Review:

Robots usually use the metric system for measurements

- Meters for measuring distance
- Radians for measuring angles
- Seconds for measuring time

Standard Prefixes:

Smaller			Larger		
centi-	10^{-2}	hundredth	kilo-	10^{3}	thousands
milli-	10^{-3}	thousandth	mega-	10^{6}	millions
mirco-	10^{-6}	millionth	giga-	10^{9}	billions
nano-	10^{-9}	billionth	tera-	10^{12}	trillions

Examples: $1 \times 10^{3} = 1000$ $1 \times 10^{-3} = .001$

Formulas:

$$speed = \frac{distance}{time} \qquad \sin(\theta) = \frac{opposite}{hypotenuse} \qquad \cos(\theta) = \frac{adjacent}{hypotenuse}$$

$$\tan(\theta) = \frac{opposite}{adjacent} \qquad 360° = \frac{2\pi}{radians} \qquad 1° = \frac{\pi}{180} \text{ Radians}$$

Conversions/Values:

- ➢ 1 meter = 3.28 feet
- ➢ Light speed = 3×10^{8} meters per second (186,000 miles per second!)
- ➢ Sound speed = 343 meters per second
- ➢ Theta (Greek letter) (abbreviation used for angle) = θ

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Video Activity:

Using LIDAR, a robot sends out a pulse of light that bounces off of a tree and returns after **30 nanoseconds**. Remember that the speed of light is 3 x 10^8 meters per second.
How far away is the tree?

(_____ m/s) x (_____ sec) = _____ m
speed x time = distance

convert from nanoseconds to seconds

Total distance light traveled = 2 x distance to tree

_____ m = 2 x distance to tree

* answer from above*

$$\frac{\text{\_\_\_\_\_ m}}{2} = \text{distance to tree}$$

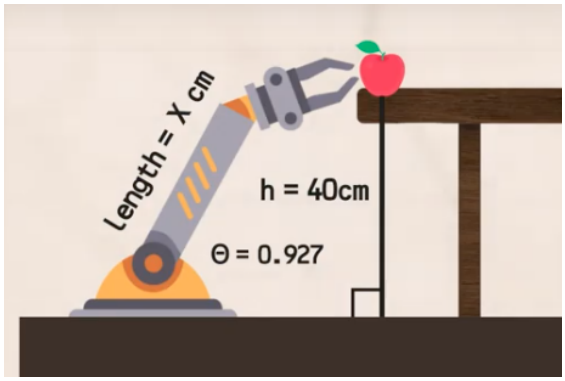
_____ m = distance to tree (answer)

We have a table that is **40cm** from the floor and the arm of the robot is at an angle of **0.927 radians** (about 53°).
How long does the arm have to be to reach the table?

$$hypotenuse = \frac{opposite}{\sin(\theta)}$$

$$hypotenuse = \frac{\text{\_\_\_\_\_ cm}}{\sin(\text{\_\_\_\_\_})}$$

$hypotenuse$ = _____cm



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