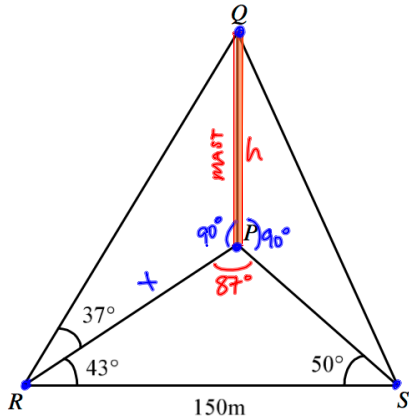


5. 3D problems

e.g. $[PQ]$ is a vertical mast and P, R, S are points on horizontal ground.

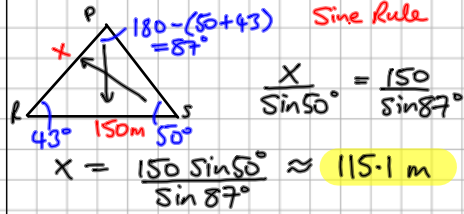
$|\angle PRS| = 43^\circ$, $|\angle PSR| = 50^\circ$,

$|\angle PRQ| = 37^\circ$ and $|RS| = 150\text{m}$.

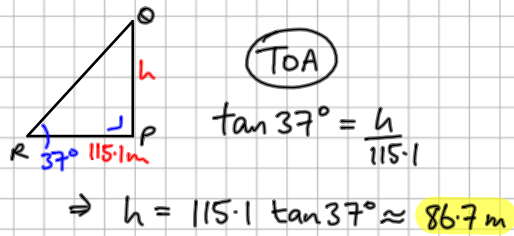


Calculate

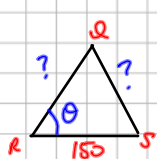
(i) $|PR|$, correct to one decimal place, ($x=?$)



(ii) $|PQ|$, correct to one decimal place, ($h=?$)



Plan: find sides and use the Cosine Rule



(1) $|RS|=?$

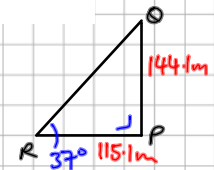
(iii) $|\angle RQS|$, correct to the nearest degree. ($\theta=?$)

$|RQ|=?$

CAH

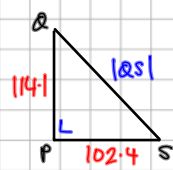
$$\cos 37^\circ = \frac{115.1}{|RQ|}$$

$$|RQ| = \frac{115.1}{\cos 37^\circ} \approx 144.1 \text{ m}$$

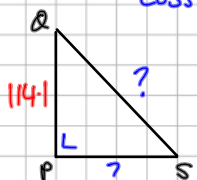


(2) $|QS|=?$

need $|PS|$



Sine Rule



Pythagoras

$$|PS| = \frac{150 \sin 43^\circ}{\sin 87^\circ} \approx 102.4 \text{ m}$$

$$|QS| = \sqrt{(114.1)^2 + (102.4)^2} \approx 153.3 \text{ m}$$

(3) $|\angle RQS|=?$

Cosine Rule

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Rightarrow A = \cos^{-1} \left(\frac{a^2 - b^2 - c^2}{-2bc} \right)$$

$$|\angle RQS| = \cos^{-1} \left(\frac{(153.3)^2 - (150)^2 - (144.1)^2}{-2(150)(144.1)} \right)$$

$$\approx 63^\circ$$