

# Assignment 5

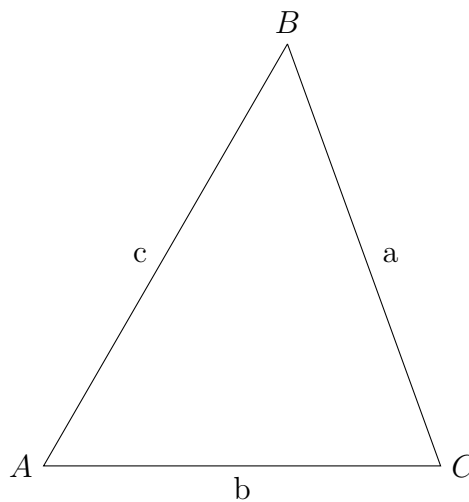
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**Question:**

If  $AC = 7$ ,  $\angle A = 60^\circ$  and  $\angle B = 50^\circ$ , can you draw the triangle?

**Solution:**



Rough Sketch

To draw the Triangle with given conditions, Let's first find the value of  $\angle C$ .

Using property, Sum of angles of triangle,

We have,

$$\angle A + \angle B + \angle C = 180^\circ$$

$$60^\circ + 50^\circ + \angle C = 180^\circ \quad (\text{given})$$

Therefore,  $\angle C = 70^\circ$ .

**To draw the triangle, we need know the coordinates of all vertices.**

Assuming starting vertex as A with coordinates as (0,0)

Therefore,  
vertex C has coordinates as (7,0) (as given AC=7)

**Coordinates of vertex B:**

Actually vertex B is intersection point of lines AB and CB, so let's find it.

Eqn of line AB:  $y = mx + c$ ; (m=slope of line and c is constt.)

$$y = 1.732x + c \quad (\text{as given } \angle A = 60^\circ \Rightarrow m = \tan(60^\circ))$$

$$\text{value of } c = 0 - 1.732(0) = 0 \quad (\text{as line AB passes through } (0,0))$$

Therefore,

$$\text{line AB: } y = 1.732x. \quad (1)$$

Similarly,

Eqn of line CB:  $y = mx + c$ ; (m=slope of line and c is constt.)

$$y = -2.727x + c \quad (\text{as } \angle C = 70^\circ \Rightarrow m = \tan(110^\circ))$$

$$\text{value of } c = 0 + 2.747(7) = 19.23 \quad (\text{as line CB passes through } (7,0))$$

Therefore,

$$\text{line CB: } y = -2.747x + 19.23. \quad (2)$$

### Finding Intersection point of line AB and CB

Substuting,eqn(1) in eqn(2),we get

$$x = \frac{19.23}{(1.73 + 2.727)}$$
$$\Rightarrow x = 4.292. \quad (3)$$

Substuting,eqn(3) in eqn(1),we get

$$y = 1.73(4.292)$$
$$\Rightarrow y = 7.44. \quad (4)$$

Therefore,coordinates of vertex B are (4.292,7.44)

Below figure 1 is possible triangle we can draw triangle with coordinates as A(0,0), B(4.292,7.44) and C(7,0).

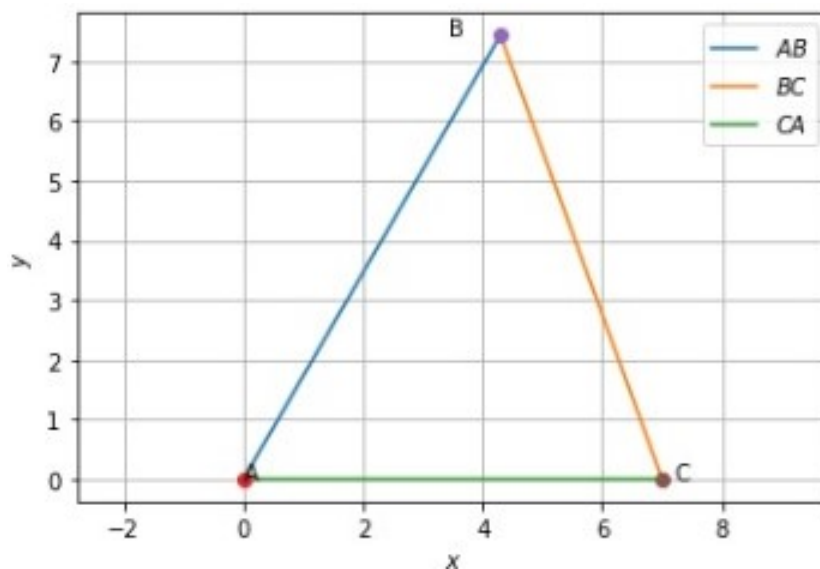
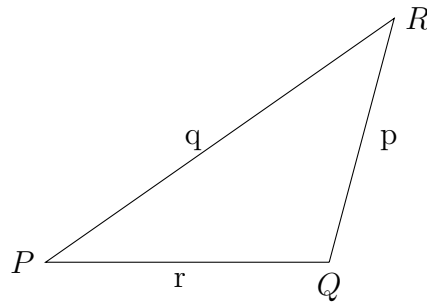


Figure 1: Figure using python

**Question:**

Construct  $\Delta PQR$  if  $PQ = 5$ ,  $\angle Q = 105^\circ$  and  $\angle R = 40^\circ$ .

**Solution:**



Rough Sketch

To draw the Triangle with given conditions, Let's first find the value of  $\angle P$ .

Using property, Sum of angles of triangle,

We have,

$$\angle P + \angle Q + \angle R = 180^\circ$$

$$\angle P + 105^\circ + 40^\circ = 180^\circ \quad (\text{given})$$

Therefore,  $\angle P = 35^\circ$ .

**To draw the triangle, we need know the coordinates of all vertices.**

Assuming starting vertex as P with coordinates as (0,0)

Therefore,

vertex Q has coordinates as (5,0) (as given  $PQ=5$ )

**Coordinates of vertex R:**

Actually vertex R is intersection point of lines PR and QR,so let's find it.

Eqn of line PR: $y=mx+c$ ; (m=slope of line and c is constt.)

$$y=0.7x+c \quad (\text{as } \angle P=35^\circ \Rightarrow m=\tan(35^\circ))$$

$$\text{value of } c=0-0.7(0)=0 \quad (\text{as line PR passes through } (0,0))$$

Therefore,

$$\text{line PR: } y=0.7x. \quad (1)$$

Similarly,

Eqn of line QR: $y=mx+c$ ; (m=slope of line and c is constt.)

$$y=3.73x+c \quad (\text{as } \angle Q=105^\circ \Rightarrow m=\tan(75^\circ))$$

$$\text{value of } c=0-3.73(5)=-18.65 \quad (\text{as line QR passes through } (5,0))$$

Therefore,

$$\text{line QR: } y=3.73x-18.65. \quad (2)$$

### **Finding Intersection point of line PR and QR**

Substuting,eqn(1) in eqn(2),we get

$$x = \frac{18.65}{(3.73 - 0.7)}$$

$$\Rightarrow x=6.15. \quad (3)$$

Substuting,eqn(3) in eqn(1),we get

$$y=0.7(6.15)$$

$$\Rightarrow y=4.3. \quad (4)$$

**Therefore,coordinates of vertex R are (6.15,4.3)**

Below figure 2 is given triangle with coordinates as  $P(0,0)$ ,  $Q(7,0)$  and  $R(6.15,4.3)$ .

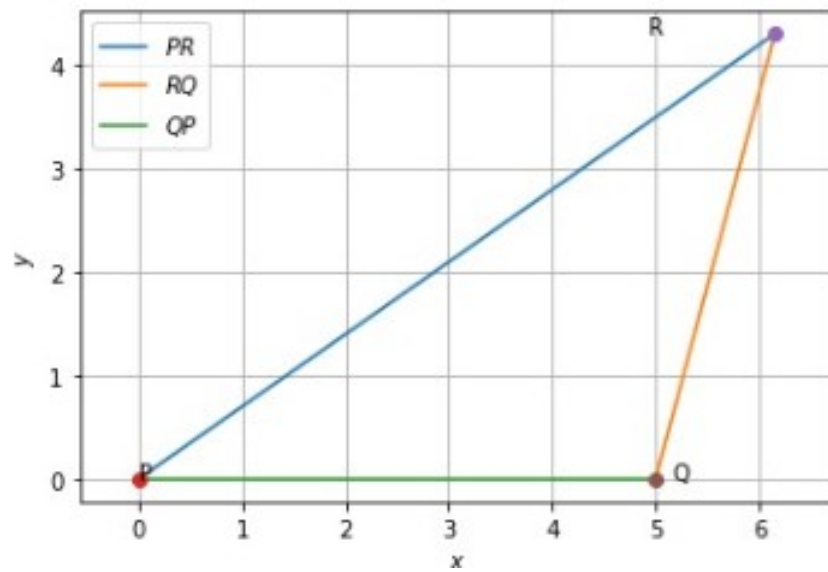


Figure 2: Figure using python

**Note:**  $m$  (i.e slope) =  $\tan(\text{angle measured anti-clock wise from x-axis})$