4 : 3$



Justification:

In $\triangle ABA_7$, we observe that A_4Y is parallel to A_7B . Therefore, by basic proportionality theorem, we have

$$\frac{AA_4}{A_4A_7} = \frac{AY}{BY}, \quad \frac{AY}{YB} = \frac{4}{3}$$

$$\therefore \text{By construction, we got } \left[\frac{AA_4}{A_4A_7} = \frac{4}{3} \right]$$

$$\Rightarrow AY : YB = 4 : 3$$

