

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 information about the python and latex codes of figures.

Download all python codes from

```
svn co https://github.com/yogi13995/
yogesh_training/tree/master/Geometry/triangle/
codes
```

and latex-tikz codes from

```
svn co https://github.com/yogi13995/
yogesh_training/tree/master/Geometry/triangle/
figures
```

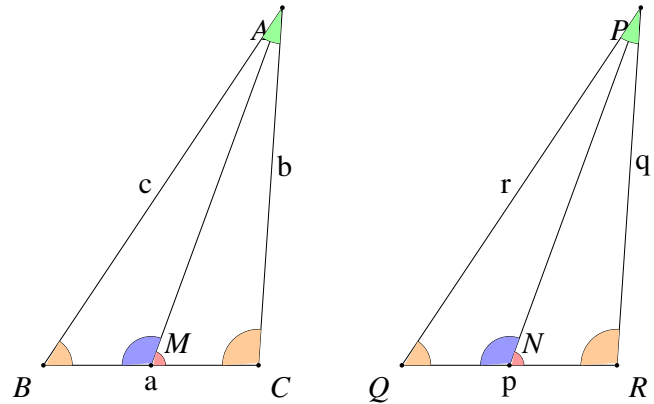


Fig. 2.1: Triangles by Latex-Tikz

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

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

$$y = \sqrt{c^2 - x^2} \quad (2.0.2)$$

$$\mathbf{A} = \begin{pmatrix} x \\ y \end{pmatrix} \quad (2.0.3)$$

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (2.0.4)$$

$$\mathbf{C} = \begin{pmatrix} a \\ 0 \end{pmatrix} \quad (2.0.5)$$

$$\mathbf{P} = \begin{pmatrix} x + 5 \\ y \end{pmatrix} \quad (2.0.6)$$

Similarly we can get q and r

$\therefore \mathbf{M}$ is the midpoint of BC and \mathbf{N} of QR ,

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

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

2.3. Drawing Fig. 2.1.

The following Python code generates Fig. 2.3

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 ΔPQR . Show that:

- (a) $\Delta ABM \cong \Delta PQN$
- (b) $\Delta ABC \cong \Delta PQR$

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 ΔACB and ΔPQR

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

TABLE 2.2: To construct median AM and PN

```
./codes/Triangle.py
```

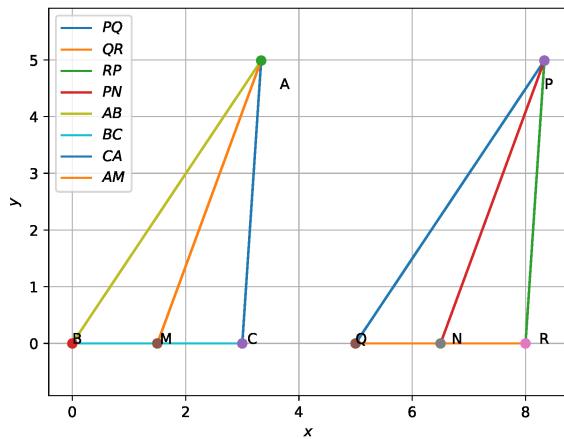


Fig. 2.3: Triangles generated using python

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
```

3.1 Solution.a)

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

$$\|BM\| = \|QN\| \quad (3.1.1)$$

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

$$\triangle ABM \cong \triangle PQN \quad (3.1.2)$$

3.2 Solution.b)

3.1. from equation (3.0.3)...

$$\|MC\| = \|NR\| \quad (3.2.1)$$

$$\because \triangle ABM \cong \triangle PQN \quad (3.2.2)$$

$$\Rightarrow \angle AMC = \angle PNR \quad (3.2.3)$$

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

$$\triangle AMC \cong \triangle PNR \quad (3.2.4)$$

$$\Rightarrow \|AC\| = \|PR\| \quad (3.2.5)$$

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

$$\triangle ABC \cong \triangle PQR \quad (3.2.6)$$

Hence proved

3 SOLUTION

3.1. given that \rightarrow

$$\|AB\| = \|PQ\| \quad (3.0.1)$$

$$\|AM\| = \|PN\| \quad (3.0.2)$$

$$\|BC\| = \|QR\| \quad (3.0.3)$$