

1 Exercises

1. Given $\sin \theta = \frac{12}{13}$ what is $\tan \theta$?

Solution: $\tan \theta = \frac{12}{5}$

2. If $\cos \theta = 1$, what are the possible values for θ ? That is, the cosine of what angle measures is 1?

Solution: 0°

3. From your knowledge of the [unit circle](#), answer the following.

- (a) What are the maximum and minimum values of sine?

Solution: Max: 1 Min: -1

- (b) What are the maximum and minimum values of cosine?

Solution: Max: 1 Min: -1

- (c) What are the maximum and minimum values of tangent? Careful here, remember this is defined as $\tan \theta = \frac{\sin \theta}{\cos \theta}$.

Solution: Max: ∞ Min: $-\infty$

4. You are trying to launch a projectile to achieve maximum distance. You believe that setting the launcher at 45° of elevation from the horizontal will achieve this. The problem is you have no tool calibrated to measure angles, what you do have is a tape measure. How can you ensure the projectile launcher is aimed at 45° ? You can assume the launcher is sitting on a perfectly horizontal surface and that you can accurately create a 90° angle.

Solution: 45-45-90 special triangle has legs of equal length. From the pivot point of the launcher measure the length of the launcher and then from that point measure an equal distance perpendicularly up. Elevate the end of the barrel to this point.

5. You have a snow globe shaped as a hemisphere with radius, $r = 6$. Inside the snow globe, you wish to place a pyramid, because pyramids are often found in snowy landscapes. Assume that the [square pyramid](#) sits on the plane that separates the sphere into two

hemispheres. Given that each corner of the base touches the edge of the hemisphere and the edge of the pyramid is sloped at 41.38° , write an equation to give the height that would be needed to accurately represent a scale model of this pyramid. You do not need to solve for the height.

Solution: $\tan 41.5^\circ = \frac{h}{3}$

6. A **gable roof** has a pitch (slope), that is $\frac{7}{12}$ meaning that for every 12 units moved in the horizontal direction it moves 7 units in the vertical direction. Give an equation that can be solved to find the slope of this roof in degrees.

Solution: $\tan \theta = \frac{7}{12}$

7. You are designing a radio tower that is stabilized by **guy-wires**. You are instructed that the angle between the ground and the guy-wire must be at 30° of elevation from the flat ground where the tower will be constructed and the guy-wire must be anchored into the ground 50 feet from the tower.
- (a) Give two ways you can calculate the length of the guy-wire. Ignore any extra length needed for securing the cable, only find the point to point distance.

Solution:

- Proportion - $1 : 2 :: 50 : x$
- Trig - $\cos 30^\circ = \frac{50}{x}$

- (b) Give two ways you can find the height the anchor point on the tower is from the ground.

Solution:

- Pythagorean Theorem - from previous step $x^2 = 50^2 + h^2$
- Trig - $\tan 30^\circ = \frac{h}{50}$
- Proportion - $1 : \sqrt{3} :: 50 : h$