

# 1.3 TRIG APPLICATIONS

**EQ:** How do I solve a word problem with right triangles?

## WARM-UP THURSDAY

Solve the right triangle with the given measures.

$$a = 2.5$$

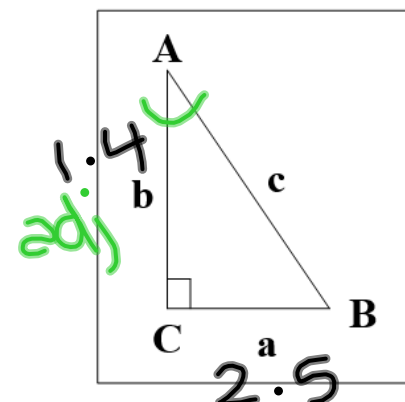
$$b = 1.4$$

$$c = 2.9$$

$$m\angle A = 61^\circ$$

$$m\angle B = 29^\circ$$

$$m\angle C = 90^\circ$$



## ABOUT ME

1. Who's the Greatest of All Time?
2. Currently, what's your favorite app?

$$2.5^2 + 1.4^2 = c^2$$

$$\tan \theta = \frac{opp}{adj} = \frac{2.5}{1.4}$$

$$\theta = \tan^{-1}\left(\frac{2.5}{1.4}\right)$$

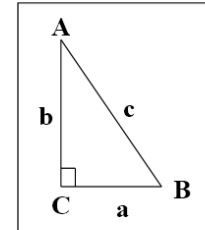
## 1.2 Solving Right Triangles

Name: \_\_\_\_\_

**OMIT #8 & 11**

Solve each triangle (find all missing sides and missing angles). Round side measures to the nearest thousandth and angle measures to the nearest degree.

1.  $c = 10$   
 $m\angle B = 50^\circ$



2.  $a = 4$   
 $c = 7$

3.  $b = 3.5$   
 $m\angle A = 72^\circ$

4.  $a = 6$   
 $m\angle A = 14^\circ$

5.  $a = 2.5$   
 $b = 1.4$

Draw a picture and solve the problem. Round all side measures to two decimal places and all angles measures to the nearest degree.

6. A 24 foot ladder leaning against a wall makes a  $75^\circ$  angle with the ground.

- How high up the wall does the ladder reach?
- How far is the base of the ladder from the wall?

7. A plane takes off at an angle of  $5.4^\circ$ . After traveling 1 mile along its flight path, how high in feet is the plane above the ground? (1 mile = 5280 feet)

8. At a certain time of day, a flagpole that is 24 feet high casts a shadow that is 15 feet long. What is the angle of elevation of the sun?

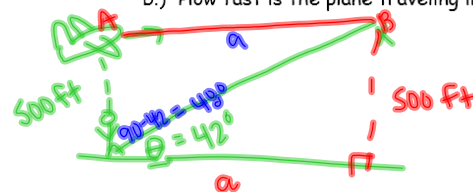
9. Sammy is flying a kite. The string has a length of 312 feet and the angle that the string makes with the ground is  $58^\circ$ . How high off the ground is the kite?

10. A guy wire stretches from the top of an antenna tower to a point on level ground 18 yards from the base of the tower. The angle between the wire and the ground is  $63^\circ$ . How tall is the antenna tower?

11. A plane passes directly over your head an altitude of 500 feet. Two seconds later you observe that its angle of elevation is  $42^\circ$ .

a.) How far did the plane travel during those two seconds.

b.) How fast is the plane traveling in miles per hour?



$$a. \tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$

$$\tan 42 = \frac{500}{a}$$

$$a \tan 42 = 500$$

$$a (.9) = \frac{500}{.9}$$

$$a = 555.3 \text{ ft}$$

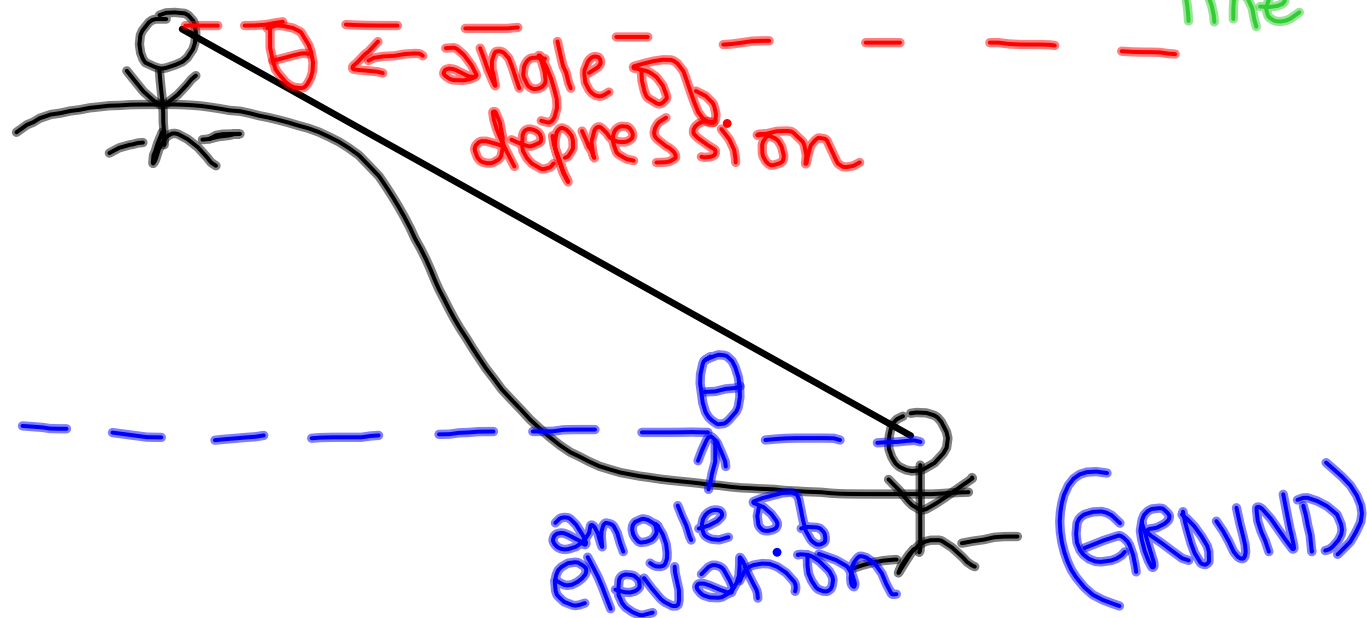
$$b. \frac{555.3 \text{ ft}}{2 \text{ sec}} \times \frac{60 \text{ sec}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{1 \text{ mile}}{5280 \text{ ft}}$$

$$189.3 \text{ mph}$$

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## ANGLE OF ELEVATION/DEPRESSION



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**EQ:** How do I solve a word problem with right triangles?

## ANGLE OF ELEVATION/DEPRESSION

see HW 1.2 #11

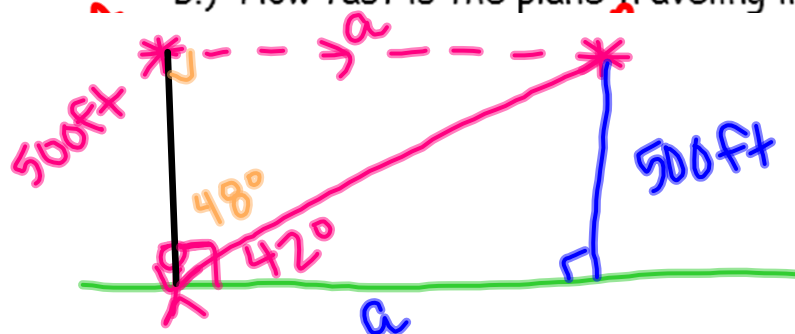
\*DRAW A PICTURE

11. A plane passes directly over your head an altitude of 500 feet. Two seconds later you observe that its angle of elevation is  $42^\circ$

right  $\angle$

a.) How far did the plane travel during those two seconds.

b.) How fast is the plane traveling in miles per hour?



a.



$$\tan 42 = \frac{500}{a}$$

$$a = \frac{500}{\tan 42}$$

$$a = 555.3 \text{ ft}$$

b.  $\frac{555.3 \text{ ft}}{2 \text{ sec}} \cdot \frac{1 \text{ mi}}{5280 \text{ ft}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}}$

$$189.3 \text{ mph}$$

4. Commercial airliners fly at an altitude of about 10 kilometers. They start descending toward the airport when they are far away, so that they will not have to dive at a steep angle.

- a.) If the pilot wants the plane's path to make an angle of  $3.2^\circ$  with the ground, at what horizontal distance from the airport must he start descending?
- b.) If he starts descending at a horizontal distance of 300 kilometers from the airport, what angle will the plane's path make with the horizontal?

5. An observer 5.2 kilometers from the launch pad at Cape Canaveral observes the Discovery space shuttle take off. (Discovery ascends vertically for some time after take-off.)

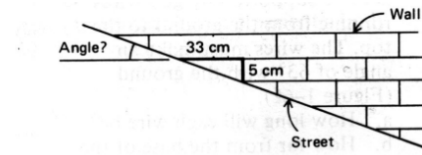
- a.) At a particular time, the angle of elevation of Discovery is  $32.3^\circ$ . How high is the space shuttle?
- b.) How far is Discovery from the observer?
- c.) What will the angle of elevation be when the space shuttle reaches 28 kilometers?

6. A submarine on the surface of the ocean makes an emergency dive, and its path makes an angle of  $22^\circ$  with the surface of the ocean.

- a.) If it travels for 315 meters along its downward path, how deep will it be?
- b.) What horizontal distance is it from its starting point?
- c.) How many meters must it go along its downward path to reach a depth of 1000 meters?

7. Judy is waiting for the cable car on Powell Street in San Francisco. The street is extremely steep, and to pass the time she decides to find out what angle the street makes with the horizontal. On the wall of a house, she measures a horizontal distance of 33 centimeters and a vertical distance of 5 centimeters along the slope of the street.

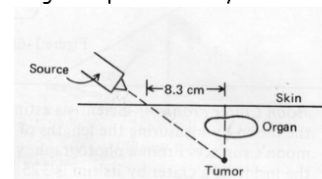
- What angle does Powell Street make with the horizontal?
- While she waited, Judy went walked up to the top of the block, counting 101 paces (approximately 101 meters). How many meters did she go vertically?



8. A rocket shoots straight up from a launch pad. Five seconds after lift-off, Billy, who is standing 2 miles away, notes that the rocket's angle of elevation is  $4.6^\circ$ . Four seconds after that, the angle of elevation is  $38^\circ$ . How far did the rocket rise during those four seconds?

9. A beam of gamma rays is to be used to treat a tumor known to be 5.7 cm beneath the patient's skin. To avoid damaging a vital organ, the radiologist moves the radiation source over 8.3 cm.

- At what angle to the patient's skin must the radiologist aim the gamma ray source to hit the tumor?
- How far will the beam have to travel through the patient's body before reaching the tumor?





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## CLOSING

8. At a certain time of day, a flagpole that is 24 feet high casts a shadow that is 15 feet long. What is the angle of elevation of the sun?

