

Computer Science Department
1st Class: Mathematics



Lecture 8.

Transcendental Function

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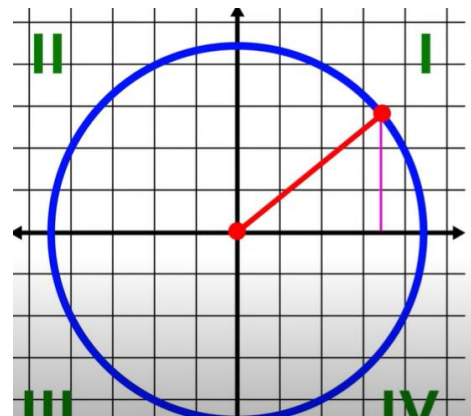
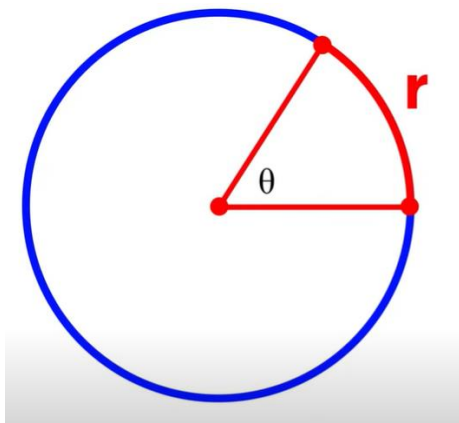
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1. Trigonometric Functions

2.1. Deriving the Trigonometric Functions

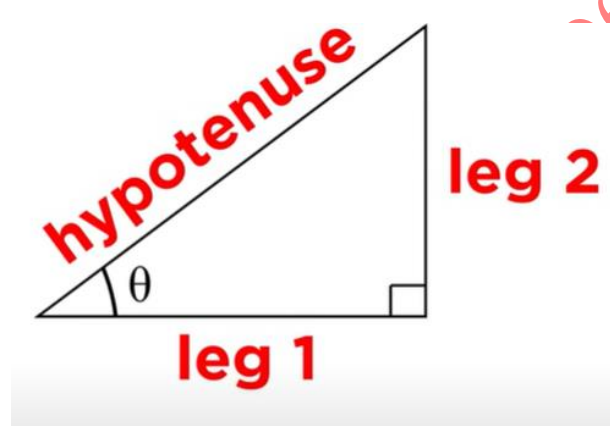
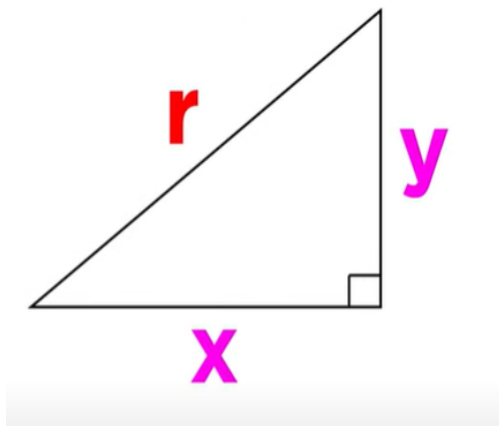
On the circle that is shown in next figure and based on the radius. Draw the right triangle with an x leg and a y leg and the radius as the hypotenuse. The hypotenuse is always same as it's the radius of the circle, but the lengths of the legs change in a way that depends on the angle.



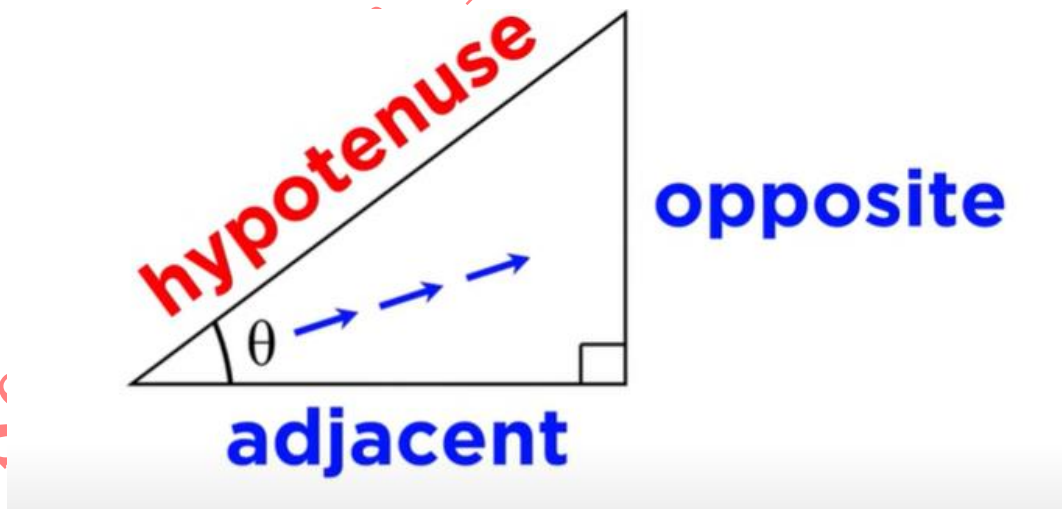
To describe the precise relationship between these side lengths and this angle, we can use trigonometric functions.

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Based on the triangle, here are two legs, the hypotenuse and the angle of interest, theta.



Now, it should different between these two legs by calling adjacent leg which is a leg right next the angle and another one is called the opposite leg.



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Now,

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

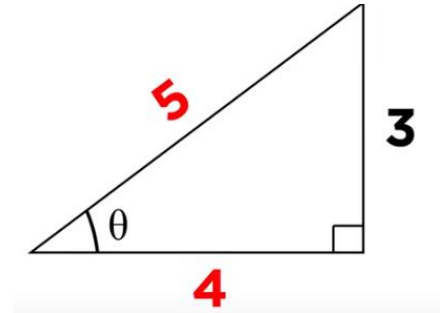
$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

For easy remember these definitions, it can use the mnemonic

SOHCAHTOA.

Example. Using this triangle to compute the Trigonometric Functions.

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Solution.

$$\sin \theta = \frac{3}{5}, \quad \cos \theta = \frac{4}{5}, \quad \tan \theta = \frac{3}{4}.$$

Memorize SOHCAHTOA and Reciprocals

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} \quad \longrightarrow \quad \text{csc } \theta = \frac{\text{hyp}}{\text{opp}}$$

"cosecant"

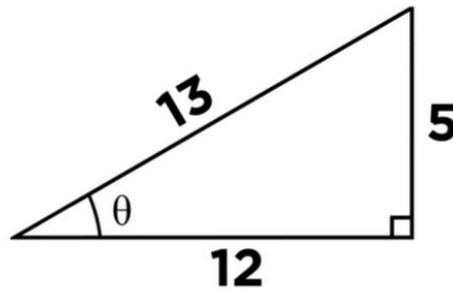
$$\cos \theta = \frac{\text{adj}}{\text{hyp}} \quad \longrightarrow \quad \text{sec } \theta = \frac{\text{hyp}}{\text{adj}}$$

"secant"

$$\tan \theta = \frac{\text{opp}}{\text{adj}} \quad \longrightarrow \quad \text{cot } \theta = \frac{\text{adj}}{\text{opp}}$$

"cotangent"

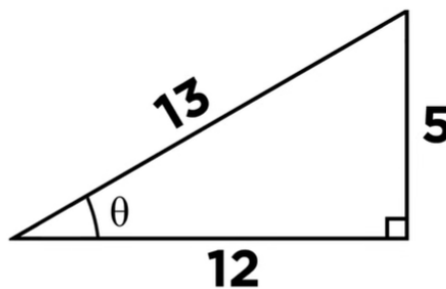
Evaluating Trigonometric Functions



**Let's evaluate all six
trigonometric functions!**

Solution.

Evaluating Trigonometric Functions



$$\sin \theta = \frac{5}{13}$$

$$\cos \theta = \frac{12}{13}$$

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

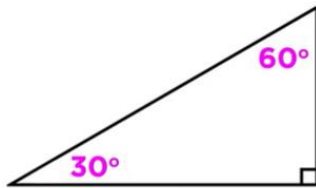
$$\csc \theta = \frac{13}{5}$$

$$\sec \theta = \frac{13}{12}$$

$$\cot \theta = \frac{12}{5}$$

Evaluating Trig Functions For Special Triangles

30-60-90 triangle

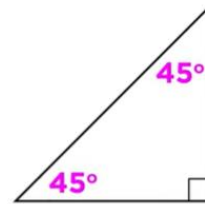


$$\sin \theta =$$

$$\cos \theta =$$

$$\tan \theta =$$

45-45-90 triangle



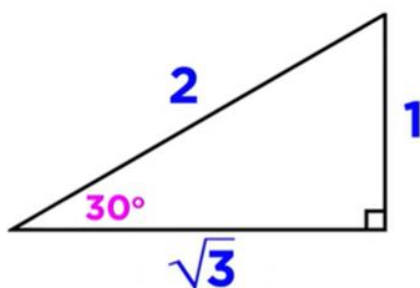
$$\sin \theta =$$

$$\cos \theta =$$

$$\tan \theta =$$

First,

30-60-90 triangle



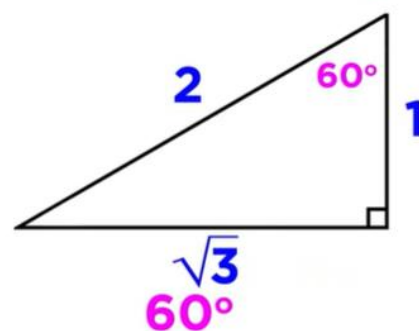
SOHCAHTOA

$$\sin \theta = 1/2$$

$$\cos \theta = \sqrt{3}/2$$

$$\tan \theta = 1/\sqrt{3}$$

30-60-90 triangle

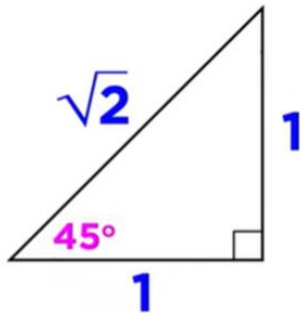


$$\sin \theta = \sqrt{3}/2$$

$$\cos \theta = 1/2$$

$$\tan \theta = \sqrt{3}$$

45-45-90 triangle



SOHCAHTOA

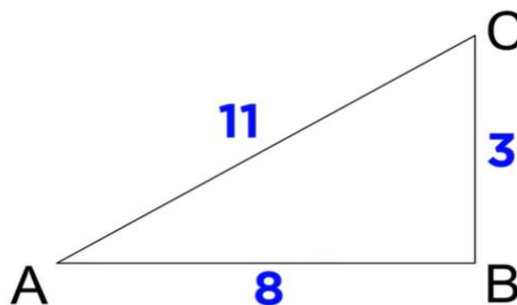
$$\sin \theta = 1 / \sqrt{2}$$

$$\cos \theta = 1 / \sqrt{2}$$

$$\tan \theta = 1/1$$

H.W. 1.

Compute all six trigonometric functions for angle A:



2. Compute the six Trigonometric Funs. Of the 30° and explain that geometrically?

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