VALUES OF TRIGONOMETRIC RATIOS OF TYPICAL ANGLES

In academic literature, the angles 0°, 30°, 45°, 60°, and 90° are commonly referred to as standard angles. The trigonometric ratios for these standard angles can be found in the table below.

	0°	30°	45°	60°	90°
sin θ	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos θ	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan θ	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined
cosec θ	Not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
sec θ	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not defined
cot θ	Not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

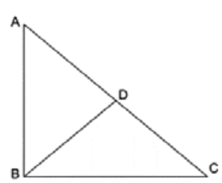
Value for 0° and 90°

Let's examine an angle of 90° and another angle close to 0°, as shown in the following image.

Let the smallest angle be A then
$\sin A =$ perpendicular/hypotenuse,
$\cos A =$ base/hypotenuse
Since angle A is very small, the corresponding perpendicular is also very small, resulting in a value of sin A that is close to zero.
Moreover, the length of the triangle's base will be approximately equal to the length of the hypotenuse. Therefore, the value of cos A will be approximately close to one.
After all this, we can say that.
$\sin A = 0$ and $\cos A = 1$
Now we know that
$\tan A = \frac{\sin A}{\cos A} = \frac{0}{1} = 0$
From this, we have shown that $\sin 0° = 0$, $\cos 0° = 1$, and $\tan 0° = 0$. Consequently, we can also deduce that $\sin 90° = 1$, $\cos 90° = 0$, and tan 90° is undefined.

Value for 30° and 60°

Let's examine the triangle below.



Given that $AC = 2BA$ and from the image above where $AD = DC = BD$ according to plane geometry, we establish that angle $C = 60°$ and angle $A = 30°$.
Now, as we understand
$\sin C = \frac{BA}{AC} = \frac{BA}{2BA} = \frac{1}{2} = \sin 30°$
$\cos C = \frac{BA}{AC} = \frac{BA}{2BA} = \frac{1}{2} = \cos 60°$,
Now $\cos A = \frac{BC}{AC} = \sqrt{1 - (\frac{BA}{AC})^2} = \sqrt{1 - (\frac{1}{2})^2} = \frac{\sqrt{3}}{2} = \cos 30$

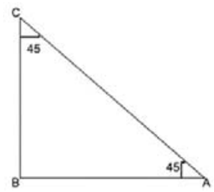
$\cos C = \frac{BC}{AC} = \sqrt{1 - (\frac{BA}{AC})^2} = \sqrt{1 - (\frac{1}{2})^2} = \frac{\sqrt{3}}{2} = \sin 60$

Here we can summarize the trigonometric ratios for 30° and 60° as follows:

	30	60
Sin	$\frac{1}{2}$	$\frac{3}{2}$
Cos	$\frac{3}{2}$	$\frac{1}{2}$

Value for 45°

Let's examine the triangle depicted below.



This is a right triangle where the other two angles are 45° each. Such a triangle is of the isosceles type.

This means $AB = BC = \frac{AC}{\sqrt{2}}$,

$\sin 45 = \frac{BC}{AC} = \frac{1}{\sqrt{2}}$

$\cos 45 = \frac{AB}{AC} = \frac{1}{\sqrt{2}}$ Hence proved

	45°
Sin	$\frac{1}{\sqrt{2}}$
Cos	$\frac{1}{\sqrt{2}}$

We've demonstrated how to derive the values of standard angles. To gain a deeper understanding of the topic, let's explore some examples or problems that can be solved using these trigonometric ratios for standard angles.

Ex. What is the value of cos 45sin 30 + sin 45cos 30 ?

Sol. Using the table of trigonometric ratios for standard angles, we can derive the following values:

$\cos 45 = \sin 45 = \frac{1}{\sqrt{2}}$

$\sin 30 = \frac{1}{2}$

$\cos 30 = \frac{\sqrt{3}}{2}$

Let's put these values in the expression.

$\cos 45 \sin 30 + \sin 45 \cos 30 = \frac{1}{\sqrt{2}} \times \frac{1}{2} + \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} = 1 + 322$

Here the above value is our answer.

Ex. If, sin 60 + cos 301 + cos 60 + sin 30 = sin then, what is the value of ?

Sol. Using the table of trigonometric ratios for standard angles, we can find the values and substitute them into the equation as follows:

$\sin 60 + \cos 301 + \cos 60 + \sin 30 = \frac{3}{2} + \frac{3}{21} + \frac{1}{2} + \frac{1}{2} = \sin$

$\frac{3}{2} = \sin$

Now, we can say that. $= 60°$