Math Virtual Learning

Precalculus with Trigonometry

May 19, 2020

Precalculus with Trigonometry
Lesson: May 19th, 2020

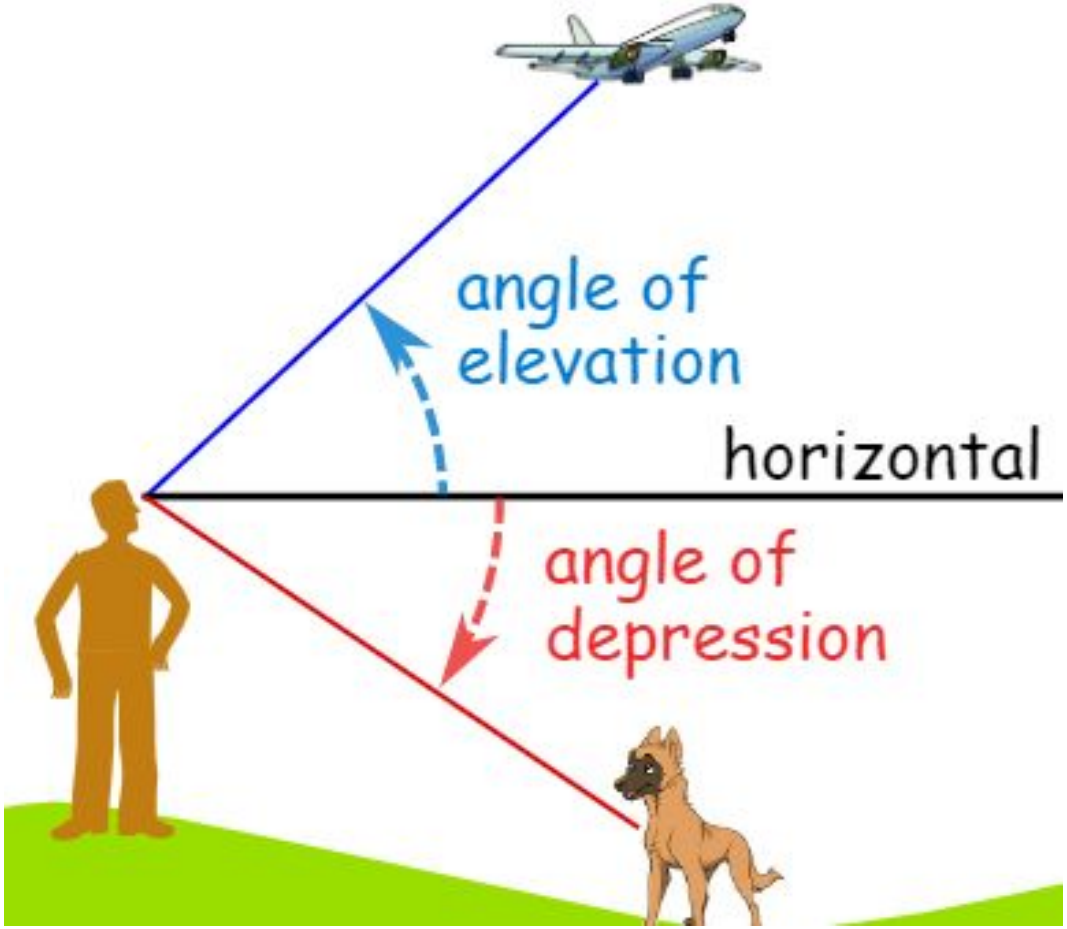
Objective/Learning Target:
Students will solve applications of right triangle trigonometry problems

Let's Get Started:
Watch video: Trigonometry Applications

Angle of Elevation vs. Angle of Depression

The angle of elevation denotes the angle from the horizontal upward to an object.

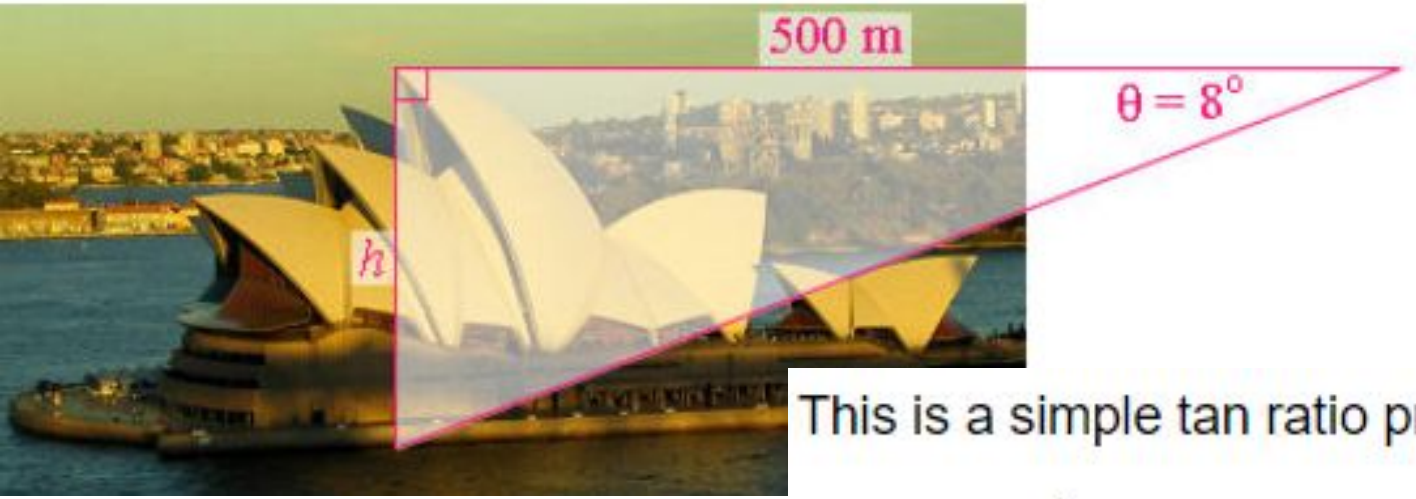
The angle of depression denotes the angle from the horizontal downward to an object.



EXAMPLE

You can walk across the Sydney Harbour Bridge and take a photo of the Opera House from about the same height as top of the highest sail.

This photo was taken from a point about $500\ \mathrm{m}$ horizontally from the Opera House and we observe the waterline below the highest sail as having an angle of depression of 8°. How high above sea level is the highest sail of the Opera House?



This is a simple tan ratio problem.

$$\tan 8^\circ = \frac{h}{500}$$

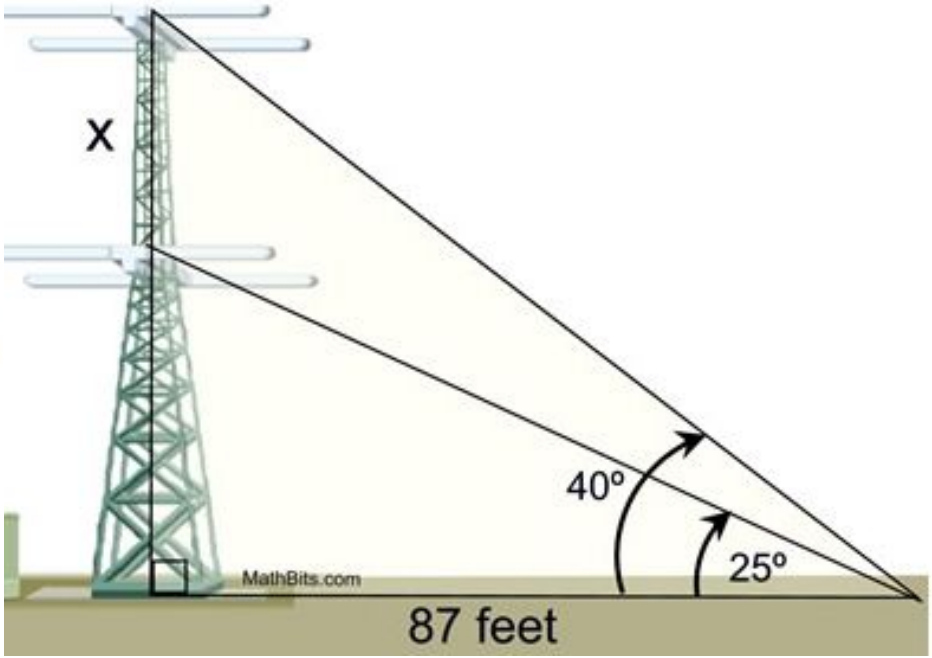
So

$$h = 500 \ \tan 8^\circ = 70.27 \text{ m}.$$

So the height of the tallest point is around 70 m.

EXAMPLE #2

A radio station tower was built in two sections. From a point 87 feet from the base of the tower, the angle of elevation of the top of the first section is 25°, and the angle of elevation of the top of the second section is 40°. To the *nearest foot*, what is the height of the top section of the tower?

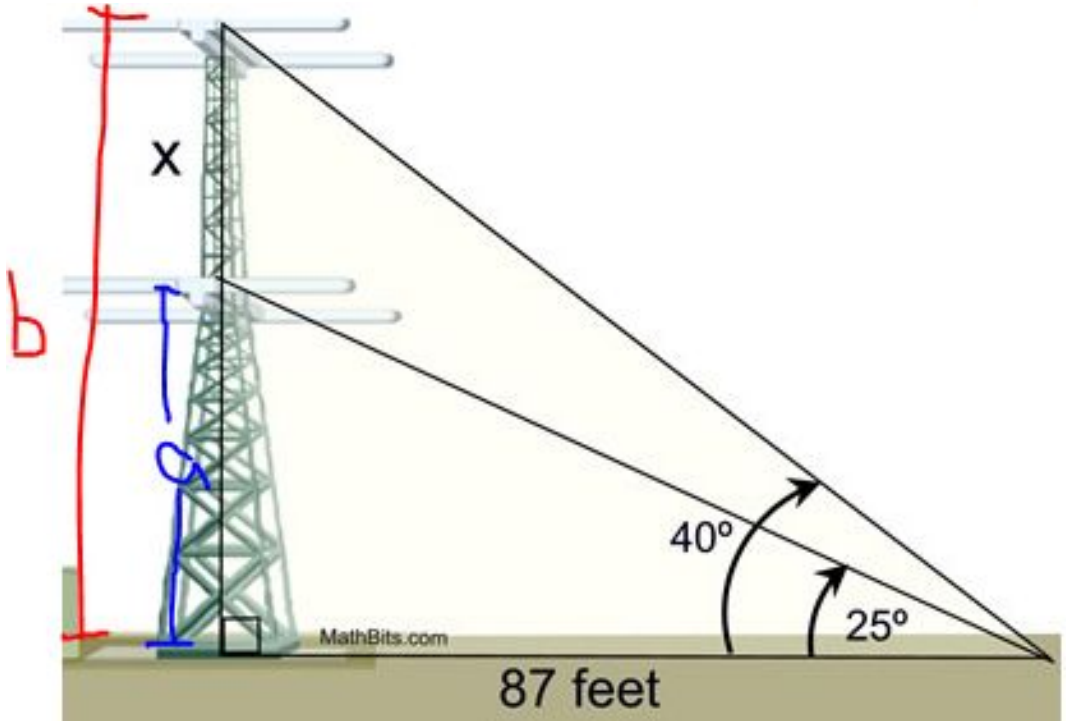


Larger triangle with height b: $\tan 40^\circ = \frac{b}{87}$ $\quad b \approx 73.0016$

Smaller triangle with height a: $\tan 25^\circ = \frac{a}{87}$ $\quad a \approx 40.5687$

Difference $(b - a)$

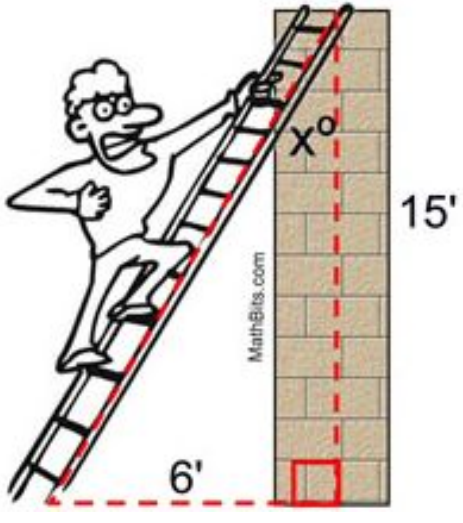
: 32.4329



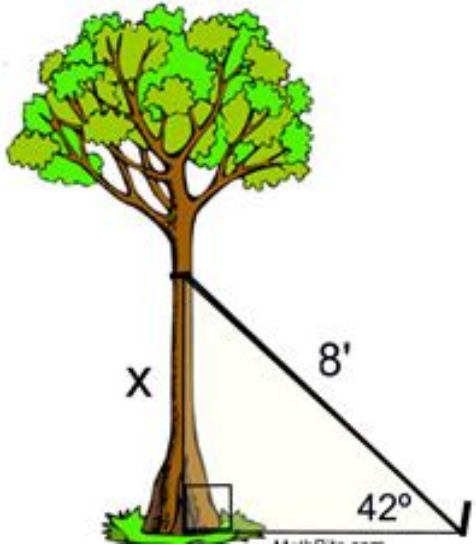
Practice

Solve the following application problems.

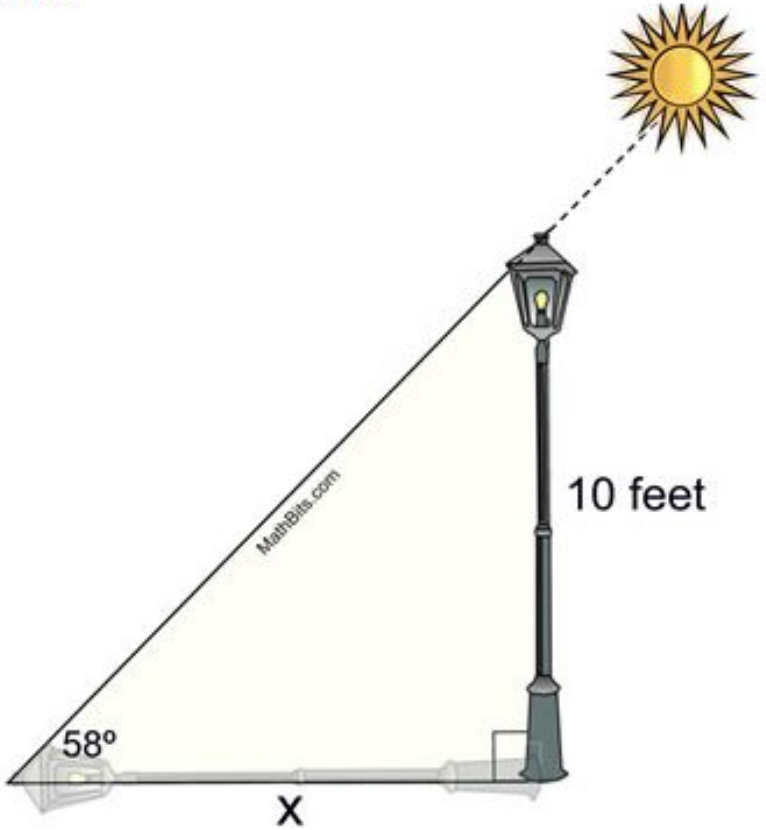
1. A ladder leans against a brick wall. The foot of the ladder is 6 feet from the wall. The ladder reaches a height of 15 feet on the wall. Find to the *nearest degree*, the angle the ladder makes with the wall.



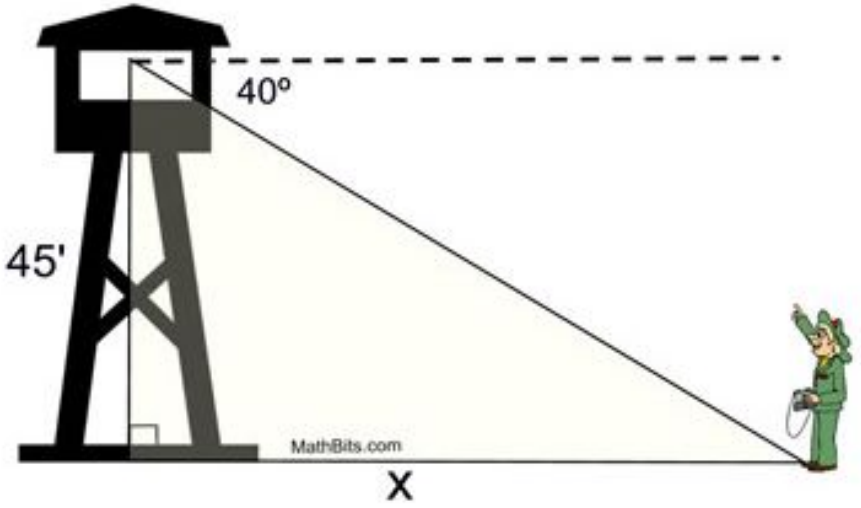
2. A nursery plants a new tree and attaches a guy wire to help support the tree while its roots take hold. An eight foot wire is attached to the tree and to a stake in the ground. From the stake in the ground the angle of elevation of the connection with the tree is 42°. Find to the *nearest tenth of a foot*, the height of the connection point on the tree.



3. Find the shadow cast by a 10 foot lamp post when the angle of elevation of the sun is 58°. Find the length to the *nearest tenth of a foot.*



4. From the top of a fire tower, a forest ranger sees his partner on the ground at an angle of depression of 40°. If the tower is 45 feet in height, how far is the partner from the base of the tower, to the *nearest tenth of a foot*?



Practice - **ANSWERS**

1. $\tan x^\circ = \frac{6}{15} = 0.4; \quad \tan^{-1}(0.4) \approx 22^\circ$

2. $\sin 42^\circ = \frac{x}{8}; \quad 0.669 = \frac{x}{8}; \quad x \approx 5.4'$

3. $\tan 58^\circ = \frac{10}{x}; \quad 1.6003 = \frac{10}{x}; \quad x \approx 6.2'$

4. $\tan 40^\circ = \frac{45}{x}; \quad 0.839 = \frac{45}{x}; \quad x \approx 53.6'$

Additional Resource Videos:

Right Triangle Trig Applications

Additional application examples

Additional Practice:

Applications Practice

Try four problems at the bottom of the page

Right Triangle Applications Practice - Khan Academy