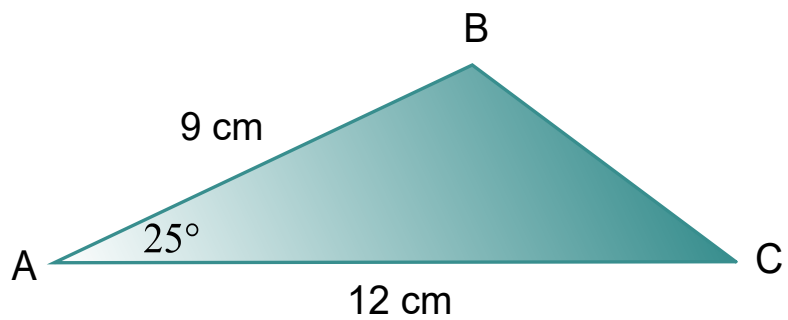


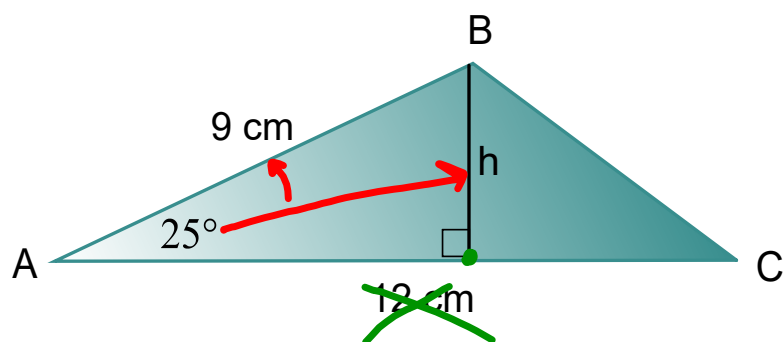
Area of a Triangle

Trigonometric Formula (given an angle and two sides SAS)

Example:

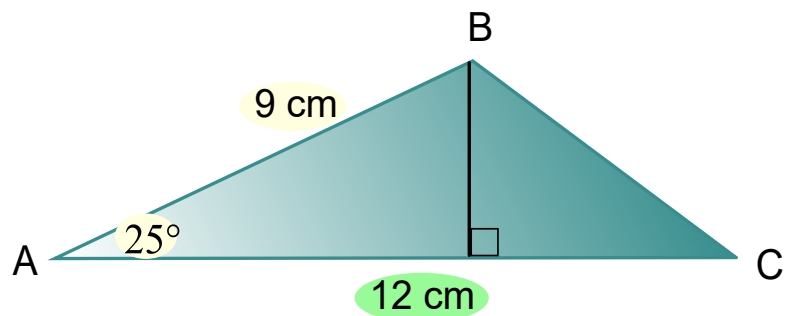


Calculate the height of $\triangle ABC$



$$\sin(25^\circ) = \frac{h}{9}$$

$$h = \underline{9} \times \sin(\underline{25^\circ})$$



Notice: The height can be expressed as the sine of the given angle times one of the given sides.

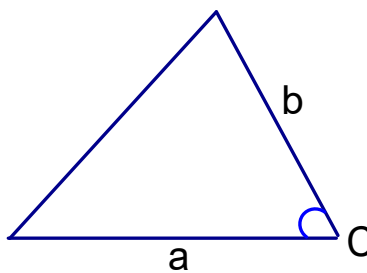
$$\text{Area} = \frac{(\text{base}) \times (\text{height})}{2}$$

$$\text{Area} = \frac{(12) \times (9 \sin 25^\circ)}{2} = \frac{(12) \times (3.804)}{2} = 22.82 \text{ cm}^2$$

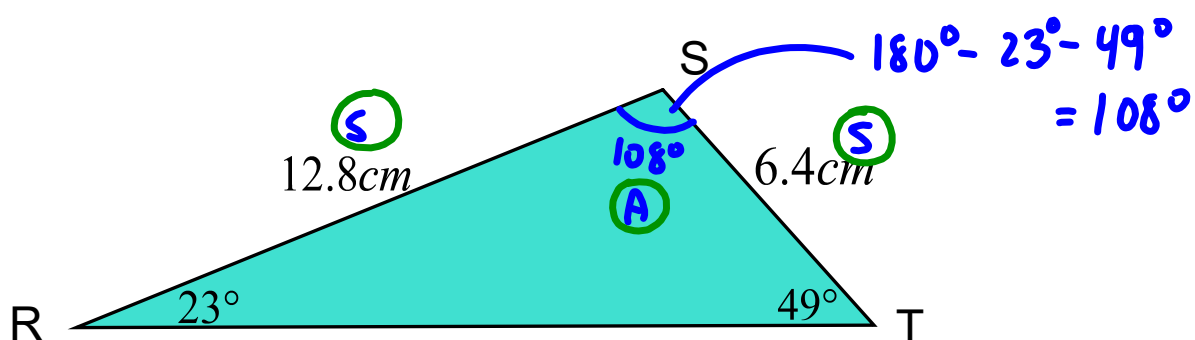
Notice: The base of the triangle equals the other given side.

Given two sides and the angle between them, we can use the following formula to calculate the area of the triangle.

$$\text{Area} = \frac{a \times b \times \sin C}{2}$$

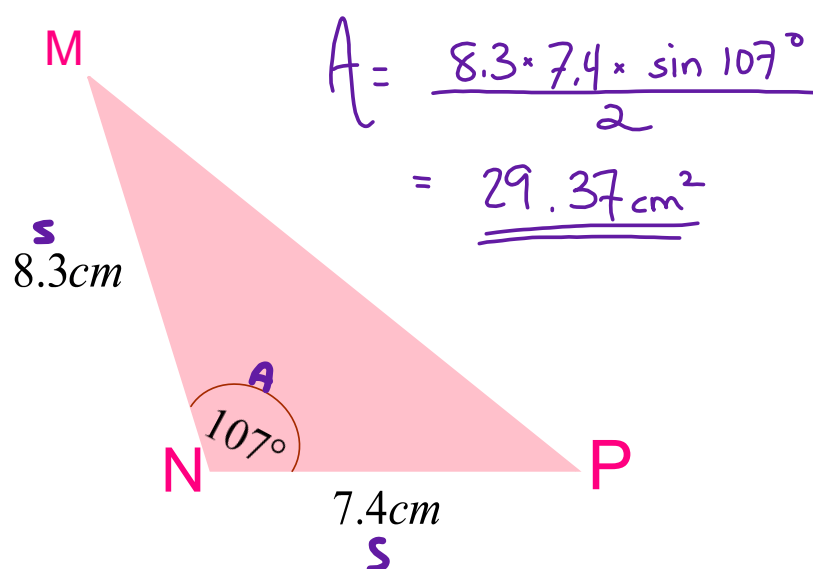


Example: Calculate the area of $\triangle RST$.



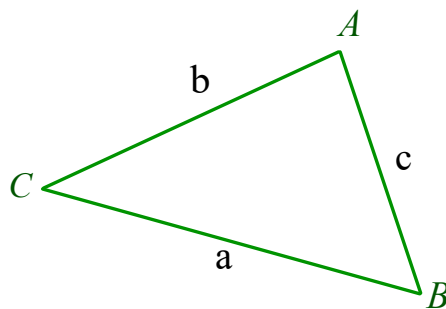
$$A = \frac{12.8 \cdot 6.4 \cdot \sin 108^\circ}{2} = \underline{\underline{38.96 \text{ cm}^2}}$$

Example: Calculate the area of $\triangle MNP$.



Hero's Formula

For finding the area of a triangle, given the lengths of its sides (SSS).



$$\text{Perimeter} = a + b + c$$

1. Calculate the **semi-perimeter**; i.e, $p = \frac{\text{Perimeter}}{2}$
2. Calculate the **area** using the **formula**

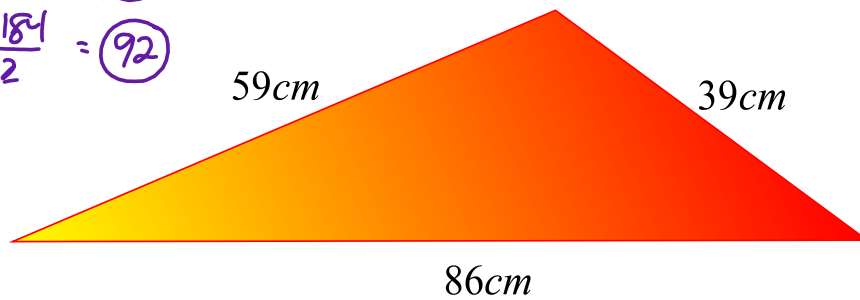
$$A = \sqrt{p \cdot (p - a) \cdot (p - b) \cdot (p - c)}$$

*all multiplications

Example: Calculate the area.

$$\textcircled{1} p = \frac{59 + 39 + 86}{2}$$

$$p = \frac{184}{2} = \textcircled{92}$$



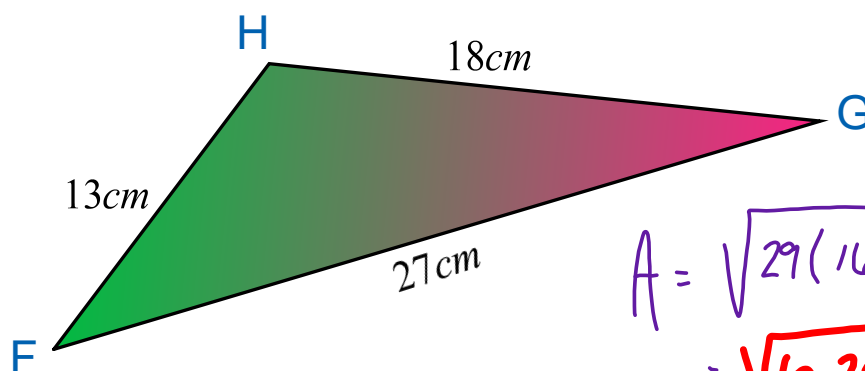
$$A = \sqrt{92(92-59)(92-39)(92-86)} \text{ cm}^2$$

$$A = \sqrt{92 \cdot (33) \cdot (53) \cdot (6)} \text{ cm}^2 \Rightarrow A = \sqrt{965\,448} \text{ cm}^2$$

$$= \underline{\underline{982.57 \text{ cm}^2}}$$

Example: Calculate the area.

$$p = \frac{13 + 27 + 18}{2} = 29$$



$$\begin{aligned} A &= \sqrt{29(16)(11)(2)} \\ &= \sqrt{10208} \\ &= 101.03 \text{ cm}^2 \end{aligned}$$

Example: Calculate the area.

$$p = \frac{7 + 13 + 10}{2} = 15$$

$$A = \sqrt{15(2)(5)(8)}$$

$$= \sqrt{1200}$$

$$= \underline{\underline{34.64 \text{ dm}^2}}$$

