Trigonometry Primer

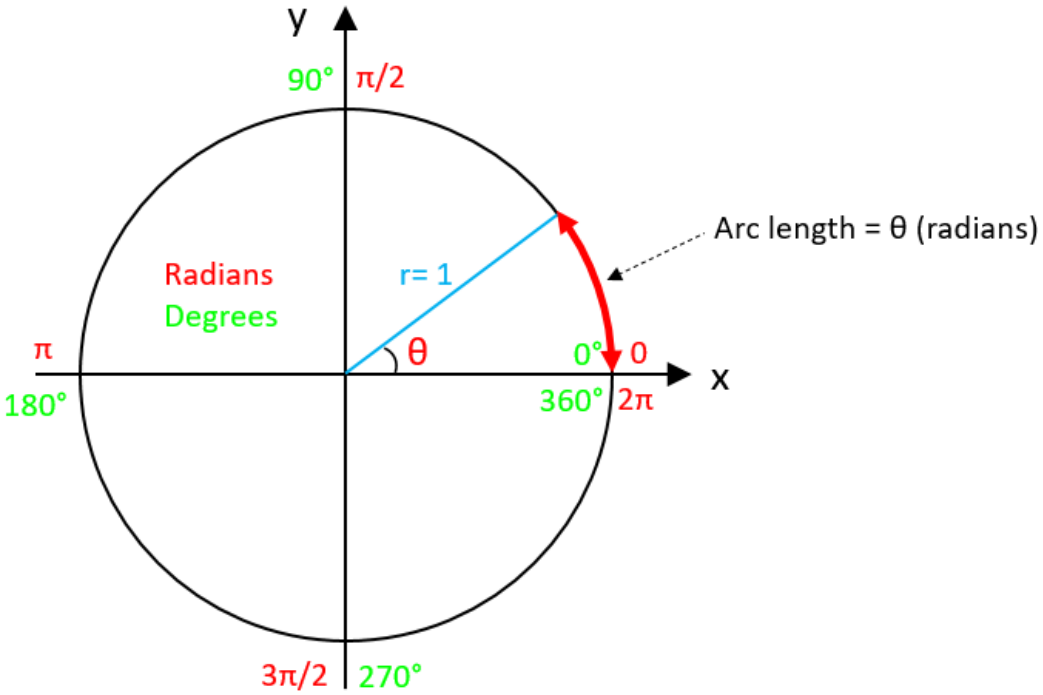
1. Introduction

Trigonometry is everywhere and used in many branches of science and technology: geography, astronomy, electrical engineering, architecture, etc…

The basic concepts are presented here, mostly in pictures and a few formulas. Also, there is a short test at the end !

2. Unit of measure of angles

Two types of units are used for angles: radians and degrees. This is important to master fully and be able to easily go from one set of units to the other.



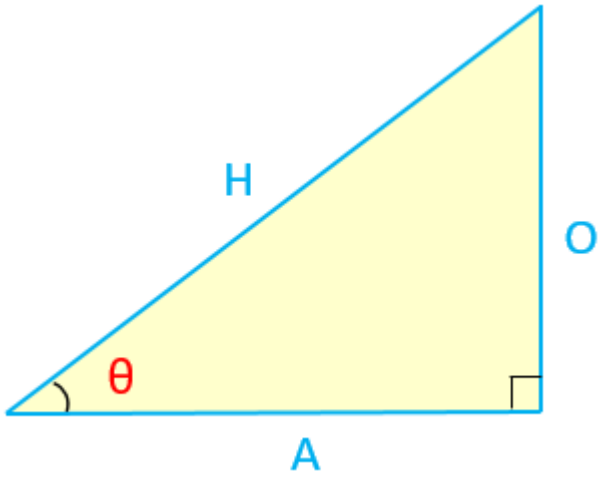
Angle θ in radians = length of the arc intercepted by the angle θ on the unit circle.

θ = 2π that corresponds to one full rotation on the unit circle, is the perimeter of the unit circle of radius of 1 (Perimeter = 2 π * Radius).

- π/2 radians → 90^0
- π radians → 180^0
- 2π radians → 360^0

3. Sinus and cosinus formulas

Considering the rectangle triangle below:



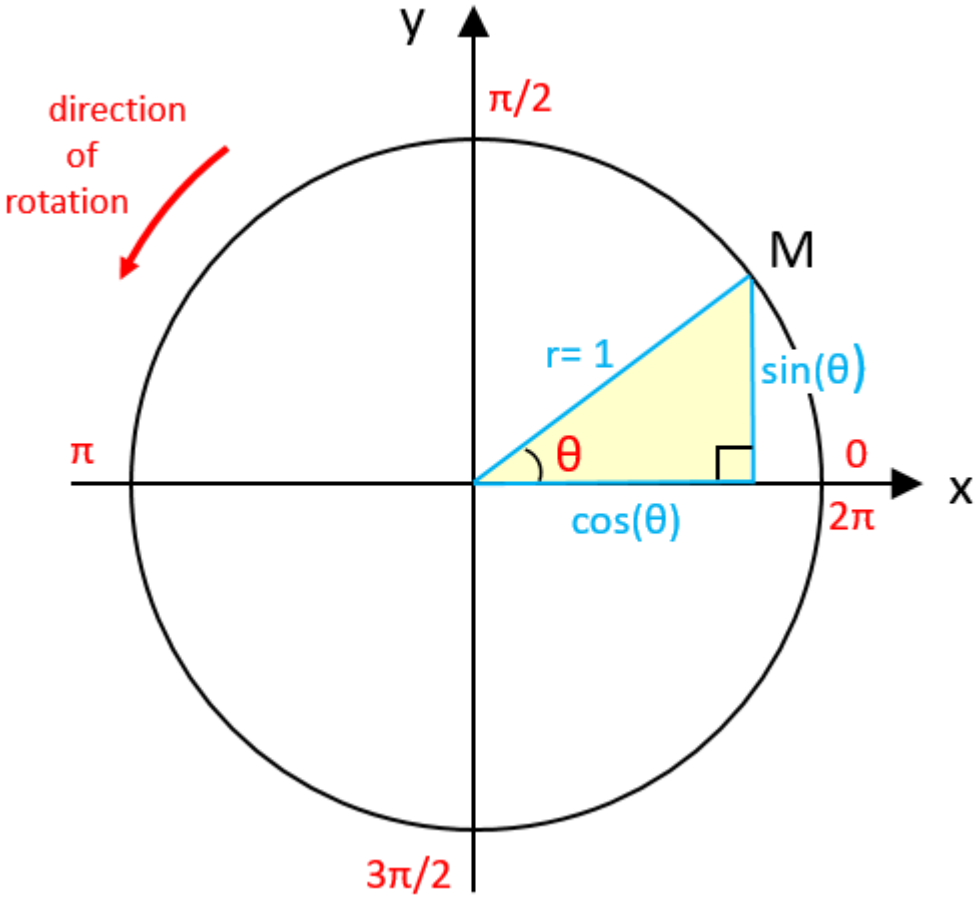
Sinus, cosinus and tangent formulas:

- Sin(θ) = O / H = Opposite / Hypotenuse
- Cos(θ) = A / H = Adjacent / Hypotenuse
- Tg(θ) = O / A = Opposite / Adjacent

Helpful mnemonic: SOH-CAH-TOA

4. Trigonometric circle

The trigonometric circle is an important tool to work with angles, for a clear understanding of the relationship to the trigonometric functions and periodicity:

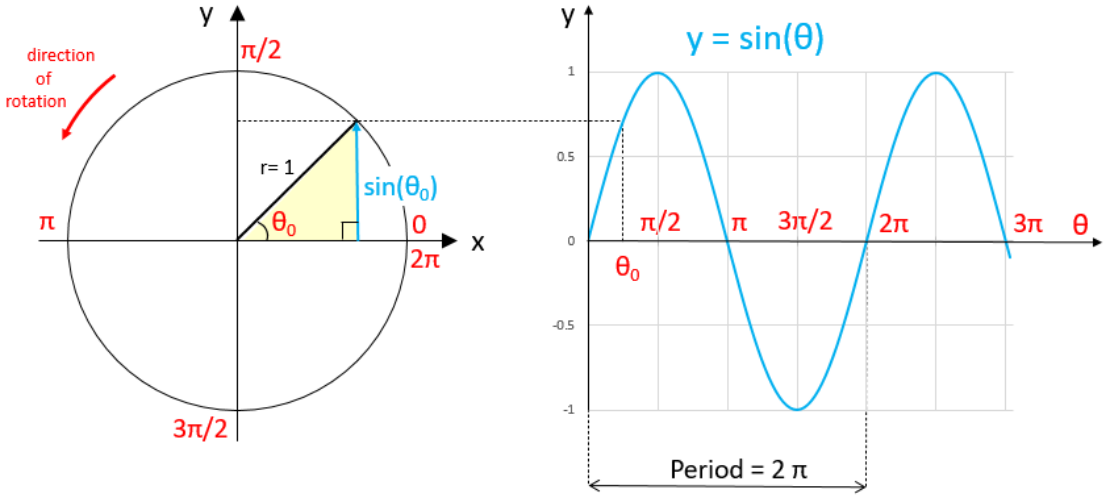


Notes:

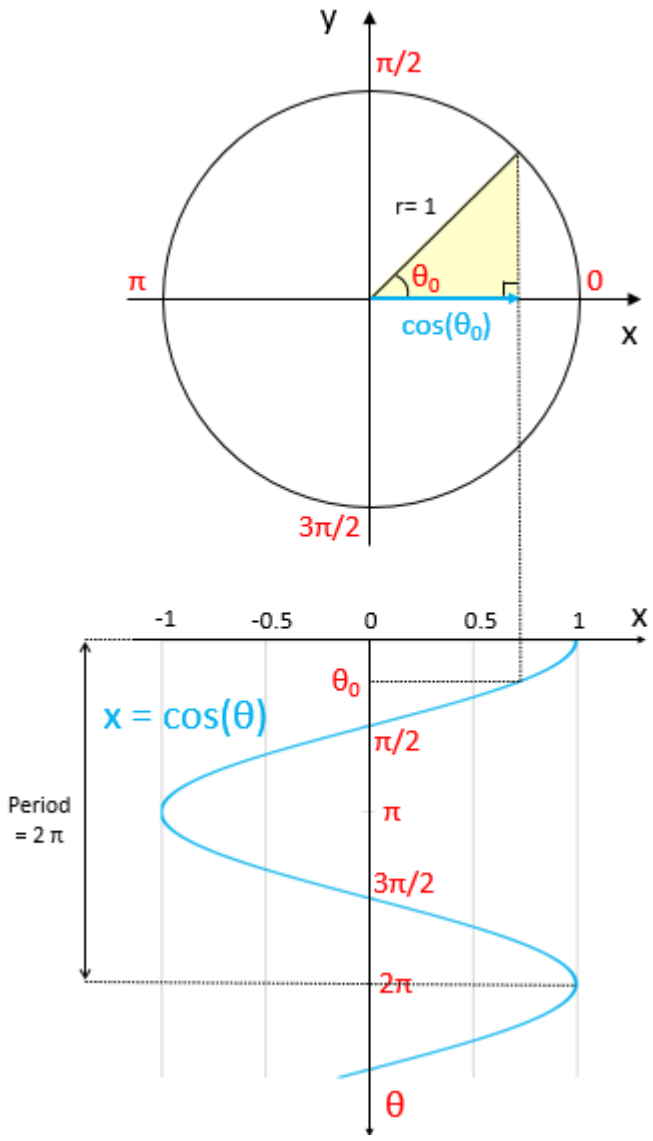
- Point M coordinates: x = cos(θ), y = sin(θ)
- Equation of the unit cercle: $x^2 + y^2 = 1$
- Special case of Pythagora: $\sin^2(\theta) + \cos^2(\theta) = 1$

5. Trigonometric circle and Sinus function

How the trigonometric circle relates to the Sinus function graph:

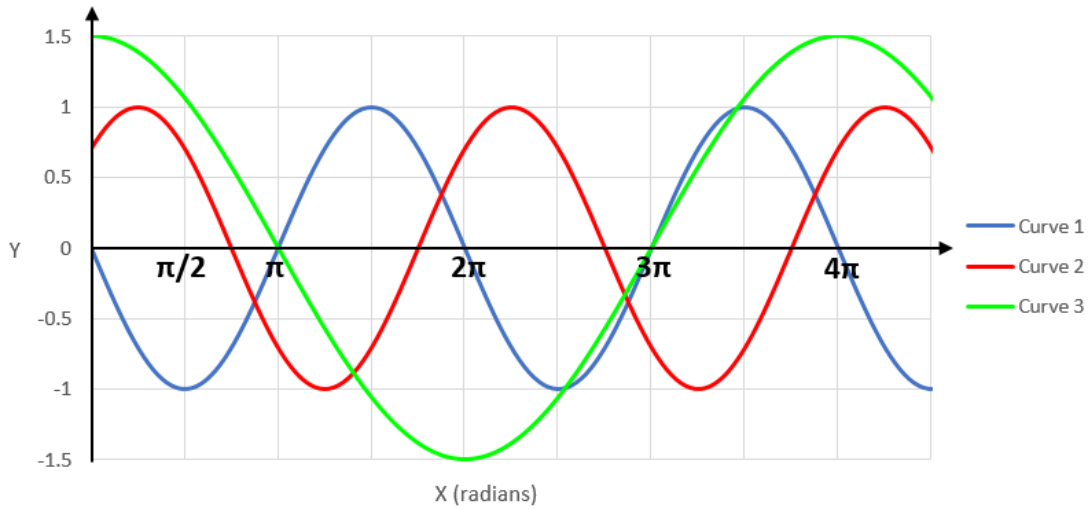


Similar figure for the Cosinus function:



6. Test yourself

Can you identify the following trigonometric functions curves ?



Solution:

Curve 1: - sin(x)
Curve 2: cos(x-π/4)
Curve 3: 1.5 cos(x/2)