Assignment 1

AI1110: Probability and Random Variables - ICSE 2019 Grade10

Sathvika marri - ai21btech11020

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Question: 6 (a)

In the given figure, $\angle PQR = \angle PST = 90°$,PQ = 5 cm and PS = 2 cm.

(i)Prove that $\triangle PQR \sim \triangle PST$.

(ii)Find ratio of Area of $\triangle PQR and Area of quadrilateral SRQT$.

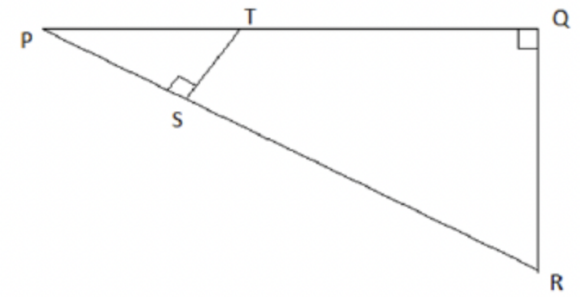

Figure 1: triangle PQR

Solution:-

(i)To prove $\triangle PQR \sim \triangle PST$

consider $\triangle PQR and \triangle PST$

$\angle PQR = \angle PST = 90°$ (given)

$\angle piscommon.$

$\boxed{\therefore \triangle PQR \sim \triangle PST(ByAAAcriterion)}$

(ii) Now,Area of $\triangle PQRis$,

From the given diagram we can say

$$= \frac{PQ}{PS} = \frac{QR}{ST} \tag{1}$$

PQ=5cm(given),QR=5cm(stated above)

$$= \frac{1}{2} \times 5 \times 5 = \frac{25}{2} \tag{2}$$

Area of triangle PST

$$= \frac{1}{2} \times PS \times ST \tag{3}$$

PS=2cm(given), ST=2cm(stated above)

$$= \frac{1}{2} \times 2 \times 2 = \frac{4}{2} \tag{4}$$

Area of Quadrilateral SQRT = Area of triangle PQR - Area of triangle PST

$$= \frac{25}{2} - \frac{4}{2} = \frac{21}{2} \tag{5}$$

$$\implies \frac{25/2}{21/2} = \frac{25}{21} \tag{6}$$

$$\boxed{\therefore ratio = \frac{25}{21}}$$

METHOD-2: steps for construction;

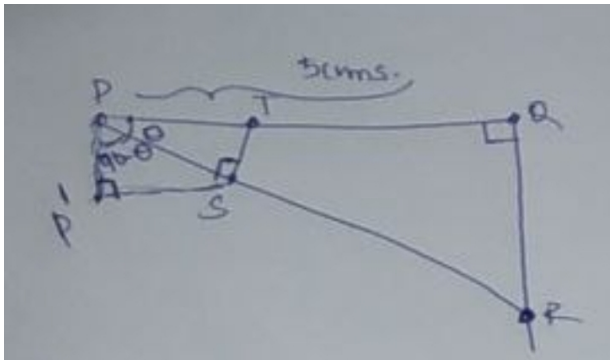

Figure 2: triangle-2

From the above figure;
$\frac{PQ}{PR}$= cos θ

$$PR = \frac{PQ}{cos\theta} \tag{7}$$

$\frac{QR}{PR}$= tan θ

$$QR = tan\theta PQ \tag{8}$$

Given, PS=2cm PQ=5cm
take an angle; $\angle RPQ = 60°$

$$let\mathbf{Q} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{9}$$

$$Pwillbe; \mathbf{P} = \begin{pmatrix} -5 \\ 0 \end{pmatrix} \tag{10}$$

$$Rwillbe; \mathbf{R} = \begin{pmatrix} 0 \\ -tan\theta PQ \end{pmatrix} \tag{11}$$

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PT will be; $\implies \frac{PS}{PT} = cos\theta$

$$Twillbe; \mathbf{T} = \begin{pmatrix} -(5 - \frac{PS}{cos\theta}) \\ 0 \end{pmatrix} \tag{13}$$

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$$\frac{P'S}{PS} = sin(90 - \theta) \tag{15}$$

$$P'S = PSsin(90 - \theta) \tag{16}$$

$$\frac{P'P}{PS} = cos(90 - \theta) \tag{17}$$

$$P'P = PScos(90 - \theta) \tag{18}$$

$$\mathbf{S} = \begin{pmatrix} -(5 - PScos\theta) \\ -Psin\theta \end{pmatrix} \tag{19}$$

(20)

Using the above coordinates,
Generating the figure using python:

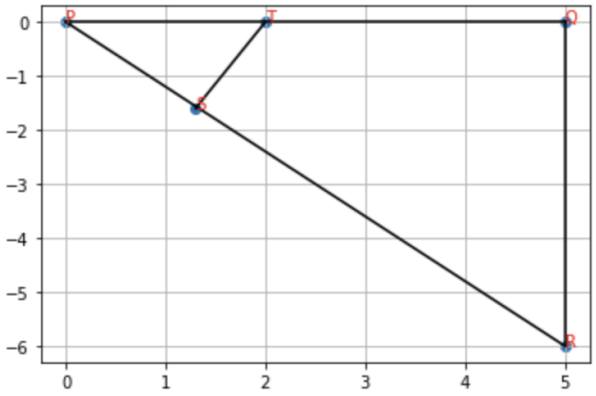

Figure 3: constructed triangle

The input and output parameters required for drawing the figure are available in the below table.

Variable	Value	Input/Output
R	5	Input
$\angle RPQ$	60°	Input
$\mathbf{Q}$	$\begin{pmatrix} 0 \\ 0 \end{pmatrix}$	Input
$\mathbf{P}$	$\begin{pmatrix} -5 \\ 0 \end{pmatrix}$	Input
$\mathbf{R}$	$\begin{pmatrix} 0 \\ -5\tan 60^\circ \end{pmatrix}$	output
$\mathbf{T}$	$\begin{pmatrix} -(5-2\sec 60^\circ) \\ 0 \end{pmatrix}$	Output
$\mathbf{S}$	$\begin{pmatrix} -(5-2\cos 60^\circ) \\ -5\sin 60^\circ \end{pmatrix}$	Output