GENERAL SOLUTIONS OF TRIGONOMETRICAL EQUATIONS.

I strongly believe that, in general, the reliance on a formula sheet does not aid understanding. It certainly facilitates a way of producing an "answer" but this is yet another illustration of the famous saying **"THERE IS A BIG DIFFERENCE BETWEEN *KNOWING* A THING AND *UNDERSTANDING* IT".**

The formulas for General Solutions of trigonometric equations are just another example of this concept.

I would guarantee that 99% of students have no idea WHY these formulae produce the general solutions of trigonometric equations. Personally, I **never** teach students to use them.

General Solutions

If $\sin\theta = \sin\alpha$ then $\theta = n\pi + (-1)^n\alpha$

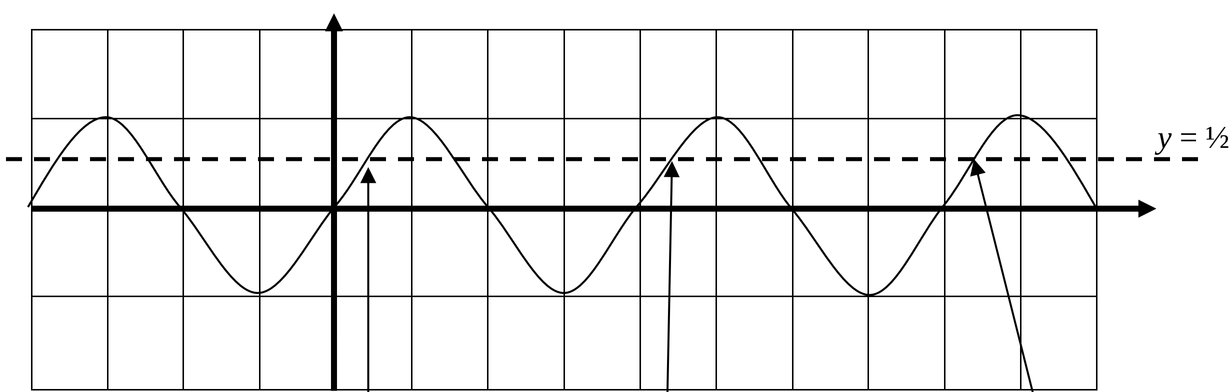
If $\cos\theta = \cos\alpha$ then $\theta = 2n\pi \pm \alpha$

If $\tan\theta = \tan\alpha$ then $\theta = n\pi + \alpha$

A **logical approach** is far superior and even the weaker students grasp it **and** they understand what they are doing!

Examples.

1. **Consider the General Solution of:** ***sin x* = ½**



The basic solution is $x = 30^0$ (or $\pi/6$ rad)

The way to find the next solution in the same relative position is simply to add 360^0 and get 390^0

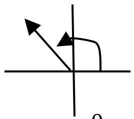
Then another 360^0 to get the next one which is 750^0

We think of this as 30^0 plus any number of 360's = $30 + 360n$ (or $\pi/6 + 2\pi n$)

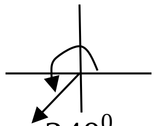
The other set of solutions is of course $150^0 + 360n$ (or $5\pi/6 + 2\pi n$)

Compared to this, the form on the formula sheet is absurdly complicated. $\boldsymbol{n\pi + (-1)^n\alpha}$

2. **<u>Consider the general solution of:</u>** ***cos 4x = –½*** (basic angle = 60^0)

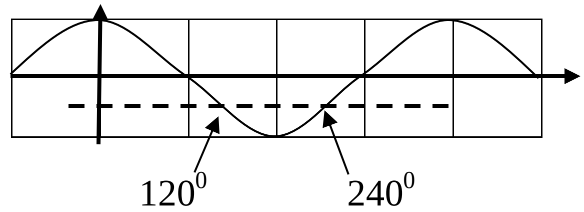


120^0



240^0

OR

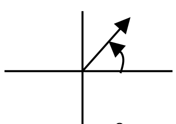


so $4x = 120 + 360n$ *or* $4x = 240 + 360n$

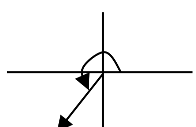
$x = 30 + 90n$ *or* $x = 60 + 90n$

> I am positive this is far better and much **easier to understand** than :
>
> $4x = 360n \pm 120$
> $x = 90n \pm 30$

3. **<u>Consider the general solution of</u>*:*** ***tan(x – 20) = √3*** (basic angle = 60^0)



60^0



240^0

so $x - 20 = 60 + 360n$ *and* $x - 20 = 240 + 360n$

$x = 40 + 360n$ *and* $x = 220 + 360n$

> The formula method gives:
> $x - 20 = 180n + 60$
> $x = 180n + 40$

> The **<u>“logic”</u>** method uses ONE concept: namely solutions repeat by adding on 360’s and **real understanding is achieved!**
>
> **The “formula” method is yet another way that teachers can be responsible for MYSTIFYING mathematics for students.**