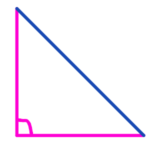
Name: ___________________________________ Date: ______________________

Learning Goal 2.1	Apply the trigonometric ratios to calculate unknown lengths and angles in a right triangle.

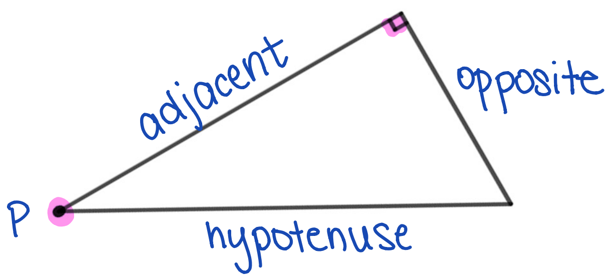
Did you ever wonder where does the word "hypotenuse" comes from?

Greek - the side subtending the right angle

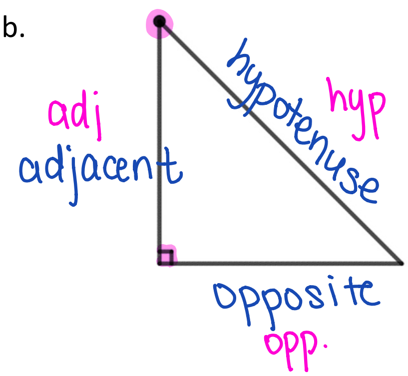


Warmup In each of the following triangles label the sides: Opposite, Adjacent, Hypotenuse from the point of view of angle labeled.

a.

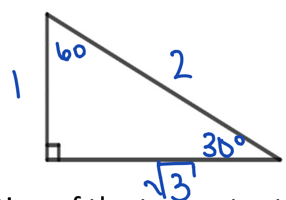


b.



Calculator Check:

$\sin 30 = \frac{1}{2}$



RAD GRAD $\boxed{\text{DEG}}$ degrees

Investigation On your investigation of the tangent ratio, title that last two columns and fill them in with your data.

	Triangle	Measure of the **biggest** angle, Angle A	Length of Side Opposite Angle A	Length of Side Adjacent to Angle A	Length of Hypotenuse	$\frac{\text{opposite}}{\text{adjacent}}$	$\frac{\text{opposite}}{\text{hypotenuse}}$	$\frac{\text{adjacent}}{\text{hypotenuse}}$
Station 1								
Station 2								

Assignment p. 95 #1 – 10, 14, 16
p. 101 #3-8, 11, 14
Quiz: Next Day!

1. What do you notice? Share your observations with your partner.

2. Can you explain your observations?

Summary:

Groups of similar triangles, have the following ratios in common:

$$\frac{\text{opposite}}{\text{hypotenuse}} = \frac{\text{opp.}}{\text{hyp.}} = \text{sine of an angle} = \sin\theta$$

$$\frac{\text{adjacent}}{\text{hypotenuse}} = \frac{\text{adj.}}{\text{hyp.}} = \text{cosine of an angle} = \cos\theta$$

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

a. $\sin 45^{\circ}$ $= 0.707$

b. $\sin 20^{\circ}$ $= 0.342$

c. $\cos 17^{\circ}$ $= 0.956$

d. $\cos 60^{\circ}$ 0.5

Sine, cosine and tangent functions convert angles into ratios of specific sides of a triangle

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

e. $\sin\theta = 0.923$

$\cancel{\sin^{-1}}(\cancel{\sin}\,\theta) = \sin^{-1}(0.923)$

$\theta = 67^{\circ}$

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

$\theta = 20^{\circ}$

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

$\theta = 76^{\circ}$

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

$\theta = 23^{\circ}$

Inverse trig functions convert ratios of specific sides of the triangle into angles.

Assignment p. 95 #1 – 10, 14, 16 Quiz: Next Day!
p. 101 #3-8, 11, 14

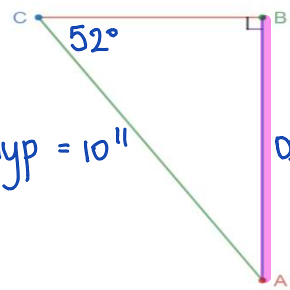
Example Find the length of AB (round to nearest hundredth).

a. $AC = 10''$
$\measuredangle C = 52°$

$\sin C = \frac{\overline{AB}}{\overline{AC}}$

$\sin 52 = \frac{\overline{AB}}{10}$

$10 \times 0.788 = \frac{\overline{AB}}{\cancel{10}} \cancel{\times 10}$



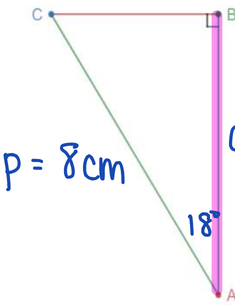
$\overline{AB} = 7.88''$

b. $AC = 8$ cm
$\measuredangle A = 18°$

$\cos A = \frac{\overline{AB}}{\overline{AC}}$

$\cos 18 = \frac{\overline{AB}}{8}$

$8 \times 0.951 = \frac{\overline{AB}}{8} \times 8$



$\overline{AB} = 7.61$ cm

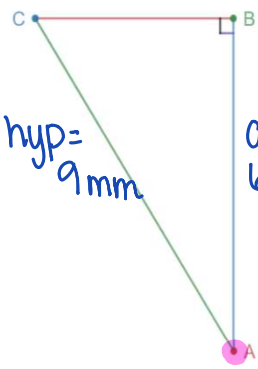
Example Find the measure of angle A (round to the nearest degree).

a. $AB = 6$ mm
$AC = 9$ mm

$\cos A = \frac{\overline{AB}}{\overline{AC}}$

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

$A = 48°$



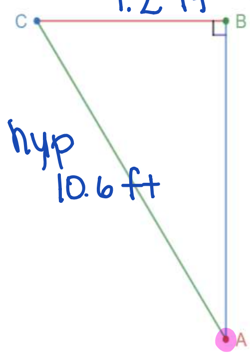
b. $AC = 10.6$ ft
$BC = 7.2$ ft

$\sin A = \frac{\overline{BC}}{\overline{AC}}$

$\sin A = \frac{7.2}{10.6}$

$\cancel{\sin^{-1}}(\sin A) = \sin^{-1}(0.679)$ ← DON'T CLEAR YOUR CALC!!

$A = 43°$



Example Solve ΔABC. Round lengths to nearest hundredth and angles to the nearest degree.
↳ find all angles and all lengths

a. $AC = 5$ cm
$\measuredangle C = 34°$

$\measuredangle A = 180 - 90 - 34$
$= 56°$

$\cos C = \frac{\overline{BC}}{\overline{AC}}$

$\cos 34 = \frac{\overline{BC}}{5}$

$5 \times 0.829 = \frac{\overline{BC}}{\cancel{5}} \cancel{\times 5}$

DON'T CLEAR!!

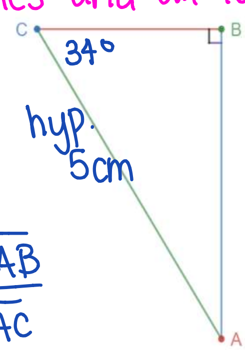
$\overline{BC} = 4.15$ cm

$\sin C = \frac{\overline{AB}}{\overline{AC}}$

$\sin 34 = \frac{\overline{AB}}{5}$

$5 \times 0.559 = \frac{\overline{AB}}{5} \times 5$

$\overline{AB} = 2.80$ cm



b. $AC = 15$ cm
$BC = 12$ cm

1. $\cos C = \frac{\overline{BC}}{\overline{AC}}$

$\cos C = \frac{12}{15}$

$\cos^{-1}(\cos C) = (0.8)\cos^{-1}$

$\measuredangle C = 37°$

2. $\overline{AB}^2 + \overline{BC}^2 = \overline{AC}^2$

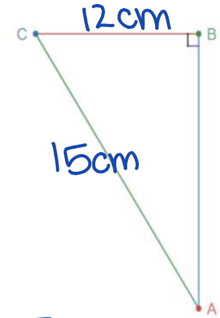
$\overline{AB}^2 + 12^2 = 15^2$

$\overline{AB}^2 + 144 = 225$
$-144 \quad -144$

$\sqrt{\overline{AB}^2} = \sqrt{81}$

$\overline{AB} = 9$ cm

3. $\measuredangle A = 180 - 90 - 37$
$= 53°$



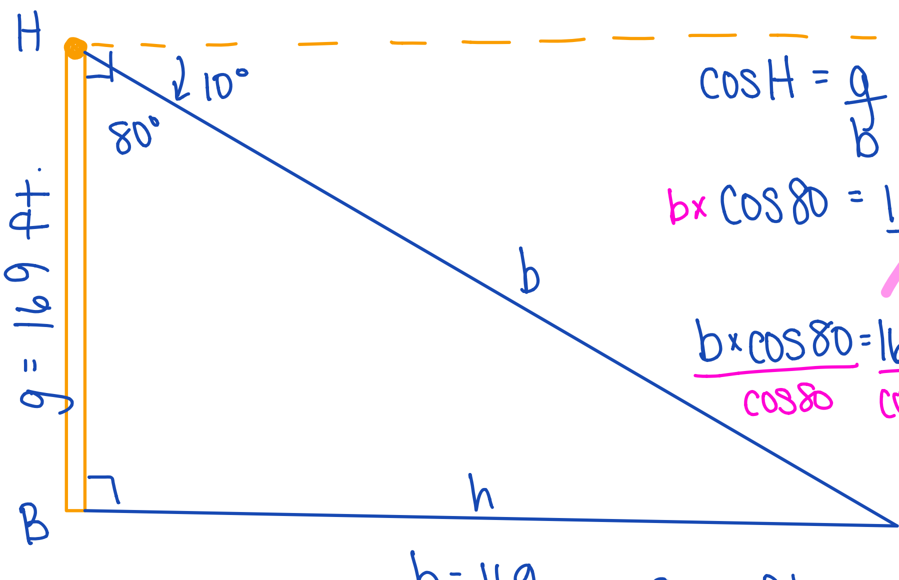
Assignment

p. 95 #1 – 10, 14, 16
p. 101 #3-8, 11, 14

Quiz: Next Day!

Example Hardeep is looking at Nelson's Monument in Trafalgar Square in London, England. He knows that the monument was built between 1840 and 1843 and it is 169 feet tall. In a moment of fancy, Hardeep wonders about running a zip-line from the top of Nelson's hat to ground. A 10° angle of descent makes for a nice ride. How much cable would be required for this fantasy zip line?

Angles of descent are measured off the horizontal.



$\cos H = \frac{g}{b}$

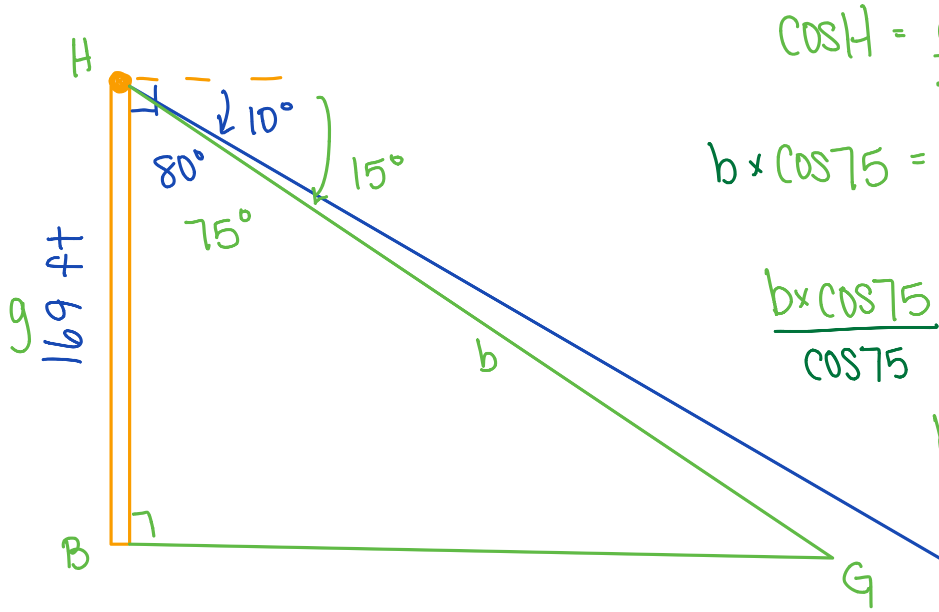
$b \times \cos 80 = \frac{169}{\cancel{b}} \times \cancel{b}$

$\frac{b \times \cos 80}{\cos 80} = \frac{169}{\cos 80}$

$b = \frac{169}{\cos 80} \doteq 973 \text{ ft}$

He would need 973 ft of cable.

A 15° angle of descent makes for a thrilling ride. Would you need more or less cable to create a thrilling ride? Calculate the amount of cable you would need to have a 15° angle of descent.



$\cos H = \frac{g}{b}$

$b \times \cos 75 = \frac{169}{\cancel{b}} \times \cancel{b}$

$\frac{b \times \cos 75}{\cos 75} = \frac{169}{\cos 75}$

$b = \frac{169}{\cos 75}$

$b = 653 \text{ ft}$

He would need less cable for thrilling ride: 653 ft altogether.