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 $MI = 3.5, IS = 6.5, \angle M = 75°, \angle I = 105°$ and $\angle S = 120°$.

2 SOLUTION

For this quadrilateral MIST, we have

$$MI = 3.5, \tag{2.0.1}$$
$$IS = 6.5 \tag{2.0.2}$$
$$\angle M = 75°, \tag{2.0.3}$$
$$\angle I = 105° \tag{2.0.4}$$
$$\angle S = 120°.\text{where} \tag{2.0.5}$$
$$\angle M + \angle I = 75° + 105° = 180°, \tag{2.0.6}$$

$\implies MT \parallel IS$ ($\because$ 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,*weget*

$$\implies \angle S + \angle T = 180°, \tag{2.0.7}$$
$$\implies 120° + \angle T = 180°; \tag{2.0.8}$$
$$\implies \angle T = 180° - 120°; \tag{2.0.9}$$
$$\implies \angle T = 60° \tag{2.0.10}$$

Now taking sum of all the angles given and (2.0.10) we get

$$= \angle M + \angle I + \angle S + \angle T \tag{2.0.11}$$
$$= 75° + 105° + 120° + 60°, \tag{2.0.12}$$
$$= 360°; \tag{2.0.13}$$

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:
$\|\mathbf{S}-\mathbf{M}\|^2 = \|\mathbf{M}-\mathbf{I}\|^2 + \|\mathbf{I}-\mathbf{S}\|^2 - 2 \times \|\mathbf{M}-\mathbf{I}\| \times \|\mathbf{I}-\mathbf{S}\| \cos I;$
$\implies SM^2 = 3.5^2 + 6.5^2 - 2 \times 3.5 \times 6.5 \times \cos 105°;$
$\implies \sqrt{8.14 * 8.14};$

$$\implies SM = 8.14 \tag{2.0.14}$$

Also,using sine formula in $\triangle MIS$, *wehave*
$\frac{\sin M}{m} = \frac{\sin I}{i} = \frac{\sin S}{s};$

$$\frac{\sin 105}{8.14} = \frac{\sin M}{6.5}; \tag{2.0.15}$$
$$\sin M = 0.7713; \tag{2.0.16}$$
$$\angle M = \arcsin 0.7713; \tag{2.0.17}$$
$$\angle M = 50.47°; \tag{2.0.18}$$

Now,polar coordinates of vertex S of $\triangle MIS be$
(SM cos $M, SM \sin M$)

$$weget, S(5.18, 6.27) \tag{2.0.19}$$

Similarly, *we* can get vertex T of$\triangle MTS as$

$$T(2.42, 9.03) \tag{2.0.20}$$

1) Now, we have the coordinate of vertices M,I,S,T as M(0,0); I(3.5,0); S(5.18,6.27);T(2.42,9.03);
2) We can construct the quadrilateral.On constructing the given quadrilateral we, get:

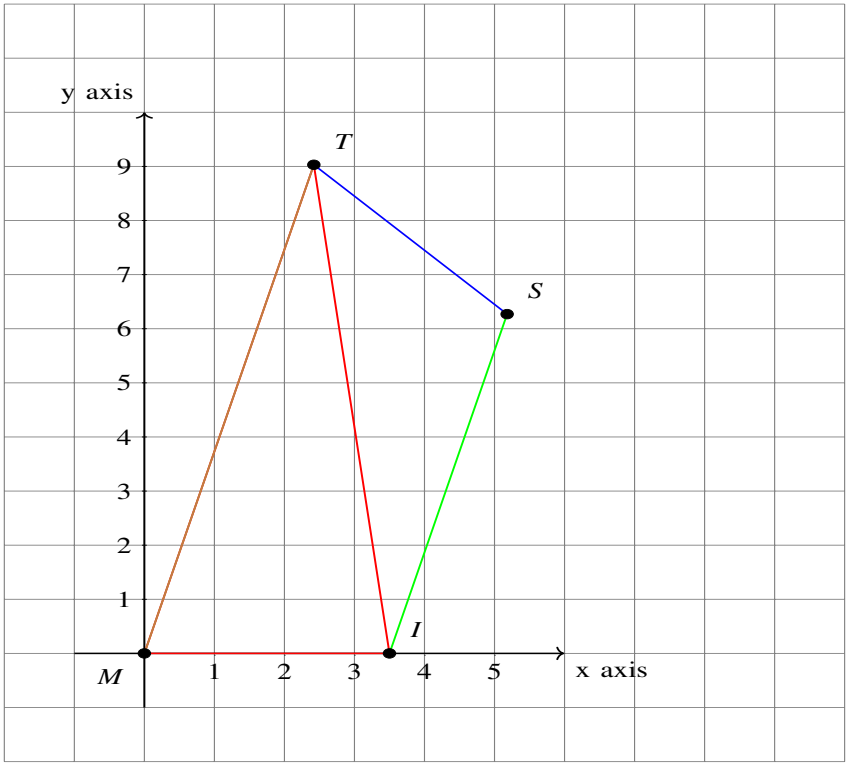

Fig. 2.1: Quadrilateral MIST