What's Going On?

Checking In

Minds on sohcahtoa? Sine Law?

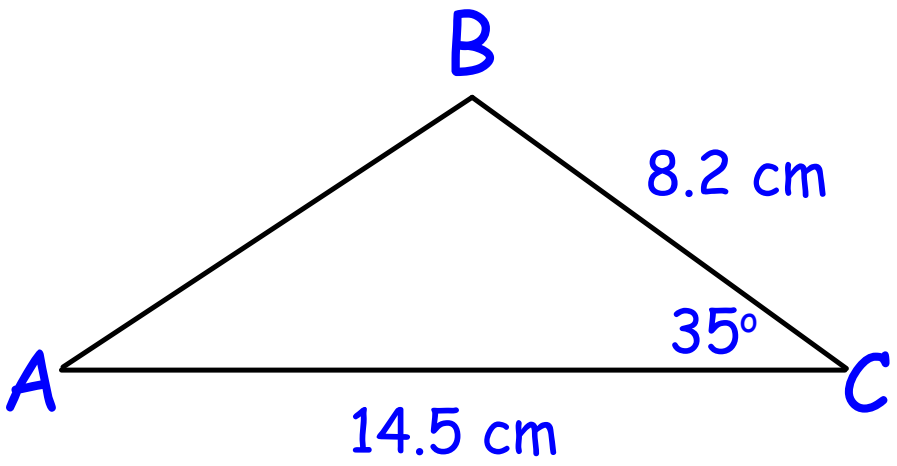
Action! The Cosine Law

Consolidation Solve the Triangles

Learning Goal - I will be able to use the Cosine Law to solve for missing sides and angles in non-right triangles!

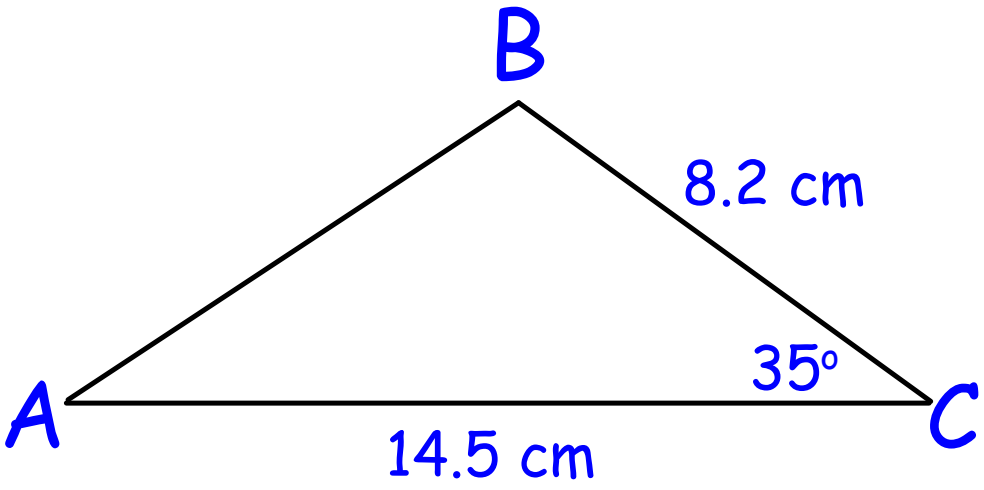
Minds on

"Solve" the triangle below.



Minds on

"Solve" the triangle below.



sohcahtoa? Nope!

- No right angles!!

Sine Law? NOPE!

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

$$\frac{8.2}{\sin A} = \frac{14.5}{\sin B} = \frac{c}{\sin 35^\circ}$$

- We don't have a corresponding side and angle! (No complete ratio!)

Action!

The Cosine Law!

Pythagorean Theorem

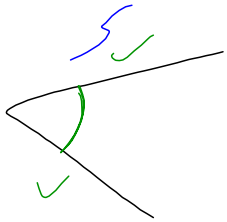
$$c^2 = a^2 + b^2 - 2ab\cos(C)$$

The Cosine Law is **ALSO** used to solve for the lengths of sides and measures of angles in non-right triangles.

NOTE: We use The Cosine Law when we **don't** have a corresponding side and angle. Instead, we have

two sides and a contained angle

OR



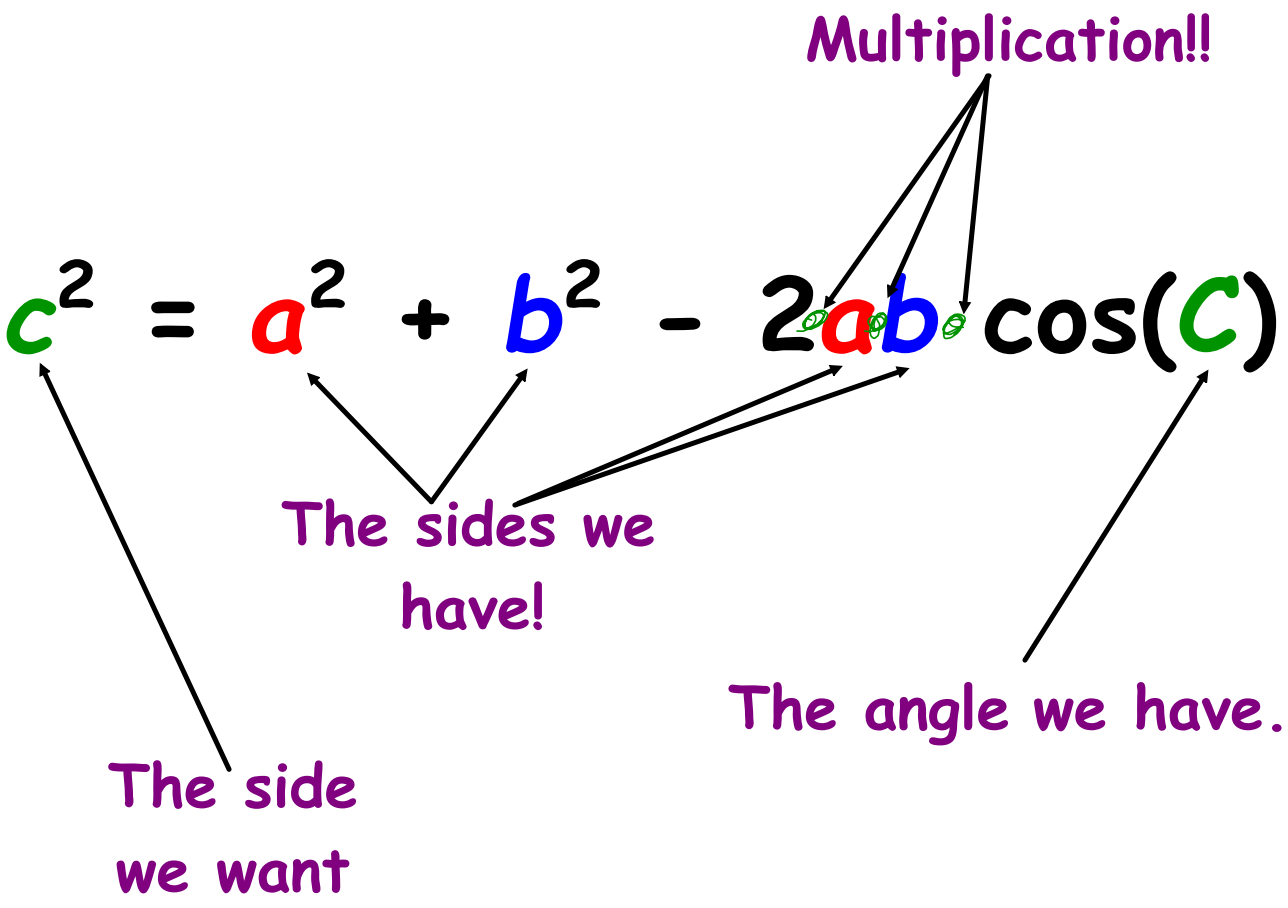
three sides

Using The Cosine Law to Solve for a Side

The Cosine Law is set-up to solve for sides.

To use The Cosine Law to solve for a side,

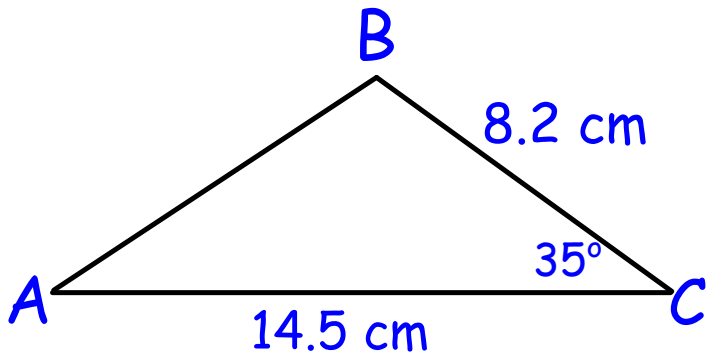
simply plug everything in and solve.



To use The Cosine Law to solve for a side:

$$c^2 = a^2 + b^2 - 2ab\cos(C)$$

- plug in a, b and angle C
- add a^2 and b^2
- multiply $2 \times a \times b \times \cos(C)$
- subtract the pieces
- square root to get c



Determine the length of side c.

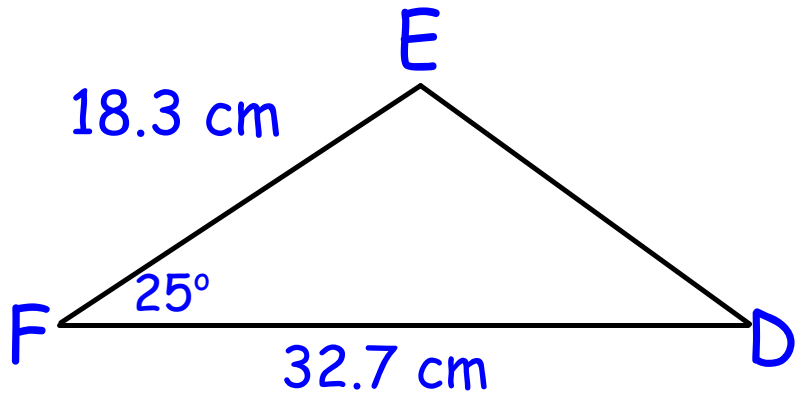
$$c^2 = a^2 + b^2 - 2ab\cos C$$

$$c^2 = 8.2^2 + 14.5^2 - 2(8.2)(14.5)\times\cos 35$$

$$c^2 = 277.49 - 194.79$$

$$c = \sqrt{82.7}$$

$$c = 9.1\text{ cm}$$



Determine the length of side f.

$$f^2 = d^2 + e^2 - 2de \times \cos F$$

$$f^2 = 18.3^2 + 32.7^2 - 2 \times 18.3 \times 32.7 \times \cos 25$$

$$f^2 = 1404.16 - 1064.69$$

$$f^2 = 319.49$$

$$f = 17.9 \text{ cm}$$

Using The Cosine Law to Solve for an Angle

We can also use Cosine Law to solve for an angle when we are given 3 sides !

We do this by rearranging the formula.

$$c^2 = a^2 + b^2 - 2ab\cos(C)$$

The sides we have!

The angle we are looking for. (Corresponds to side c)

To use The Cosine Law to solve for an angle:

$$c^2 = a^2 + b^2 - 2ab\cos(C)$$

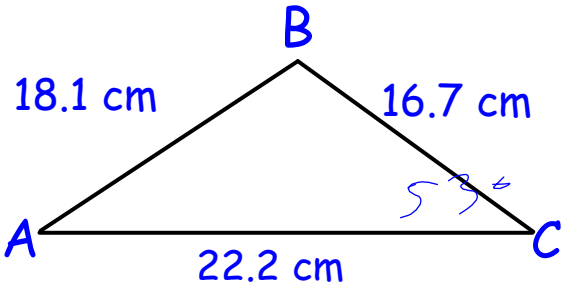
- rewrite cosine law for your triangle
- calculate c^2
- add a^2 and b^2
- multiply $2 \times a \times b$

$\square = \square - \square \cos C$

1. subtract from both sides

2. divide on both sides

Take the inverse cos of both sides!



Determine the measure of angle C.

$c^2 = a^2 + b^2 - 2ab\cos C$

$18.1^2 = 16.7^2 + 22.2^2 - 2(16.7)(22.2)\cos C$

$327.61 = 771.73 - 741.46\cos C$

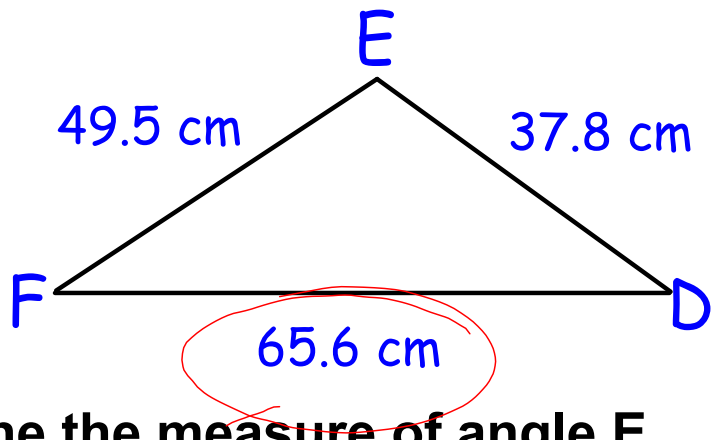
$-771.73 \quad -771.73$

$\frac{-444.12}{-741.46} = \frac{-741.46\cos C}{-741.46}$

$\cos C = 0.5990$

$C = \cos^{-1}(0.5990)$

$C = 53^\circ$



Determine the measure of angle E.

$e^2 = d^2 + f^2 - 2df\cos E$

$65.6^2 = 49.5^2 + 37.8^2 - 2(49.5)(37.8)\cos E$

$4303.36 = 3479.09 - 3742.2\cos E$

$-3479.09 \quad -3479.09$

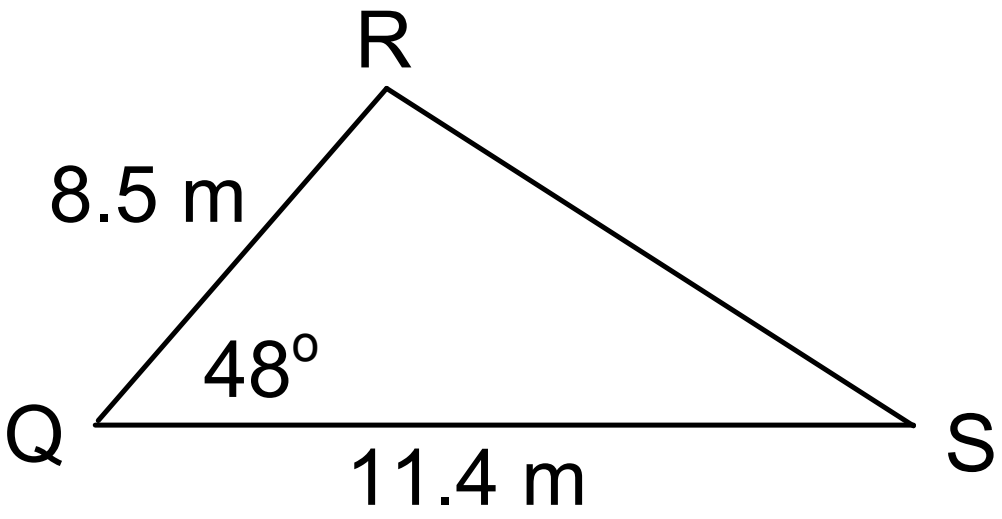
$\frac{424.27}{-3742.2} = \frac{-3742.2\cos E}{-3742.2}$

$\cos E = -0.1134$

$E = 96.5^\circ$

Consolidation

"Solve" the Triangle



We can use a combination of The Cosine Law and The Sine Law to "solve" triangles!

Consolidation

"Solve" the Triangle