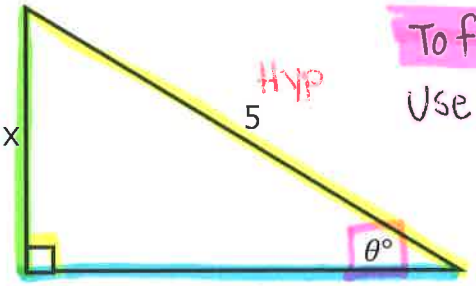
GEOMETRY/TRIG **Name** _____
Unit 8

Inverse Trig & Trig Applications

Solve for missing side length x and missing angle θ.



To find x:
- OPTION 1: Use Pythagorean Theorem (P.T.) OPP x
  $5^2 = x^2 + 4^2$ → $9 = x^2$ → $3 = x$
- OPTION 2: Use $S_H^O C_H^A T_A^O$
  - using x & 5
  - S_H^O ★ won't work don't have θ!! ★ Always look to use P.T.

To find θ:
Use 4(ADJ) & 5 (HYP)
C_H^A
$\theta = \cos^{-1}\left(\frac{4}{5}\right)$
$\approx 36.87°$

***Use Inverse Trig Functions to solve for a missing** angle **in a triangle if you are only given two sides.**

Inverse Trig. Functions $\theta =$

$\sin^{-1}\left(\frac{O}{H}\right), \cos^{-1}\left(\frac{A}{H}\right), \tan^{-1}\left(\frac{O}{A}\right)$

All three inverse trig. functions are found on your calculator:

Press **2nd**
→ and then select the trig. function you want to use!

Calculator: Find the angle. *Round to 2 decimal places.*

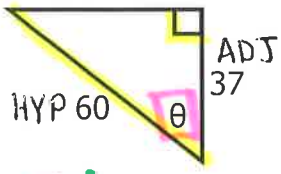
$\sin\theta = \frac{5}{8}$ $\theta = \sin^{-1}\left(\frac{5}{8}\right) \approx 38.68°$

$\cos\theta = \frac{4}{5}$ $\theta = \cos^{-1}\left(\frac{4}{5}\right) \approx 36.87°$

$\tan\theta = \frac{\sqrt{2}}{15}$ $\theta = \tan^{-1}\left(\frac{\sqrt{2}}{15}\right) \approx 5.39$

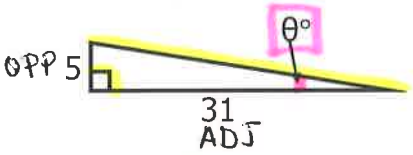
Find the value of the angle. *Round to 2 decimal places.* Show the trig ratio.

1) $\theta =$ 51.93°



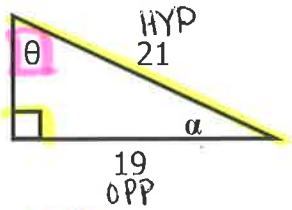
C_H^A
$\theta = \cos^{-1}\left(\frac{37}{60}\right)$
$\theta \approx 51.93°$

2) $\theta =$ 9.16°



T_A^O
$\theta = \tan^{-1}\left(\frac{5}{31}\right)$
$\theta \approx 9.16°$

3) $\theta =$ 64.79° $\alpha =$ 25.51°



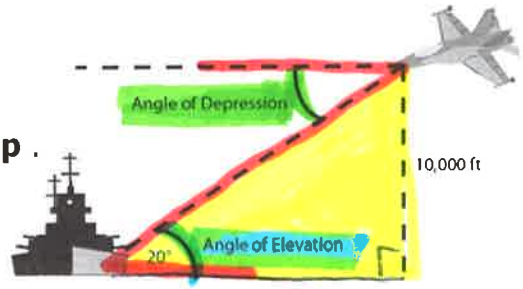
S_H^O
$\theta = \sin^{-1}\left(\frac{19}{21}\right)$
$\theta \approx 64.79°$

$\alpha = 90 - 64.79°$
$\alpha = 25.51°$

**To solve for missing angle α: Find θ & then subtract θ from 90°

APPLICATIONS:

angle of elevation **:** the angle formed between the line of sight and the horizontal line when a person on the ground looks **up** .

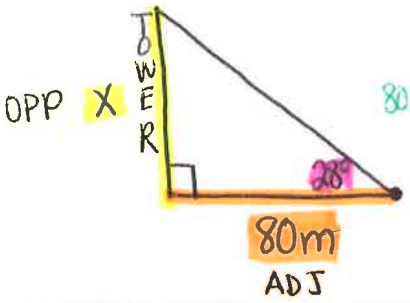


angle of depression **:** the angle formed between the line of sight and the horizontal line when a person from an elevated location looks **down**.

* angle of dep. = angle of elev. } alt. int ∠s

Express all answers to 2 decimal places.

1) From a point 80m from the base of a tower, the angle of elevation to the top of the tower is 28°. How tall is the tower?



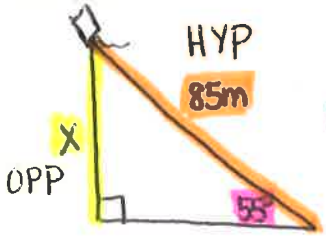
TOA

$80 \cdot \tan(28°) = \frac{x}{80} \cdot 80$

$80\tan(28°) = x$

$42.54 \approx x$ m

2) A kite is flying at an angle of elevation of 55°. Ignoring the sag in the string, find the height of the kite if 85 m of string have been let out.



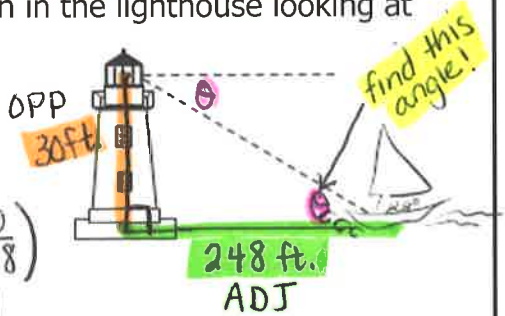
SOH

$85 \cdot \sin(55°) = \frac{x}{85} \cdot 85$

$85 \cdot \sin(55°) = x$

$69.63 \approx x$ m

3) A man at the top of a 30 ft lighthouse sees a boat 248 ft away from shore. At what angle is the man in the lighthouse looking at the boat?

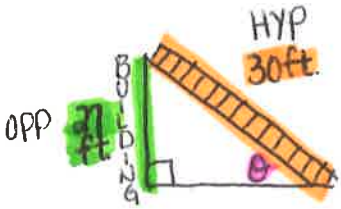


TOA

$\theta = \tan^{-1}\left(\frac{30}{248}\right)$

$\theta \approx 6.90°$

4) A 30 ft ladder is leaning against the side of a 27 ft. building. Find the angle formed between the base of the ladder and the ground.



SOH

$\theta = \sin^{-1}\left(\frac{27}{30}\right)$

$\theta \approx 64.16°$

5) A guy wire is attached to the top of a tower and to a point on the ground that is 35 m from the base of the tower. If the wire makes a 65° angle with the ground, how long is the wire?

CAH

$\cos(65°) = \frac{35}{x}$

$x = \frac{35}{\cos(65°)}$

$x \approx 82.82$ m