

Math Document Template

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Abstract—This is a document explaining for a question on the concept of area of triangles.

Download all python codes from

```
svn co https://github.com/Ashuwin/Summer_20/
trunk/triangle p8.1.2/codes
```

and latex-tikz codes from

```
svn co https://github.com/Ashuwin/Summer_20/
trunk/triangle p8.1.2/figs
```

1 PROBLEM

Triangles on the same base(or equal bases) and between the same parallels are equal in area.

2 CONSTRUCTION

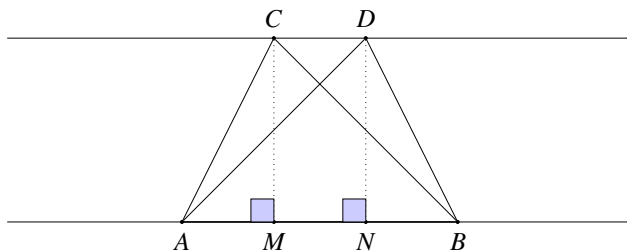


Fig. 2.0: Triangles by Latex-Tikz

2.1. The design parameters used for construction of figure 2.0

Solution: See Table. 2.1.

2.2. Draw fig. 2.2.

Solution: The following Python code generates Fig. 2.2

```
codes/triangle.py
```

and the equivalent latex-tikz code generating Fig. 2.2 is

```
figs/triangle.tex
```

Design Parameters	
Parameters	Value
A	$\begin{pmatrix} 2 \\ 0 \end{pmatrix}$
B	$\begin{pmatrix} 5 \\ 0 \end{pmatrix}$
C	$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$
D	$\begin{pmatrix} 4 \\ 2 \end{pmatrix}$

TABLE 2.1: Triangles ABC and ABD

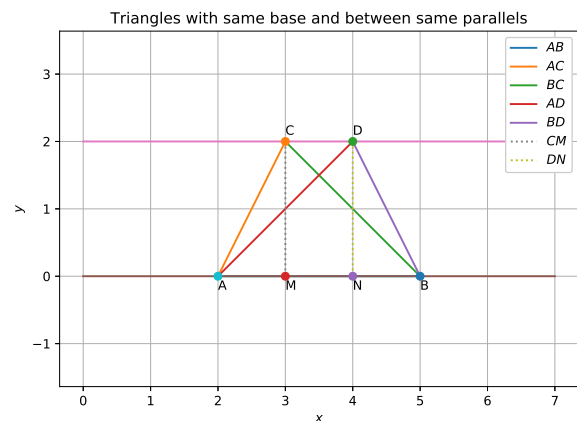


Fig. 2.2: Triangles generated using python

3 SOLUTION

3.1. Area of a triangle = $\frac{1}{2} \times (\text{base}) \times (\text{height})$

3.2. $\|\mathbf{M} - \mathbf{C}\| = \|\mathbf{D} - \mathbf{N}\| = x$ (Perpendicular distance between the parallel lines)

3.3. Area of $\triangle ABC = \frac{1}{2} \times \|\mathbf{B} - \mathbf{A}\| \times \|\mathbf{M} - \mathbf{C}\|$

$$\text{ar}(\triangle ABC) = \frac{1}{2} \times \|\mathbf{B} - \mathbf{A}\| \times x$$

3.4. Area of $\triangle ABD = \frac{1}{2} \times \|\mathbf{B} - \mathbf{A}\| \times \|\mathbf{N} - \mathbf{D}\|$

$$ar(\triangle ABD) = \frac{1}{2} \times \|\mathbf{B} - \mathbf{A}\| \times x$$

3.5. From 3.3 and 3.4,

$$\implies ar(\triangle ABC) = ar(\triangle ABD)$$

Hence, the triangles with same base and between same parallels are equal in area.