Solution For The School Geometry Problems

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Question

Exercise 8.1(Q no.36)

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 $\cong$ Δ PQN

b)Δ ABC $\cong$ Δ PQR

Codes and Figures

The python code for the figure is

```
./code/Traingle.py
```

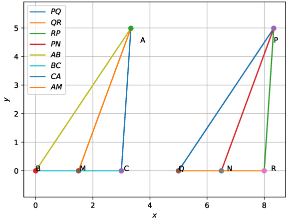
The latex- tikz code is

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

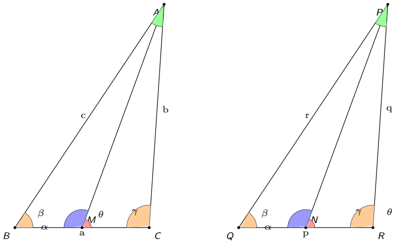
The above latex code can be compiled as standalone document

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

.



(a) By Python



(b) By Latex-tikz

Construction method

The tables below are the values used for constructing the triangles in both Python and Latex-Tikz.

Initial Input Values.	
a, p	3
b, q	5
c, r	6

Table: To construct $\triangle ACB$ and $\triangle PQR$

The steps for constructing $\triangle ACB$ are

$$(i)\mathbf{A} = \begin{pmatrix} 3.33 \\ 4.99 \end{pmatrix} (ii)\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} (iii)\mathbf{C} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$$

$$(i)\mathbf{P} = \begin{pmatrix} 8.33 \\ 4.99 \end{pmatrix} (ii)\mathbf{Q} = \begin{pmatrix} 5 \\ 5 \end{pmatrix} (iii)\mathbf{R} = \begin{pmatrix} 8 \\ 0 \end{pmatrix}$$

$$\mathbf{M} = (1/2)(\mathbf{B} + \mathbf{C})$$

$$\mathbf{N} = (1/2)(\mathbf{Q} + \mathbf{R})$$

$$\mathbf{M} = \begin{pmatrix} 1.5 \\ 0 \end{pmatrix}, \mathbf{N} = \begin{pmatrix} 6.5 \\ 0 \end{pmatrix}$$

Derived Values for *triangleDCB*.	
M	$\binom{1.5}{0}$
N	$\binom{6.5}{0}$

Table: To construct madians AN and PN

Solution

given that $\rightarrow$

$$\|\mathbf{AB}\| = \|\mathbf{PQ}\| = c = r$$

$$\|\mathbf{BC}\| = \|\mathbf{QR}\| = a = p$$

$$\|\mathbf{AM}\| = \|\mathbf{PN}\| = m = n$$

Therefore $\rightarrow$
M and **N** are the position vector of mid-point of **BC** and **QR** repectively .

$$\frac{1}{2}\|\mathbf{B} - \mathbf{C}\| = \frac{1}{2}\|\mathbf{Q} - \mathbf{R}\|$$

$$\|\mathbf{B} - \mathbf{M}\| = \|\mathbf{Q} - \mathbf{N}\|$$

Solution a)

from triangles ABM and PQR $\rightarrow$

$$\|\mathbf{AB}\| = \|\mathbf{PQ}\| \, (given)$$

$$\|\mathbf{AM}\| = \|\mathbf{PN}\| \, (given)$$

$$\|\mathbf{M} - \mathbf{B}\| = \|\mathbf{N} - \mathbf{Q}\|$$

(Both m and N are the mid points)

$\implies \triangle ABM$ and $\triangle PQN$ are congruent to each other by SSS congruency.
Hence, proved

Solution b)

given that $\rightarrow$

$$\|\mathbf{AM}\| = \|\mathbf{PN}\|$$

from triangle ABC and PQN $\rightarrow$

$$\|\mathbf{M} - \mathbf{C}\| = \|\mathbf{N} - \mathbf{R}\|$$

$$\because \Delta ABM \cong \Delta PQN$$

$$180 - \angle AMB = 180 - \angle PNQ$$

$$\angle AMC = \angle PNR$$

from SAS congurancy $\rightarrow$

$$\Delta AMC \cong \Delta PNR$$

Therefore $\rightarrow$

$$\|\mathbf{A} - \mathbf{C}\| = \|\mathbf{P} - \mathbf{R}\|$$

from triangle ABC and PQR $\rightarrow$

$$\|\mathbf{A} - \mathbf{M}\| = \|\mathbf{P} - \mathbf{N}\|$$

$$\|\mathbf{M} - \mathbf{C}\| = \|\mathbf{N} - \mathbf{R}\|$$

$$\angle AMC = \angle PNR$$

from SAS congurancy $\rightarrow$

$$\Delta AMC \cong \Delta PNR$$

Hence proved