

April 13

MPM 2D

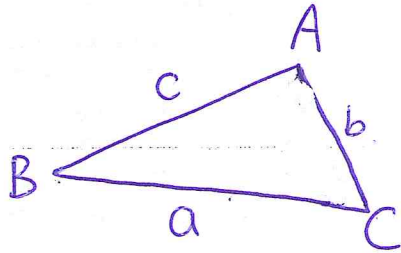
Ms. Kueh Park

Labelling Triangles

Sine Law

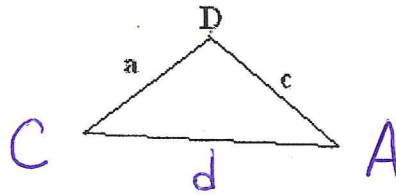
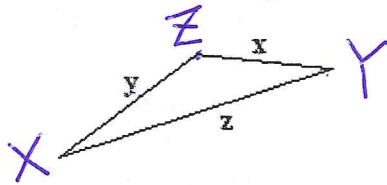
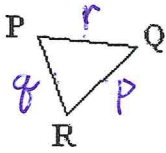
* Quiz on Wed (AP15)

* Youtube: "Maths Tutorial: Trigonometry Law of Sines" by vcefurthermaths



Sides are labelled with small letters. Vertices are labelled with capital letters.

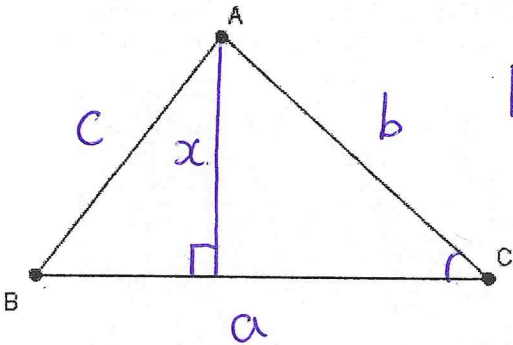
Example 1 Completely label these triangles:



*The primary trig ratios (sin, cos and tan) can only be used when we have a 90° (right) angle.

Deriving the sine law

Suppose we no longer have a 90° triangle.



$\triangle \rightarrow \sin B = \frac{x}{c}$ ^{SOH} $\rightarrow C \sin B = x$ ^{Multiply both sides by C} ①

$\triangle \leftarrow \sin C = \frac{x}{b}$ $\rightarrow b \sin C = x$ ②

Sub ① into ②

$\frac{b \sin C}{bc} = \frac{c \sin B}{bc}$

$\frac{\sin C}{c} = \frac{\sin B}{b}$

There are 2 forms of the sine law:

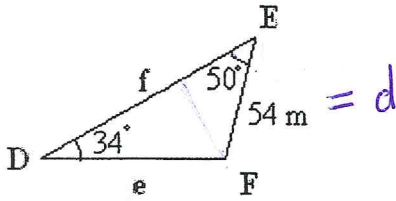
$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ | $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Sine Law can be used...

1. When you know 2 angles and 1 side or
2. When you know 2 sides and 1 angle

Example 2 Given DEF with 2 angles and 1 side. Find the missing values.

$$\angle F = ? \quad e = ? \quad f = ?$$



$$\angle F = 180^\circ - 50^\circ - 34^\circ = 96^\circ$$

$$\frac{f}{\sin F} = \frac{d}{\sin D}$$

~~$$\frac{f}{\sin 96^\circ} = \frac{54}{\sin 34^\circ}$$~~

$$f \cdot \sin 34^\circ = 54 \cdot \sin 96^\circ$$

$$\div \sin 34^\circ \qquad \div \sin 34^\circ$$

$$f = \frac{54 \cdot \sin 96^\circ}{\sin 34^\circ}$$

$$\therefore f = 96 \text{ m}$$

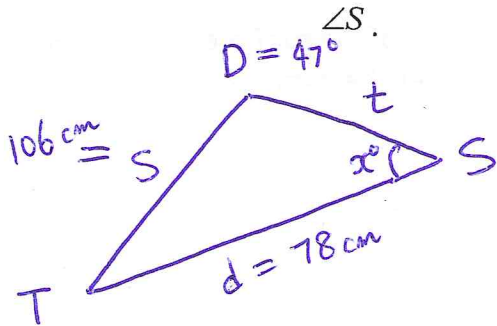
$$\frac{e}{\sin E} = \frac{d}{\sin D}$$

~~$$\frac{e}{\sin 50^\circ} = \frac{54}{\sin 34^\circ}$$~~

$$e = \frac{54 \cdot \sin 50^\circ}{\sin 34^\circ}$$

$$\therefore e = 74 \text{ m}$$

Example 3 Given ΔDST with $\angle D = 47^\circ$, $d = 78 \text{ cm}$, and $s = 106 \text{ cm}$, find the measure of



$$\frac{\sin S}{s} = \frac{\sin D}{d}$$

~~$$\frac{\sin x}{106} = \frac{\sin 47^\circ}{78}$$~~

$$\sin x^\circ \times 78 = \frac{\sin 47^\circ \times 106}{78}$$

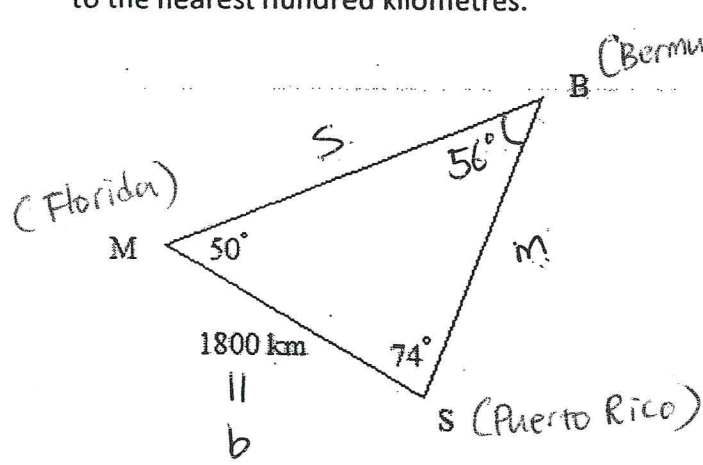
$$\sin(x) = \left(\frac{\sin 47^\circ \times 106}{78} \right)$$

$$x = \sin^{-1} \left(\frac{\sin 47^\circ \times 106}{78} \right)$$

$$x = 84^\circ$$

Example 4 Perimeter of the Bermuda Triangle $S = ?$ $m = ?$

Use the information given on the diagram to determine the perimeter of the Bermuda Triangle, to the nearest hundred kilometres.



$\angle B = 180^\circ - 50^\circ - 74^\circ = 56^\circ$

$$\frac{S}{\sin 74^\circ} = \frac{1800}{\sin 56^\circ}$$

$$\times \sin 74^\circ \quad \times \sin 74^\circ$$

$$S = \frac{1800 \times \sin 74^\circ}{\sin 56^\circ}$$

$S = 2087 \text{ km}$

$$\frac{m}{\sin 50^\circ} = \frac{1800}{\sin 56^\circ}$$

$$\times \sin 50^\circ \quad \times \sin 50^\circ$$

$$m = \frac{1800 \cdot \sin 50^\circ}{\sin 56^\circ}$$

$$m = 1663 \text{ km}$$

Perimeter = 1800 + S + m

$\therefore P = 1800 + 2087 + 1663$

$\therefore P = 5600 \text{ km}$

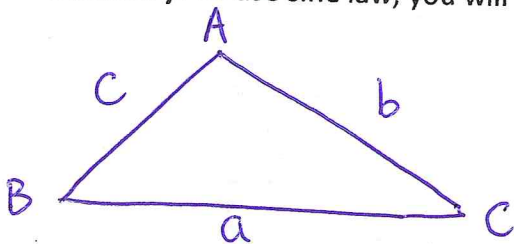
Example 5 A cottage under construction is to be 12.6 m wide. The two sides of the roof are to be supported by rafters that meet at a 50° angle. How long should the rafters be if they are the same size?

Sometimes you will have to use **both** sine law, and primary trig ratios.

Example 6

Omar and Ritu are determining the height of a cliff they plan to climb. They are 18 m apart on the same side of the cliff. Sighting along the same line, Omar views the top of the cliff at an angle of elevation of 23° , and Ritu views the top at an angle of elevation of 29° . How high is the cliff? **Hint: Draw the diagram!**

Summary: To use sine law, you will need a matching pair of sides and angles:



If you are looking for a side use this form of the sine law:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

If you are looking for an angle use this form of the sine law:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$