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# TRIGONOMETRY

Mata Kuliah Bahasa Inggris untuk Matematika



By:

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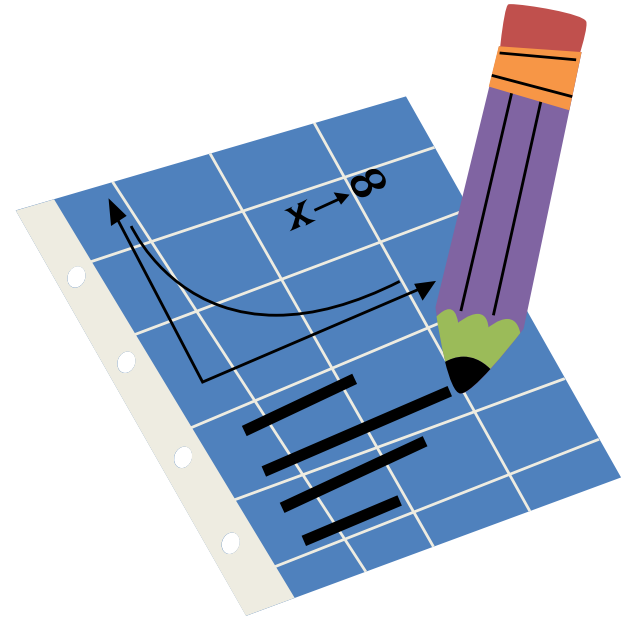
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# 01

# Definition of Trigonometry

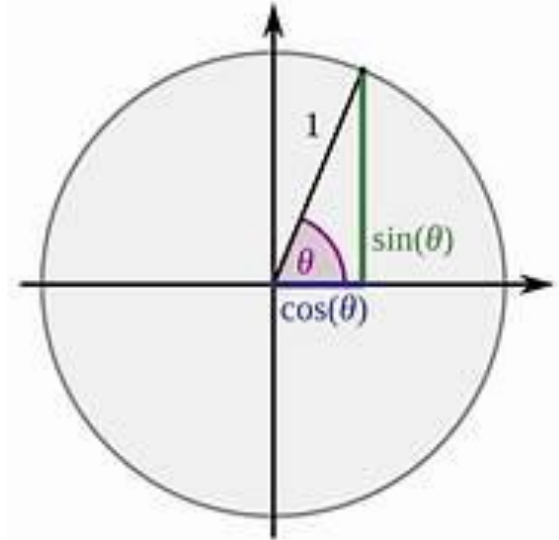


# Definition of Trigonometry

Trigonometry is a branch of mathematics dealing with the relations of the sides and angles of triangles and with the relevant functions of any angles. It is concerned with specific functions of angles.

The term "trigonometry" is derived from the Greek words "trigonon," meaning triangle, and "metron," meaning measure. This term was first discovered in the title of a book by the German scientist-mathematician Pitiscus in 1505. The word "trigonometry" essentially means "I measure a triangle".

Trigonometry is one of the important branches in the history of mathematics that deals with the study of the relationship between the sides and angles of a right-angled triangle. The field emerged in the Hellenistic world during the 3rd century BC from applications of geometry to astronomical studies.





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# History of Trigonometry

Trigonometry, the branch of mathematics concerned with specific functions of angles, has a rich and fascinating history. The early study of triangles can be traced back to the 2nd millennium BC, in Egyptian mathematics (Rhind Mathematical Papyrus) and Babylonian mathematics. Trigonometry was also prevalent in Kushite mathematics.



Rhind Mathematical Papyrus

The systematic study of trigonometric functions began in Hellenistic mathematics, reaching India as part of Hellenistic astronomy. In Indian astronomy, the study of trigonometric functions flourished in the Gupta period, especially due to Aryabhata (sixth century CE), who discovered the sine function.





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# History of Trigonometry

During the Middle Ages, the study of trigonometry continued in Islamic mathematics, by mathematicians such as Al-Khwarizmi and Abu al-Wafa. It became an independent discipline in the Islamic world, where all six trigonometric functions were known.



Abu Al Wafa

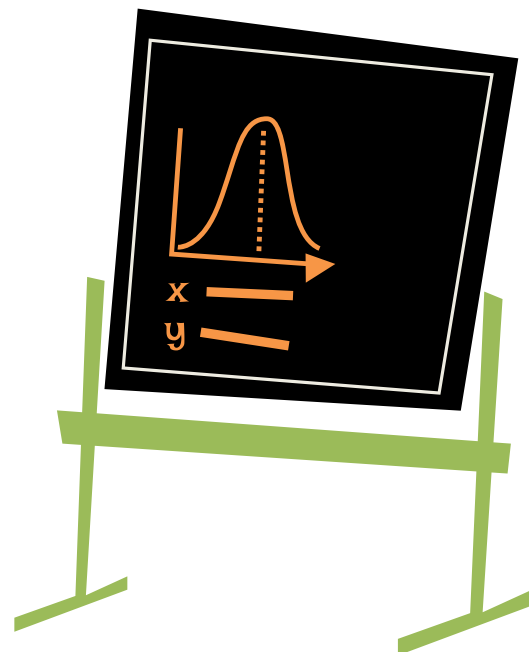
Translations of Arabic and Greek texts led to trigonometry being adopted as a subject in the Latin West beginning in the Renaissance with Regiomontanus. The development of modern trigonometry shifted during the western Age of Enlightenment, beginning with 17th-century mathematics (Isaac Newton and James Stirling) and reaching its modern form with Leonhard Euler (1748).



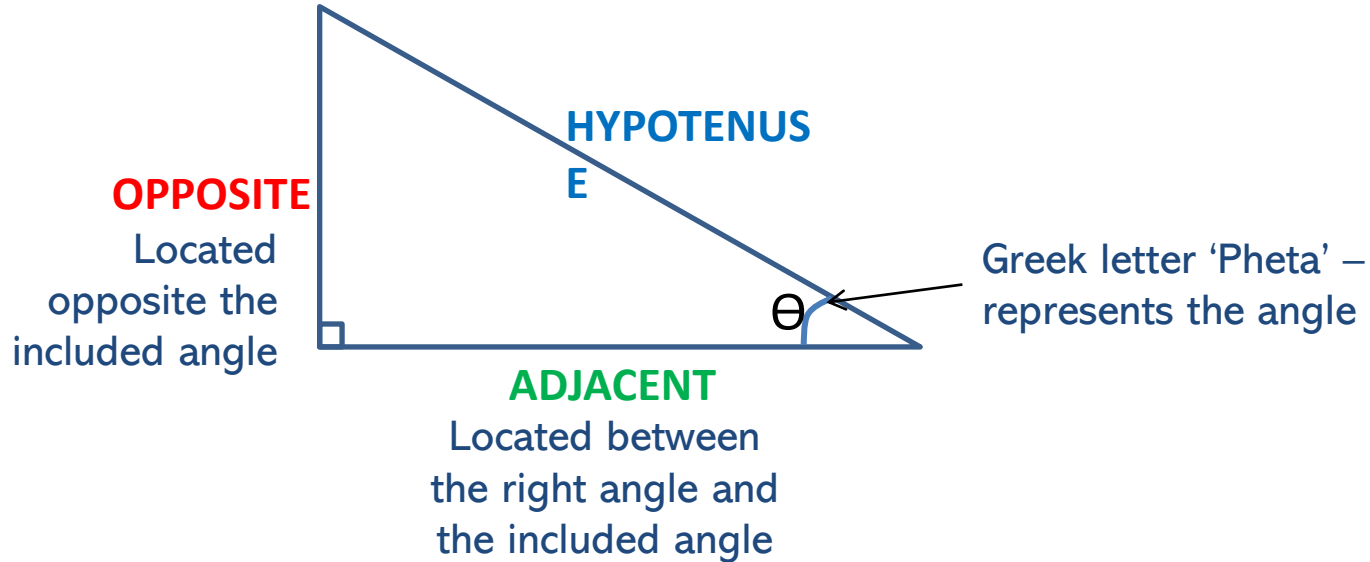


## 02

# Trigonometry Ratios



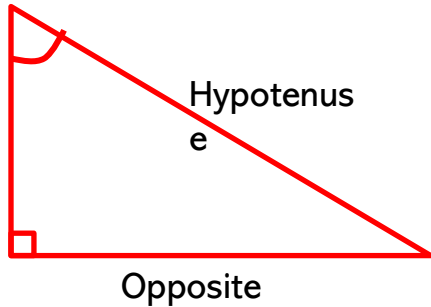
# Trigonometry





# Trigonometry Ratios

## Sine function



SOH

Sine Ratio:

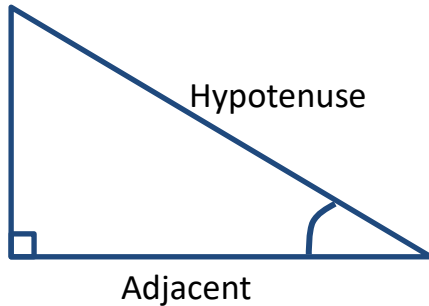
$$\sin \theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

The ratio of the length of the side that is opposite that angle to the length of the longest side of the triangle (the hypotenuse).

**Cosecant Function (cosec):** The reciprocal of the sine function

# Trigonometry Ratios

## Cosine function



CAH

Cosine Ratio:

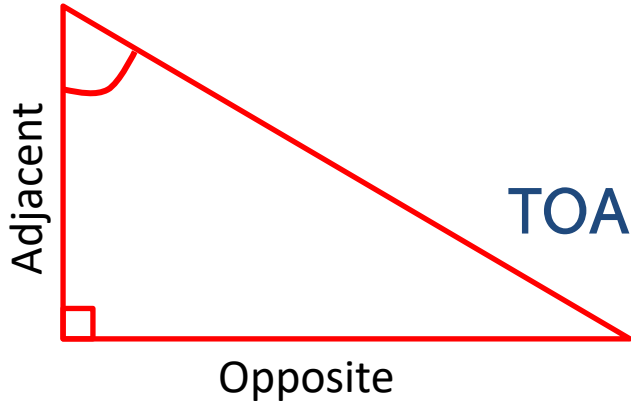
$$\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

The ratio of the length of the side that is opposite that angle to the length of the longest side of the triangle (the hypotenuse).

**Secant Function (sec):** The reciprocal of the cosine function

# Trigonometry Ratios

## Tangent function



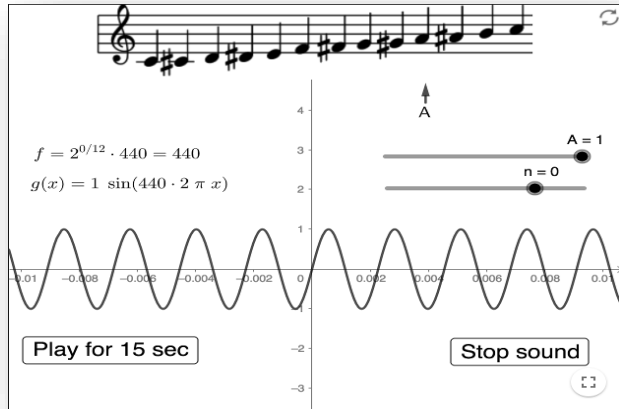
Tangent Ratio:

$$\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$$

The ratio of the length of the side that is opposite that angle to the length of the longest side of the triangle (the hypotenuse).

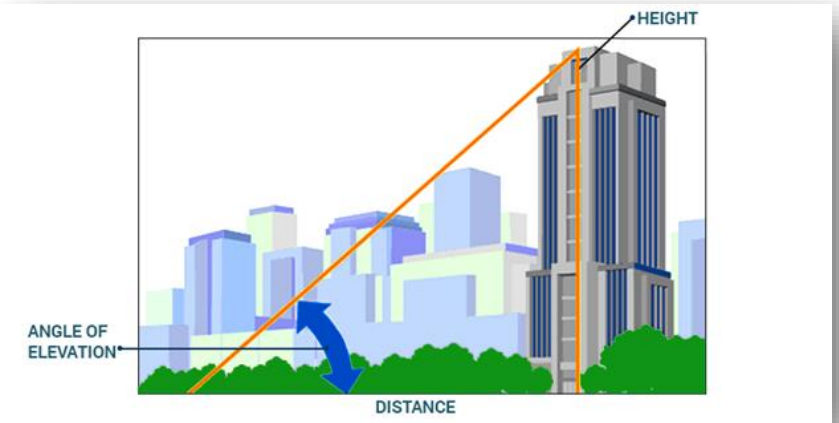
**Cotangent Function (cot):** The reciprocal of the tangent function

# Real-life Examples of Trigonometry



## Music

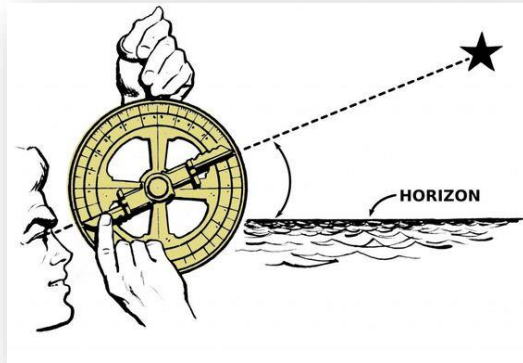
Sound travels in waves, and this pattern, though not as regular as a sine or cosine function, is still useful in developing computer music



## Measuring Heights

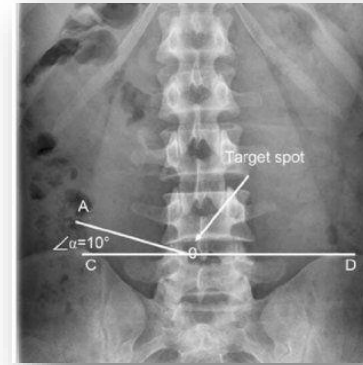
If you know the distance from where you observe the building and the angle of elevation, you can easily find the height of the building

# Real-life Examples of Trigonometry



## Navigation

Trigonometry is used in navigation to find the distance of the shore from a point in the sea

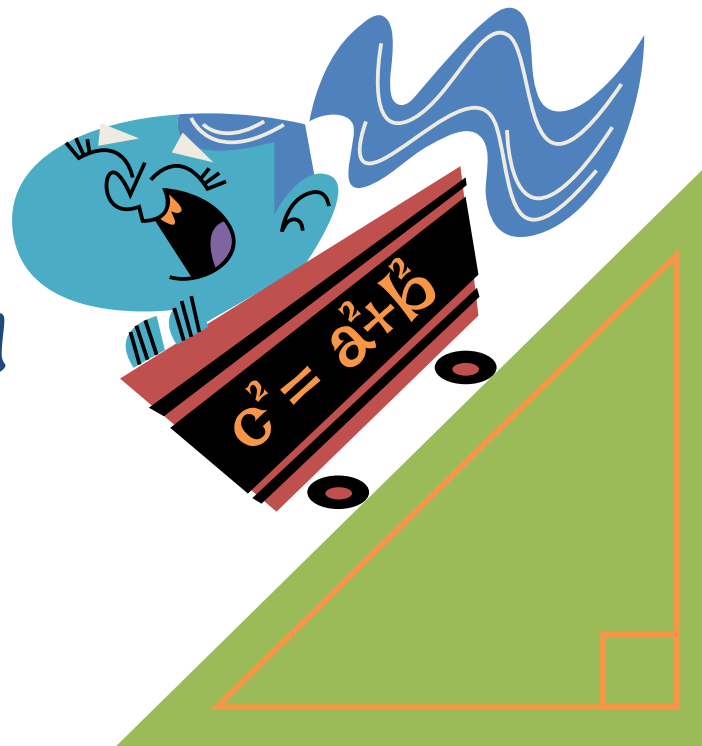


## Medical Imaging

Trigonometry can help in the creation of images through the use of ultrasound, computerized tomography, and magnetic resonance imaging

# 03

## Angles of Elevation and Depression

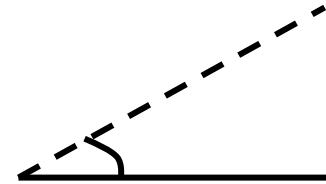




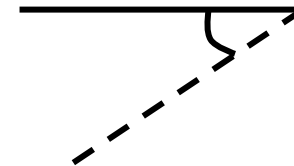
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# Angles of Elevation and Depression

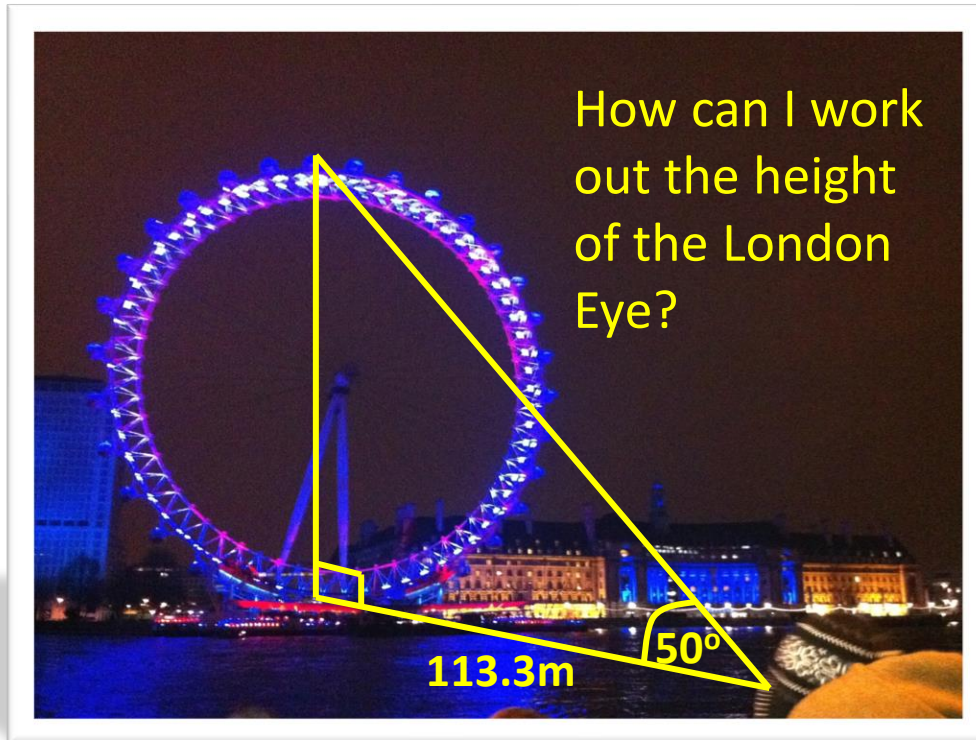
**Angles of Elevation:** the angle between the horizontal and an object above the observer's line of sight



**Angle of Depression:** the angle between the horizontal and an object below the observer's line of sight



# Angles of Elevation



$$\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$$

$$\tan 50 = \frac{h}{113.3}$$

$$h = 113.3 \tan 50$$

$$h = 134.67\text{m (2dp)}$$





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# Angles of Elevation



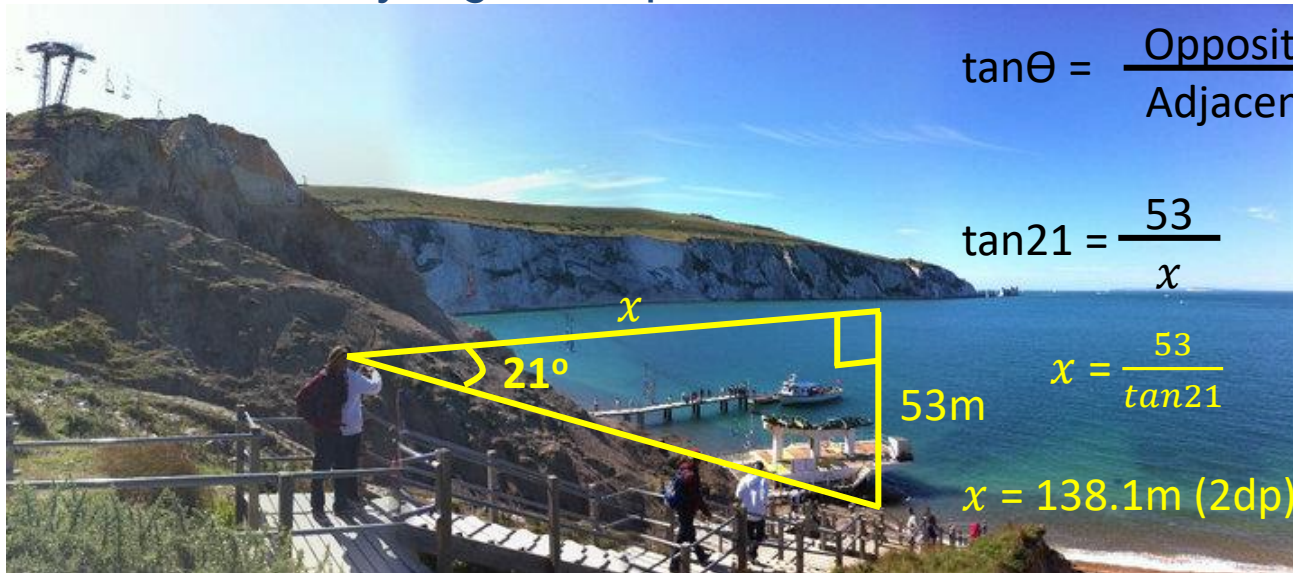
If I stand  
140m from  
Horseguard's  
Parade, the  
building is  
60m tall,  
what is my  
angle of  
elevation?



# Angles of Depression

I want to work out how far away the beach is from where I'm standing. I know I'm currently 53m above sea level.

I need to know my angle of depression.



$\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$

$\tan 21 = \frac{53}{x}$

$x = \frac{53}{\tan 21}$

$x = 138.1\text{m (2dp)}$



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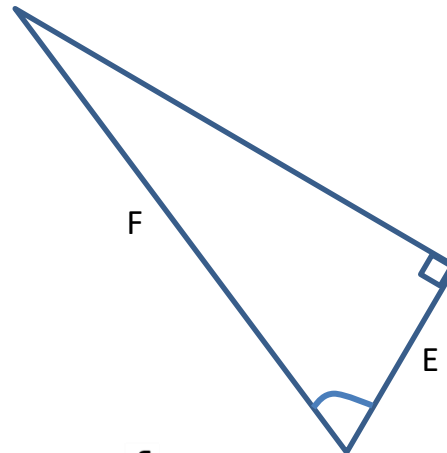
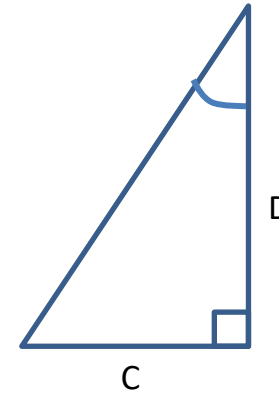
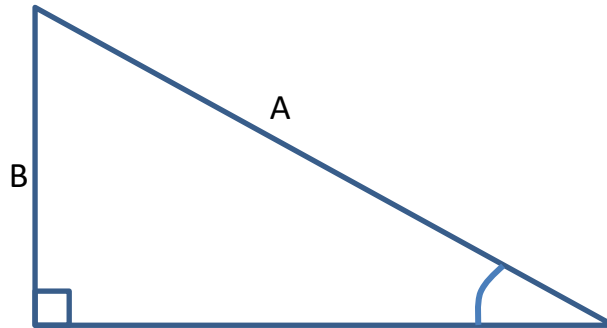


04

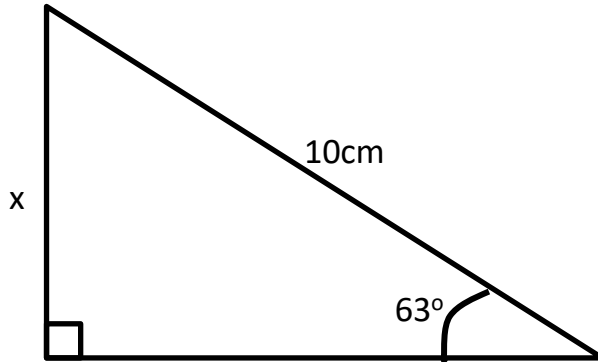
# Activities



# Which side?



# Example



~~SOH~~ ~~CAH~~ ~~TOA~~

$$\sin \theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

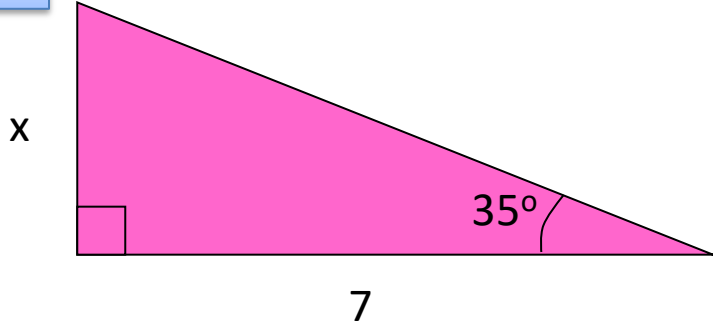
$$\sin 63 = \frac{x}{10}$$

$$x = 10 \sin 63$$

$$x = 8.91 \text{ cm (2dp)}$$

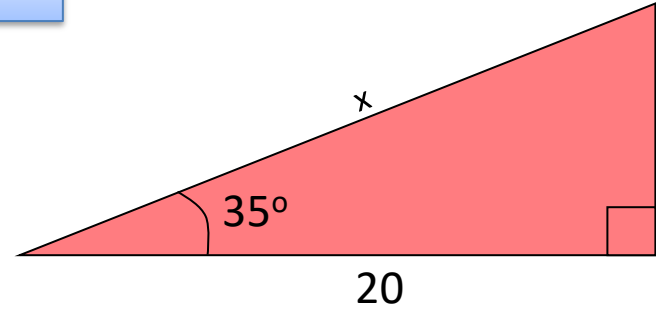
# Find the value of $x$ !

1



SOH CAH TOA

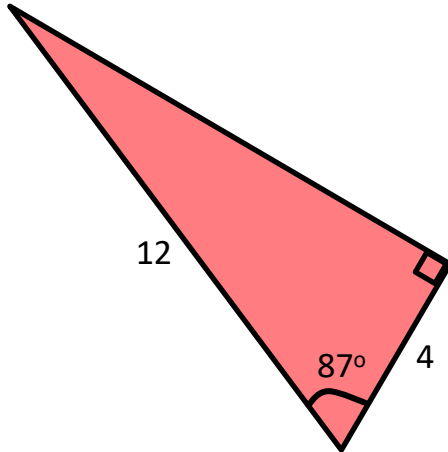
2



SOH CAH TOA

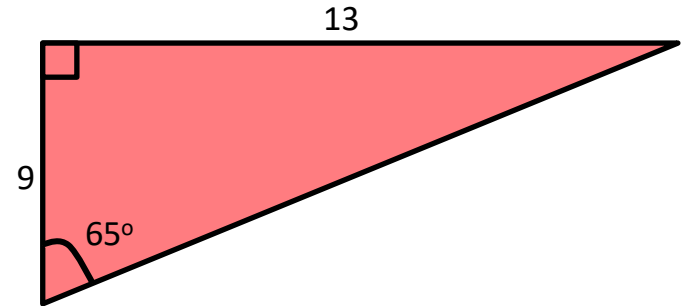
# Which Ratio?

3



SOH CAH TOA

4



SOH CAH TOA



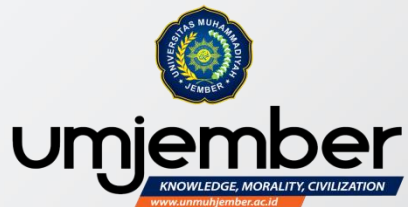
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# Task

1. From the top of a building, a person observes a kite flying at an angle of elevation of 45 degrees. If the person is on the rooftop, which is 30 meters above the ground, and the kite is directly above a point 50 meters away from the base of the building, how high is the kite flying above the ground?
2. Standing on a hill, a hiker looks down at a campsite situated in a valley. The angle of depression from the hiker to the campsite is 20 degrees. If the hill's elevation is 150 meters above sea level, and the campsite is directly below the hiker, how deep is the valley at the location of the campsite?







Thank  
you!