

# 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  $180^\circ$  only when lines are parallel.

Now, considering ST as another transversal on parallel lines MT and IS, then

$\angle S + \angle T = 180^\circ$ , (angles on same side of transversal)

$$\Rightarrow 120^\circ + \angle T = 180^\circ;$$

$$\Rightarrow \angle T = 180^\circ - 120^\circ;$$

$$\Rightarrow \angle T = 60^\circ;$$

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

$$\Rightarrow \angle M + \angle I + \angle S + \angle T$$

$$\Rightarrow 75^\circ + 105^\circ + 120^\circ + 60^\circ,$$

$$\Rightarrow 360^\circ;$$

So construction of given quadrilateral is possible as sum of all the angles is equal to  $360^\circ$ .

Let the coordinate of vertices M, I, S be

$M(0, 0)$ ;  $I(3.5, 0)$ ;  $S(p, q)$ ;

Using cosine formula:

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

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

$$SM = \sqrt{8.14 * 8.14};$$

$$\Rightarrow SM = 8.14;$$

Also, Using, Distance Formula;

$$\Rightarrow SM^2 = (p - 0)^2 + (q - 0)^2;$$

$$\Rightarrow SM^2 = p^2 + q^2;$$

$$\Rightarrow p^2 + q^2 = 8.14 \quad \text{--- (1)}$$

$$\text{And, } SI^2 = (p - 3.5)^2 + (q - 0)^2;$$

$$\Rightarrow (p - 3.5)^2 + q^2 = 6.5^2 \quad \text{--- (2)}$$

On solving, these two equations we get

$$(p, q) = (5.46, 6.036)$$

Similarly we can obtain, T as (2.42, 9.03)

Now, On constructing the given quadrilateral we, get:

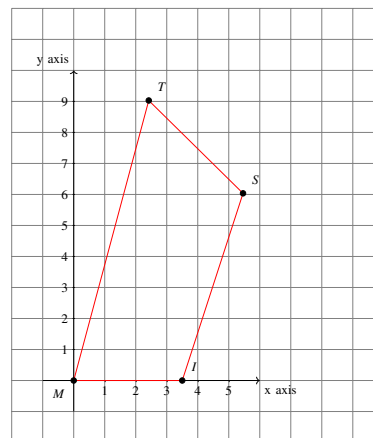


Fig. 2.1: Quadrilateral MIST