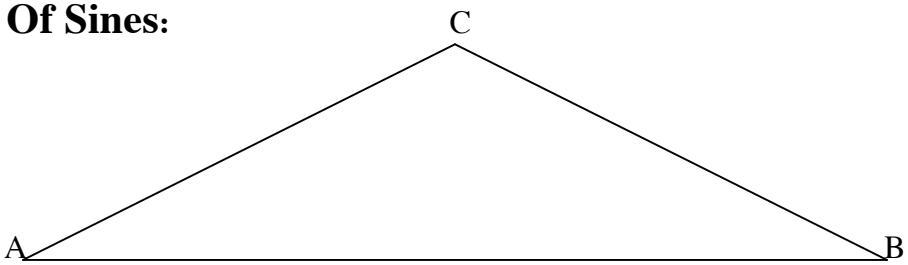
Proving the Law Of Sines:



Label sides of triangle, a,b,c and angles α, β and γ.
Draw $\overline{CD} \perp \overline{AB}$. Label it h.

In ΔACD, $\sin\alpha =$ In ΔBCD, $\sin\beta =$

Solve each equation for h and set the two equal to each other.
Divide both sides of equation by ab.

You have the **Law Of Sines**!

Now use it! But remember an acute angle and an obtuse angle both have a positive sine. Why is this a problem?

Solve these triangles:

a) $\alpha = 50^\circ, \beta = 62^\circ, a = 4$ cm

b) $\beta = 85^\circ, a = 4$ cm, $b = 6$ cm

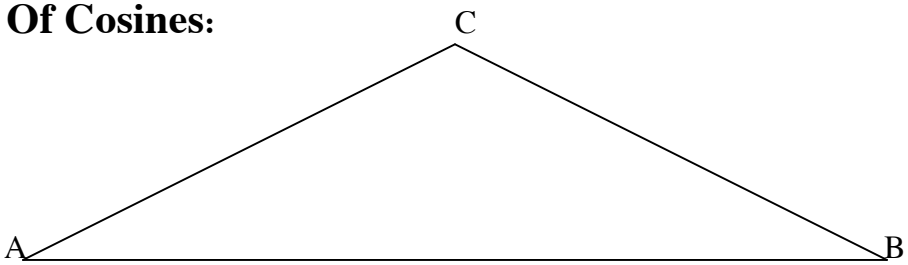
c) $\alpha = 40^\circ, a = 12$ cm, $b = 15$ cm

d) $\alpha = 60^\circ, \beta = 38^\circ, b = 12$ cm

e) $\alpha = 50^\circ, b = 50$ cm, $c = 75$cm

Answers: a) $\gamma = 68^\circ, b \approx 4.61, c \approx 4.84$ b) $\alpha \approx 41.62^\circ, \gamma \approx 53.38^\circ, c \approx 4.83$
c) 2 solutions: $\beta \approx 53.46^\circ, \gamma \approx 86.54^\circ, c \approx 8.34$ or $\beta \approx 126.54^\circ, \gamma \approx 13.46^\circ, c \approx 4.35$
d) $\gamma = 82^\circ, a \approx 16.88, c \approx 19.3$
e) Must use law of cosines. $c \approx 57.48, \beta \approx 41.79^\circ, \gamma \approx 88.21^\circ$

Proving the Law Of Cosines:



Label sides of triangle, a,b,c and angles α, β and γ.
Draw $\overline{CD} \perp \overline{AB}$. Label it *h*. Label the left part of *c* with the letter *e* and the right part with *c-e*.

Cos α = sin α =

So e = and h =

In Δ CDB a^2 =

Substitute for e and h:

Simplify:

You have one version of the **law of cosines.** Write all three here:

a) a = 8cm , b = 10 cm, c = 15 cm

b) a = 12 cm, b = 14 cm, $\gamma = 105^\circ$

c) c = 10 cm, $\gamma = 50^\circ$, b = 12 cm

d) c = 36 m, b = 77 m, a = 85 m

Answers: a) $\gamma \approx 112.41^\circ$, $\alpha \approx 29.54^\circ$, $\beta \approx 38.05^\circ$ b) c ≈ 20.66, $\alpha \approx 34.13^\circ$, $\beta = 40.87^\circ$
c) Two solutions: $\beta \approx 66.82^\circ$, $\alpha \approx 63.18^\circ$, a ≈ 11.65 or $\beta \approx 113.18^\circ$, $\alpha \approx 16.82^\circ$, a ≈ 3.78
d) Find largest angle using law of cosines, $\alpha = 90^\circ$, $\gamma \approx 64.94^\circ$, $\beta \approx 25.06^\circ$