

ASSIGNMENT-2

UNNATI GUPTA

Download all python codes from

<https://github.com/unnatigupta2320/Assignment-2/tree/master/codes>

and latex-tikz codes from

<https://github.com/unnatigupta2320/Assignment-2/tree/master>

1 QUESTION No. 2.36

Construct a quadrilateral MIST where $MI = 3.5$, $IS = 6.5$, $\angle M = 75^\circ$, $\angle I = 105^\circ$ and $\angle S = 120^\circ$.

2 SOLUTION

For this quadrilateral adjacent side lengths $MI = 3.5$, $IS = 6.5$ and angles, $\angle M = 75^\circ$, $\angle I = 105^\circ$ and $\angle S = 120^\circ$.

Also, $\angle M = 75^\circ$ and $\angle I = 105^\circ$,
where $\angle M + \angle I = 75^\circ + 105^\circ = 180^\circ$,

$\Rightarrow MT \parallel IS$ (MI being the transversal)

As, sum of adjacent angle on same side is 180° only when lines are parallel. Now, considering ST as another transversal on parallel lines MT and IS then $\angle S$ and $\angle T$ being on same side of transversal, we get

$$\Rightarrow \angle S + \angle T = 180^\circ, \quad (2.0.1)$$

$$\Rightarrow 120^\circ + \angle T = 180^\circ; \quad (2.0.2)$$

$$\Rightarrow \angle T = 180^\circ - 120^\circ; \quad (2.0.3)$$

$$\Rightarrow \angle T = 60^\circ; \quad (2.0.4)$$

Now taking sum of all the angles given and $\angle T$ we get

$$\Rightarrow \angle M + \angle I + \angle S + \angle T \quad (2.0.5)$$

$$\Rightarrow 75^\circ + 105^\circ + 120^\circ + 60^\circ, \Rightarrow 360^\circ; \quad (2.0.6)$$

So construction of given quadrilateral is possible as sum of all the angles is equal to 360° .

Now, Using cosine formula we can find SM:

$$\|S-M\|^2 = \|M-I\|^2 + \|I-S\|^2 - 2 \times \|M-I\| \times \|I-S\| \cos I;$$

$$\Rightarrow SM^2 = 3.5^2 + 6.5^2 - 2 \times 3.5 \times 6.5 \times \cos 105^\circ;$$

$$\Rightarrow SM = \sqrt{8.14 \times 8.14};$$

$$\Rightarrow SM = 8.14 \quad (2.0.7)$$

- 1) Let the coordinate of vertices M, I, S be $M(0,0)$; $I(3.5,0)$; $S(p,q)$;
- 2) Using Distance Formula we have
 - $SM^2 = (p-0)^2 + (q-0)^2$;
 - $SM^2 = p^2 + q^2$;
 - $p^2 + q^2 = 8.14$ ($SM = 8.14$);
- 3) And, $SI^2 = (p-3.5)^2 + (q-0)^2$;
- 4) $(p-3.5)^2 + q^2 = 6.5^2$ ($SI = 6.5$);
- 5) On solving, these two equations we get $(p,q) = (5.46, 6.036)$; Similarly, we can obtain T as $(2.42, 9.03)$
- 6) Now, On constructing the given quadrilateral we, get:

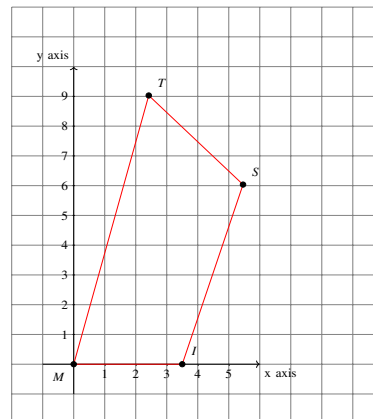


Fig. 2.1: Quadrilateral MIST