Solving Trigonometric Equations - Lesson 3

Solving Trigonometric Equations
(Rearranging : 0° to 360°)

LI

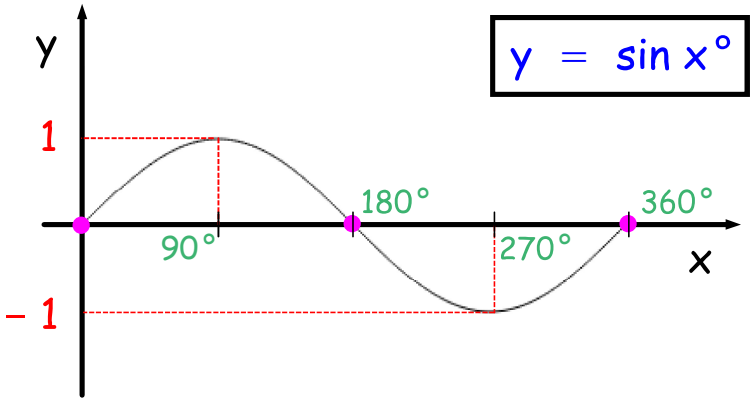
- Solve trigonometric equations after rearranging into the form :

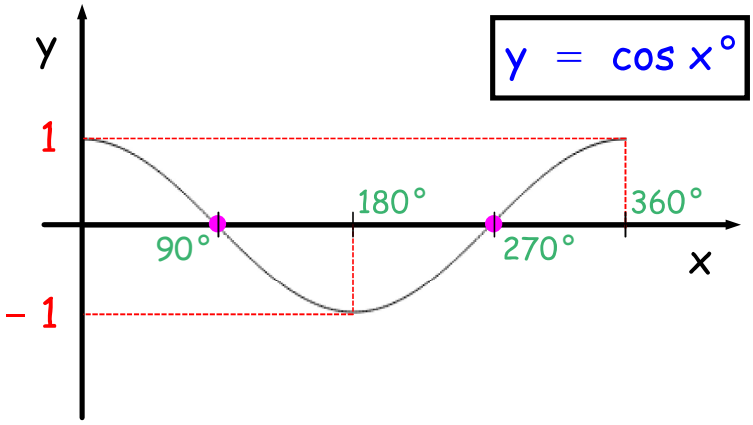
$$\sin x^\circ = a$$
$$\cos x^\circ = a \qquad \text{between } 0^\circ \text{ and } 360^\circ$$
$$\tan x^\circ = a$$

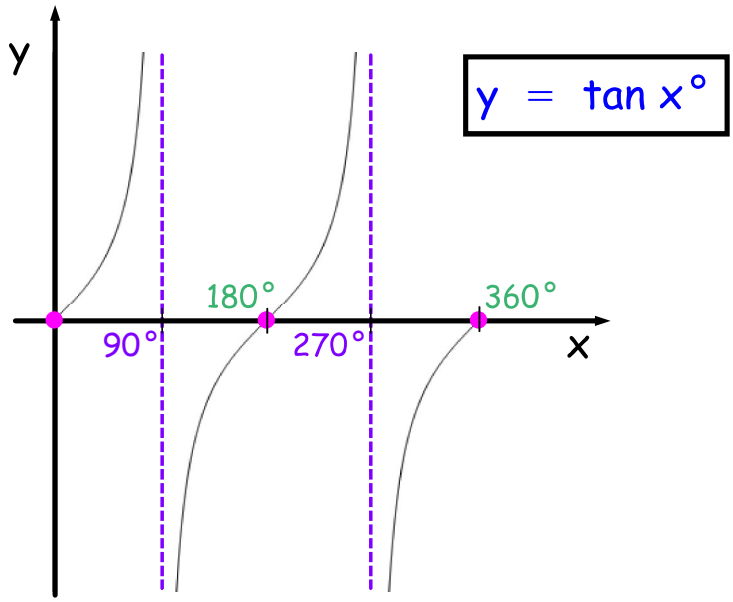
SC

- Graphs of $y = \sin x^\circ$, $y = \cos x^\circ$ and $y = \tan x^\circ$ between 0° and 360°.
- Use the ASTC Diagram .

Trigonometric Graphs Between 0° and 360°







Example 1

Solve $5 \tan x° - 3 = 0$ for $0° \leq x° \leq 360°$ (1 d.p.).

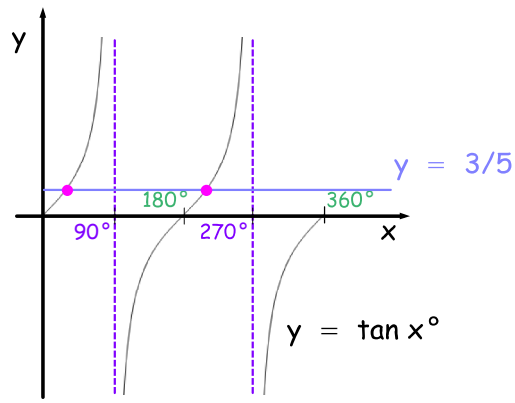
$$5 \tan x° - 3 = 0$$

$$\Rightarrow \quad 5 \tan x° = 3$$

main equation

$$\Rightarrow \quad \underline{\tan x° = 3/5}$$

STEP 1



(Expecting 2 answers)

STEP 2

$$RAA = \tan^{-1}(3/5)$$

$$\Rightarrow \quad \underline{RAA = 30.96\ldots°}$$

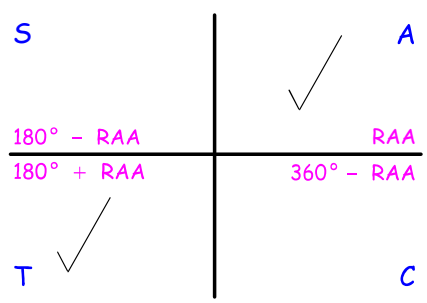
STEP 3

main equation

$$\tan x° = 3/5$$

$\boxed{\text{tan is } + \text{ve}}$

STEP 4



$$x° = RAA, 180° + RAA$$

$$\therefore \quad x° = 31.0°, 180° + 31.0°$$

$$\Rightarrow \quad \boxed{x° = 31.0°, 211.0°}$$

Example 2

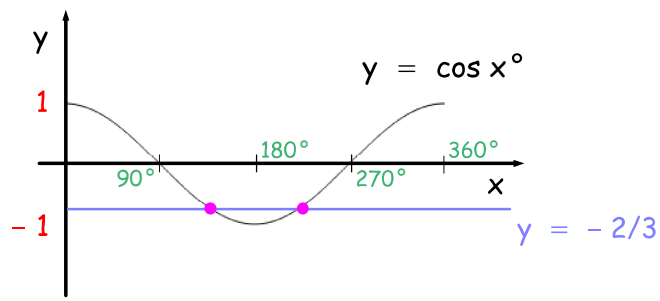
Solve $3\cos x° + 4 = 2$ for $0° \le x° \le 360°$. (1 d.p.).

$$3\cos x° + 4 = 2$$

$$\Rightarrow \quad 3\cos x° = -2$$

$$\Rightarrow \quad \underbrace{\cos x° = -2/3}_{\text{main equation}}$$

STEP 1



(Expecting 2 answers)

STEP 2

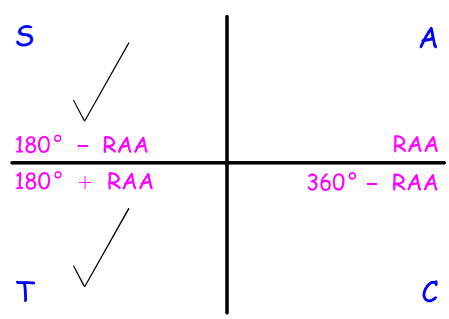
$$RAA = \cos^{-1}(2/3)$$

$$\Rightarrow \quad RAA = 48.18\ldots°$$

STEP 3

$$\underbrace{\cos x° = -2/3}_{\text{main equation}} \qquad \boxed{\cos \text{ is } -\text{ve}}$$

STEP 4



$$x° = 180° - RAA,\ 180° + RAA$$

$$\therefore \quad x° = 180° - 48.2°,\ 180° + 48.2°$$

$$\Rightarrow \quad \boxed{x° = 131.8°,\ 228.2°}$$

CfE N5 Maths

pg. 279 Ex. 24D Q 1, 2

Questions

1 Solve for $0 \leqslant x \leqslant 360$, giving your answers to 1 decimal place.

a $3\sin x° - 2 = 0$ **b** $4\cos x° + 1 = 2$ **c** $5\tan x° - 4 = 3$

d $4\cos x° + 3 = 0$ **e** $8 + 3\tan x° = 4$ **f** $7 - 3\cos x° = 6$

g $4\sin x° - 5 = -1$ **h** $6\cos x° + 2 = 7$ **i** $3 + 5\sin x° = 7$

j $2\tan x° - 3 = 5$ **k** $2\cos x° + 3 = 1$ **l** $5 - 4\sin x° = 8$

2 The height, h metres, of a carriage on a Ferris wheel is given by the equation

$$h = 35 + 30\sin t°$$

where t is the time in seconds after starting.

a Calculate the height after 45 seconds.

b **i** After how many seconds is the carriage first at a height of 50 m?

ii When does it next reach this height?

Answers

1 a $x = 41.8°$, $x = 138.2°$

b $x = 75.5°$, $x = 284.5°$

c $x = 54.5°$, $x = 234.5°$

d $x = 138.6°$, $x = 221.4°$

e $x = 126.9°$, $x = 306.9°$

f $x = 70.5°$, $x = 289.5°$

g $x = 90.0°$

h $x = 33.6°$, $x = 326.4°$

i $x = 53.1°$, $x = 126.9°$

j $x = 76.0°$, $x = 256.0°$

k $x = 180.0°$

l $x = 228.6°$, $x = 311.4°$

2 a $h = 56.2\text{m}$

b i $x = 30.0\text{s}$

ii $x = 150.0\text{s}$