

Solution For School Geometry Problems

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Question

1 Two sides AB and BC and median AM of one triangle ABC are respectively equal to sides PQ and QR and median PN of $\triangle PQR$. Show that:

1 $\triangle ABM \cong \triangle PQN$

2 $\triangle ABC \cong \triangle PQR$

Construction

- 1 We have the values of all three sides of the triangle ABC and PQR so to construct a triangle we need all three coordinates of A,B and C.

Table: table for the output.

Input Table	
parameter	value
a	3
b	5
c	4

$$x = \frac{(a^2 + c^2 - b^2)}{2 * a} \quad (1)$$

$$y = \sqrt{c^2 - x^2} \quad (2)$$

coordinates of A \rightarrow

$$x_A = x \quad (3)$$

$$y_A = y \quad (4)$$

coordinates of B \rightarrow

$$x_B = 0 \quad (5)$$

$$y_B = 0 \quad (6)$$

coordinates of C \rightarrow

$$x_C = a \quad (7)$$

$$y_C = 0 \quad (8)$$

coordinates of M \rightarrow

$$x_M = \frac{a}{2} \quad (9)$$

$$y_M = 0 \quad (10)$$

Table: table for the output.

output Table	
parameter	value
M	1.5
N	1.5

Figures

Let assume we have two triangles as follows→

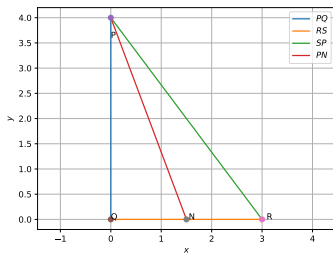


Figure: Triangle ABC

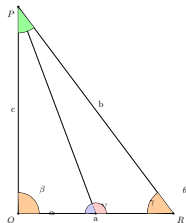


Figure: Triangle PQR

Codes

latex codes for figures a and b

```
./figures/congurentpicabc2.pdf  
./figures/congurentpicabc.pdf  
./figures/triangle.pdf
```

python codes for figures a and b

```
./codes/congurenttriangle.py  
../codes/congurenttriangle2.py
```

Ans.1

given that \rightarrow

$$AB = PQ \quad (11)$$

$$AM = PN \quad (12)$$

$$BC = QR \quad (13)$$

from equation (13)...

$$\frac{BC}{2} = \frac{QR}{2} \quad (14)$$

$$BM = QN \quad (15)$$

from fig [1] and [2] ...

$$AB = PQ \quad (16)$$

$$AM = PN \quad (17)$$

$$BM = QN \quad (18)$$

$$\implies \triangle ABM \cong \triangle PQN \quad (19)$$

Ans.2

given that \rightarrow

$$AM = PN \quad (20)$$

from equation (13)...

$$\frac{BC}{2} = \frac{QR}{2} \quad (21)$$

$$MC = NR \quad (22)$$

from equation (19)...

$$\triangle ABM \cong \triangle PQN \quad (23)$$

$$\implies \angle AMB = \angle PNQ \quad (24)$$

$$180 - \angle AMB = 180 - \angle PNQ \quad (25)$$

$$\angle AMC = \angle PNR \quad (26)$$

from equation (10),(12) and (16)...

$$AM = PN \quad (27)$$

$$MC = NR \quad (28)$$

$$\angle AMC = \angle PNR \quad (29)$$

$$\implies \triangle AMC \cong \triangle PNR \quad (30)$$

$$\implies AC = PR \quad (31)$$

from equation (11),(13) and (31)...

$$AB = PQ \quad (32)$$

$$BC = QR \quad (33)$$

$$AC = QR \quad (34)$$

$$\implies \triangle ABC \cong \triangle PQR \quad (35)$$