

Answers to Additional Practice:

- 1) $\frac{7}{25}$
 5) $\frac{9}{41}$
 9) 4.0
 13) 19.2

- 2) $\frac{4}{3}$
 6) 7.2
 10) 3.4
 14) 16.8

- 3) $\frac{4}{5}$
 7) 16.9
 11) 5.0
 15) 13.8

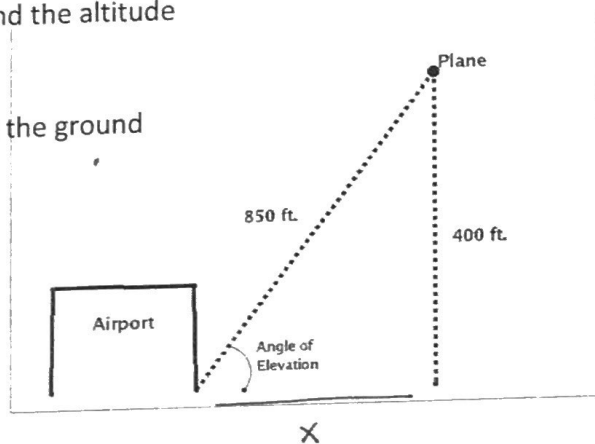
- 4) $\frac{3}{5}$
 8) 20.8
 12) 5.1
 16) 17.7
 17) 897.8

Learning Task: Finding the Missing Angle using SOH CAH TOA

1. An airport is tracking the path of one of its incoming flights. The distance to the plane is 850 ft. (from the ground) and the altitude of the plane is 400 ft.

- (a) What is the sine ratio of the angle of elevation from the ground at the airport to the plane (refer to the figure)?

$$\sin \theta = \frac{400}{850}$$



- (b) What is the cosine ratio of the angle of elevation?
 (Hint: use the Pythagorean Theorem to solve for the missing side of the right triangle before setting up the ratio)

$$x^2 + 400^2 = 850^2$$

$$x^2 = 562500 = 750$$

$$\cos \theta = \frac{750}{850}$$

- (c) What is the tangent ratio of the angle of elevation?

$$\tan \theta = \frac{400}{750}$$

- (d) Now, use your calculator to find the measure of the angle itself. Pressing "2nd" followed by one of the trigonometric function keys finds the angle measure corresponding to a given ratio.

Press 2nd → SIN → Type the sine ratio from part a.
 What value do you get? Round your answer to two decimal places.

$$\sin^{-1}\left(\frac{400}{850}\right) \approx \boxed{28.07^\circ}$$

- (e) Press 2nd → COS → Type in the cosine ratio from part b. What value do you get?

$$\cos^{-1}\left(\frac{750}{850}\right) \approx \boxed{28.07^\circ}$$

(f) Press $2^{\text{nd}} \rightarrow \text{TAN} \rightarrow$ Type in the tangent ratio from part c. What value do you get?

$$\tan^{-1}\left(\frac{400}{750}\right) \approx \boxed{28.07^\circ}$$

Did you notice that, for each of the calculations in parts d-f, when you pressed 2^{nd} , \sin , the calculator typed \sin^{-1} . This means that we are taking the inverse of the function. This allows us to find the angle given two sides of the triangle.

(g) Why did you get the same answer each time?

You are measuring the Same Angle.

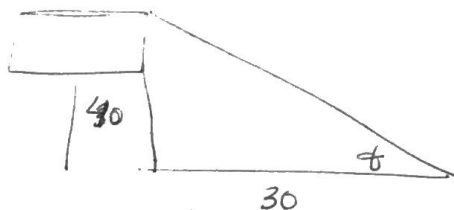
(h) To the nearest hundredth of a degree, what is the measure of the angle of elevation?

$$\theta \approx \boxed{28.07^\circ}$$

Guided Practice:

1. The top of a billboard is 40 feet above the ground. What is the angle of elevation of the sun when the billboard casts a 30-foot shadow on level ground?

a. Sketch a figure to illustrate the problem.



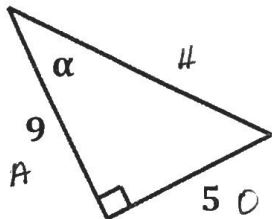
b. Use the inverse trigonometric function to find the angle of elevation. Round to the nearest hundredth of a degree.

$$\tan \theta = \frac{40}{30}$$

$$\tan^{-1}\left(\frac{40}{30}\right) = \boxed{53.13^\circ}$$

For problems 2-5, find the missing angle. Round to the nearest hundredth of a degree.

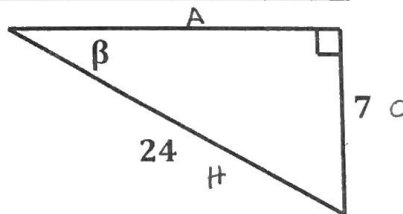
2.



$$\tan \alpha = \frac{5}{9}$$

$$\alpha \approx \boxed{29.05^\circ}$$

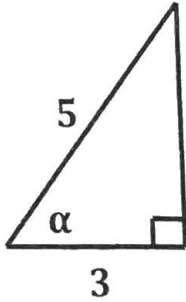
3.



$$\frac{\sin \beta}{\tan \beta} = \frac{7}{24}$$

$$\beta \approx \boxed{16.96^\circ}$$

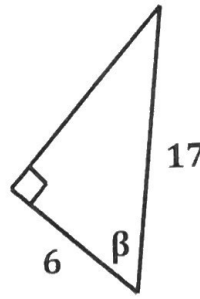
4.



$$\cos \alpha = \frac{3}{5}$$

$$\alpha \approx 53.13^\circ$$

5.



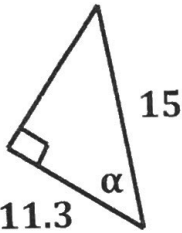
$$\cos \beta = \frac{6}{17}$$

$$\beta \approx 69.33^\circ$$

Skills Practice using Inverse Trigonometric Functions

Solve for the missing degree measure. Round to the nearest hundredth of a degree.

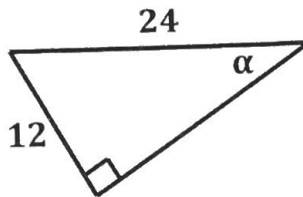
1.



$$\cos \alpha = \frac{11.3}{15}$$

$$\alpha = \underline{41.12^\circ}$$

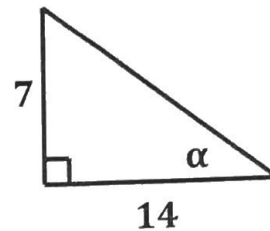
2.



$$\sin \alpha = \frac{12}{24}$$

$$\alpha = \underline{30^\circ}$$

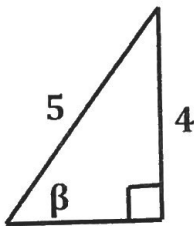
3.



$$\tan \alpha = \frac{7}{14}$$

$$\alpha = \underline{26.57^\circ} *$$

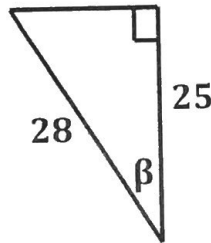
4.



$$\beta = \underline{53.13^\circ}$$

$$\sin \beta = \frac{4}{5}$$

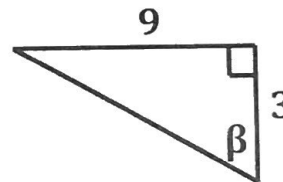
5.



$$\beta = \underline{26.77^\circ} *$$

$$\cos \beta = \frac{25}{28}$$

6.



$$\beta = \underline{71.57^\circ} *$$

$$\tan \beta = \frac{9}{3}$$