Solution For The School Geometry Problems

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Abstract—**This document includes different problems and solution on geometry from trigonometry and algebra.It also provides the imformation about the python and latex codes of figures.**

Download all python codes from

and latex-tikz codes from

1 Problem

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

(a) Δ ABM ≅ Δ PQN
(b) Δ ABC ≅ Δ PQR

2 Construction

2.1. 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.After getting the all three coordinates the coordinates of the median from point A to side BC and from point P to line QR, are achieved.

Parameter		Value
a	p	3
b	q	5
c	r	6

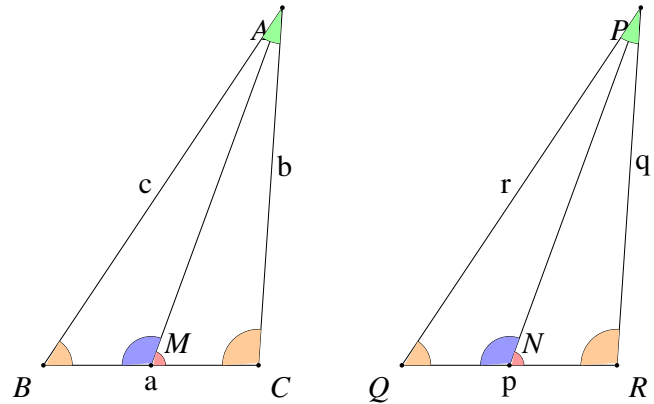TABLE 2.1: To construct $\triangle ACB$ and $\triangle PQR$

Fig. 2.1: Triangles by Latex-Tikz

2.2. Finding out the coordinates of the various points in Fig. 2.1

$$x = \frac{\left(a^2 + c^2 - b^2\right)}{2 * a} \tag{2.0.1}$$

$$y = \sqrt{c^2 - x^2} \tag{2.0.2}$$

$$\mathbf{A} = \begin{pmatrix} x \\ y \end{pmatrix} \tag{2.0.3}$$

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{2.0.4}$$

$$\mathbf{C} = \begin{pmatrix} a \\ 0 \end{pmatrix} \tag{2.0.5}$$

$$\mathbf{P} = \begin{pmatrix} x + 5 \\ y \end{pmatrix} \tag{2.0.6}$$

Similarly we can get q and r

$\because$ **M** is the midpoint of *BC* and **N** of *QR*,

$$\mathbf{M} = \frac{1}{2} \begin{pmatrix} a \\ 0 \end{pmatrix} \tag{2.0.7}$$

$$\mathbf{N} = \frac{1}{2} \begin{pmatrix} a + 5 \\ 0 \end{pmatrix} \tag{2.0.8}$$

2.3. Drawing Fig. 2.1.
The following Python code generates Fig. 2.3

Derived Values.	
M	$\begin{pmatrix} 1.5 \\ 0 \end{pmatrix}$
N	$\begin{pmatrix} 6.5 \\ 0 \end{pmatrix}$

TABLE 2.2: To construct madian AM and PN
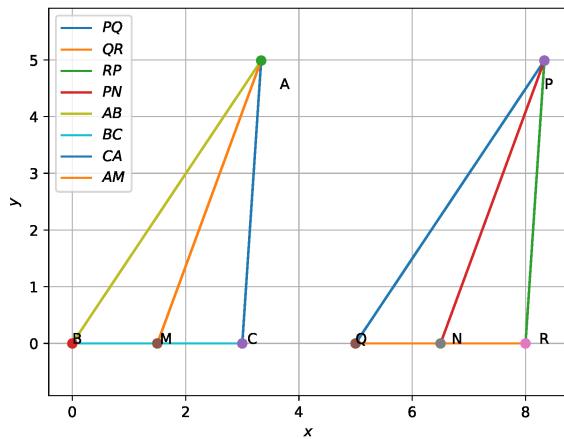
```
./codes/Triangle.py
```


Fig. 2.3: Triangles generated using python

and the equivalent latex-tikz code generating Fig.2.1 is

```
./figs/triangle.tex
```

The above latex code can be compiled as a standalone document as

```
./figs/triangle_fig.tex
```

3 SOLUTION

3.1. given that $\rightarrow$

$$AB = PQ \qquad (3.0.1)$$
$$AM = PN \qquad (3.0.2)$$
$$BC = QR \qquad (3.0.3)$$

3.1 Solution.a)

3.1. **M** and **N** are midpoints So from equation (3.0.3)...

$$BM = QN \qquad (3.1.1)$$

From eq (3.0.1) ,(3.0.2),(3.1.1) and by SSS congurancy

$$\Delta ABM \cong \Delta PQN \qquad (3.1.2)$$

3.2 Solution.b)

3.1. from equation (3.0.3)...

$$MC = NR \qquad (3.2.1)$$
$$\because \Delta ABM \cong \Delta PQN \qquad (3.2.2)$$
$$\implies \angle AMC = \angle PNR \qquad (3.2.3)$$

from equation (3.0.2),(3.2.1) and (3.2.3)and by SAS congurancy

$$\Delta AMC \cong \Delta PNR \qquad (3.2.4)$$
$$\implies AC = PR \qquad (3.2.5)$$

from equation (3.0.1),(3.0.3),(3.2.5) and by SSS congurancy

$$\Delta ABC \cong \Delta PQR \qquad (3.2.6)$$

Hence proved