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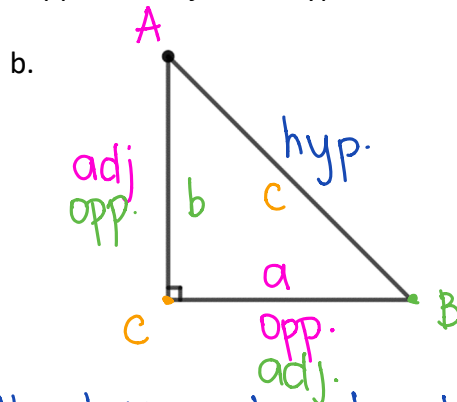
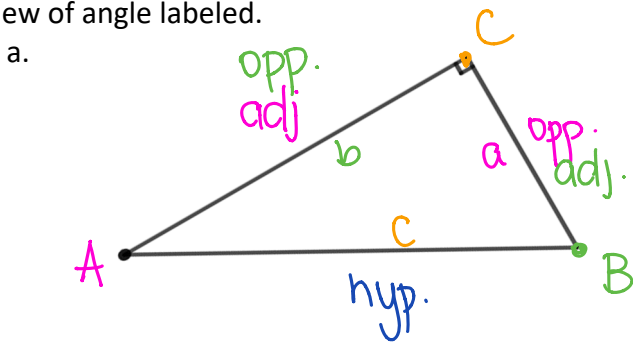
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Learning Goal 2.2	Using trigonometric ratios and solving simple trigonometric equations.
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Did you ever wonder where does the word "hypotenuse" comes from?

Greek - the side the subtends the right angle.

Warmup In each of the following triangles label the sides: Opposite, Adjacent, Hypotenuse from the point of view of angle labeled.



Summary: - the hypotenuse will always be the longest side.

SOH
 $\sin \theta = \frac{\text{opp.}}{\text{hyp.}}$

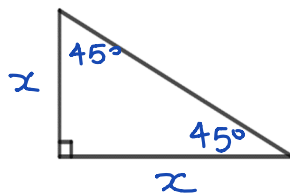
CAH
 $\cos \theta = \frac{\text{adj.}}{\text{hyp.}}$

TOA
 $\tan \theta = \frac{\text{opp.}}{\text{adj.}}$

$0 \leq \sin \theta \leq 1$
 $0 \leq \cos \theta \leq 1$

Calculator Check:

DEG
 RAD - Grade 12
 GRAD



$\tan^{-1}(1) = 45^\circ$

Example Use your calculator to find each of the following ratios, round your answer to the nearest thousandth. = 3 decimal places

a. $\sin 45^\circ$
 = 0.707
 (= $\frac{1}{\sqrt{2}}$)
 = $\frac{\text{opp.}}{\text{hyp.}}$

b. $\tan 20^\circ$
 = 0.364
 = $\frac{\text{opp.}}{\text{adj.}}$

c. $\cos 17^\circ$
 = 0.956
 = $\frac{\text{adj.}}{\text{hyp.}}$

d. $\tan 60^\circ$
 = 1.732
 (= $\sqrt{3}$)

Example Use your calculator to find the indicated angle, round your answer to the nearest degree.

e. $(\tan \theta) = (1.923)$
 $\tan^{-1}(\tan)$

$\theta = 63^\circ$

f. $(\sin \theta) = (0.345)$
 $\sin^{-1}(\sin)$

$\theta = 20^\circ$

g. $(\tan \theta) = (0.234)$
 $\tan^{-1}(\tan)$

$\theta = 13^\circ$

h. $(\cos \theta) = (0.922)$
 $\cos^{-1}(\cos)$

$\theta = 23^\circ$

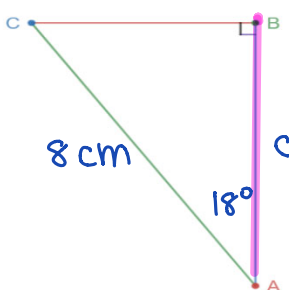
Example Find the length of AB (round to nearest hundredth).

- a. AC = 8 cm
 $\angle A = 18^\circ$

$\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$8 \times \cos 18^\circ = \frac{c}{8} \times 8$

$c = 8 \times \cos 18 \approx 7.61 \text{ cm.}$



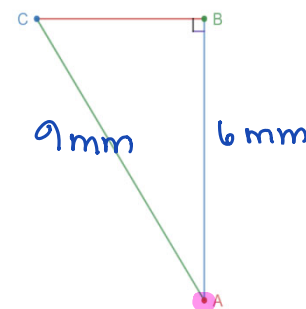
Example Find the measure of angle A (round to the nearest degree).

- a. AB = 6 mm
 AC = 9 mm

$\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$\cos^{-1}(\cos \theta) = \left(\frac{6}{9}\right)$

$\theta = \cos^{-1}\left(\frac{6}{9}\right) \approx 48^\circ$



Example Solve $\triangle ABC$. Round lengths to nearest hundredth and angles to the nearest degree.

↳ find everything

- a. AC = 5 cm
 $\angle C = 34^\circ$

1. $A + B + C = 180$

$A + 90 + 34 = 180$

$A = 180 - 90 - 34$
 $= 56^\circ$

2. $\sin \theta = \frac{\text{opp}}{\text{hyp}}$

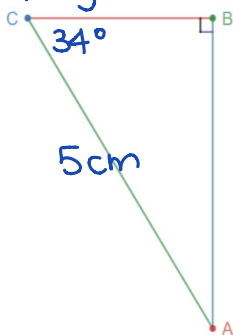
$5 \times \sin 34 = \frac{c}{5} \times 5$

$c = 5 \times \sin 34$
 $\approx 2.81 \text{ cm.}$

3. $\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$5 \times \cos 34 = \frac{a}{5} \times 5$

$a = 5 \times \cos 34$
 $\approx 4.15 \text{ cm.}$



- b. AC = 15 cm
 BC = 12 cm

1. $a^2 + c^2 = b^2$

$(12)^2 + c^2 = (15)^2$

$144 + c^2 = 225$

$-144 \quad -144$

$\sqrt{c^2} = \sqrt{81}$

$c = \pm 9 = 9 \text{ cm.}$

2. $\sin A = \frac{\text{opp}}{\text{hyp}}$
 $= \frac{12}{15}$

$A = \sin^{-1}\left(\frac{12}{15}\right)$
 $\approx 53^\circ$

3. $\cos C = \frac{\text{adj}}{\text{hyp}}$
 $= \frac{12}{15}$

$C = \cos^{-1}\left(\frac{12}{15}\right)$
 $\approx 37^\circ$

