Section 8.2: Law of Cosines

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2:05 PM

if I asked you to solve the following triangle:
$a = 3.0,\ b = 4.0,\ c = 6.0,$
could you use the law of sines?

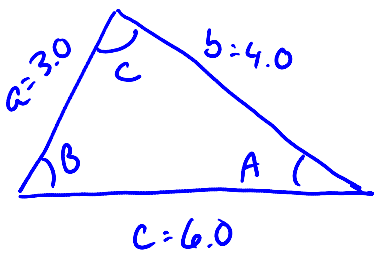
not easily, because you don't have a matching pair of angle & side (both A and a, or B and b, etc)

in this situation, use the cosine law instead

law of cosines:

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$

so, let's use this to solve the triangle with
$a = 3.0,\ b = 4.0,$ and $c = 6.0,$
rounding all angles to one decimal place



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

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

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

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

$$= \frac{(3.0)^2 + (4.0)^2 - (6.0)^2}{2(3.0)(4.0)}$$

$$C = 117.3^\circ$$

can use sine law:

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

$$\sin A = \frac{a \sin C}{c} = \frac{3.0 \sin 117.3^\circ}{6.0}$$

$$A = 26.38^\circ$$
$$= 26.4^\circ$$

now find B: $B = 180^\circ - A - C$

$$= 36.3^\circ$$

$A = 26.4^\circ$, $B = 36.3^\circ$, $C = 117.3^\circ$