## Trigonometric Equations

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## What is a Trigonometric Equation?



The equations having trigonometric functions of unknown angles are known as trigonometric equations.
For example: $\tan ?=\sqrt{\frac{1}{3}}$

## Solution of a trigonometric equation

The value of the unknown angle that satisfies the given trigonometric equation is called the solution of the trigonometric equation.

## General Solutions of Trigonometric Equations

Under this section, we will learn about thegeneral solutions of the trigonometric equations $\operatorname{Sin} ?=0, \operatorname{Cos} ?=0, \operatorname{Tan} ?=0$ and $\operatorname{Cot}$ $?=0, \operatorname{Sin} ?=\operatorname{Sin} ?, \operatorname{Cos} ?=\operatorname{Cos} ?$ and $\operatorname{Tan} ?=\operatorname{Tan} ?$ and $\mathrm{a} \operatorname{Cos} ?+\mathrm{b} \operatorname{Sin} ?=\mathrm{c}$

## General Solution of Sin ?=0

The general solution of $\operatorname{Sin} ?=0$ is ? $=\mathrm{n} ?, \mathrm{n} ? \mathrm{Z}$

General Solution of Cos? $=0$

The general solution of $\operatorname{Cos} ?=0$ is $?=(2 n+1) \frac{\Pi}{2}, n ? Z$.

## General Solution of Tan ? = 0

The general solution of Tan ? $=0$ is ? $=\mathrm{n} ?, \mathrm{n} ? \mathrm{~N}$.

## General Solution of Cot $\boldsymbol{?}=\mathbf{0}$

The general solution of $\operatorname{Cot} ?=0$ is $(2 n+1) \frac{\Pi}{2}, n ? Z$.

## Important Note:

As we have discussed the general solution of 4 trigonometric ratios out of 6 .

## General Solution of Sec ? = 0

Since Sec ? ? 1, or Sec ? ? -1

Therefore, $\operatorname{Sec} ?=0$ does not have any solution.

## General Solution of Cosec ? = 0

Since Cosec ? ? 1, or Cosec ? ?-1
Therefore, Cosec $?=0$ does not have any solution.

## General Solution of $\operatorname{Sin} \boldsymbol{?}=\operatorname{Sin}$ ?

$?=\mathrm{n} ?+(-1)^{\mathrm{n}} \mathrm{n} ?, \mathrm{n} ? \mathrm{Z}$

The equation Cosec $?=\operatorname{Cosec} ?$ is equivalent to $\operatorname{Sin} ?=\operatorname{Sin} ?$. Thus, Cosec $?=\operatorname{Cosec} ?$ and $\operatorname{Sin} ?=\operatorname{Sin} ?$ have the same general solution.

## General Solution of $\operatorname{Cos} ?=\operatorname{Cos}$ ?

$?=2 \mathrm{n} ? \pm$ ?, where n ? Z.
The equation $\operatorname{Sec} ?=\operatorname{Sec} ?$ is equivalent to $\operatorname{Cos} ?=\operatorname{Cos} ?$. Thus, $\operatorname{Sec} ?=\operatorname{Sec} ?$ and $\operatorname{Cos} ?=\operatorname{Cos} ?$ have the same general solution.

## General Solution of Tan ? = Tan ?

$?=\mathrm{n} ?+?, \mathrm{n} ? \mathrm{Z}$

The equation Tan $?=\operatorname{Tan} ?$ is equivalent to $\operatorname{Cot} ?=\operatorname{Cot} ?$. Thus, Tan $?=\operatorname{Tan} ?$ and $\operatorname{Cot} ?=\operatorname{Cot} ?$ have the same general solution.

General Solution of $\operatorname{Sin}^{2} ?=\operatorname{Sin}^{2}$ ?
$?=\mathrm{n} ? \pm ?, \mathrm{n} ? \mathrm{Z}$.

General Solution of $\operatorname{Cos}^{2} ?=\operatorname{Cos}^{2}$ ?
$?=\mathrm{n} ? \pm ?, \mathrm{n} ? \mathrm{Z}$.

General Solution of $\operatorname{Tan}^{\mathbf{2}} \boldsymbol{?}=\operatorname{Tan}^{\mathbf{2}}$ ?
$?=\mathrm{n} ? \pm$ ?, n ? Z.

## 

$\mathrm{a} \operatorname{Cos} ?+\mathrm{b} \operatorname{Sin} ?=\mathrm{c}$, where $\mathrm{a}, \mathrm{b}, \mathrm{c} ? \mathrm{R}$ such that $? \mathrm{c} ? ? \mathrm{e}^{2}+\mathrm{b}^{2}$

In order to solve this type of equations, we reduce them in the form $\operatorname{Cos} ?=\operatorname{Cos} ?$ or $\operatorname{Sin} ?=\operatorname{Sin} ?$.

Now try it yourself! Should you still need any help, click here to schedule live online session with e Tutor!

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## Reference Links:

- http://www.purplemath.com/modules/solvtrig.htm
- http://www.wikihow.com/Solve-Trigonometric-Equations
- http://en.wikibooks.org/wiki/Trigonometry/Solving_Trigonometric_Equations

