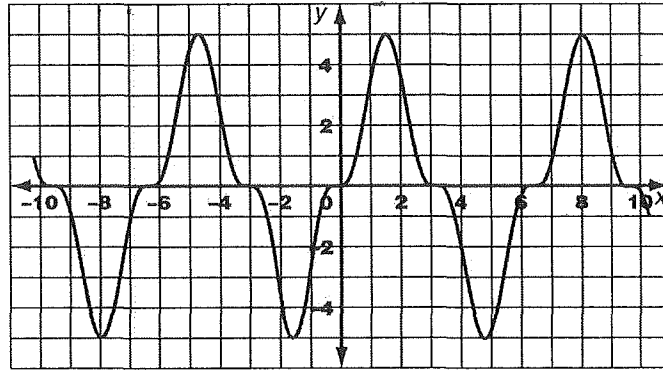# Day 1: Prerequisite Skills

Periodic Functions

- A function is **periodic** if it has a pattern of y-values that repeat at regular intervals.
- A **cycle** is one complete pattern.
- The **period of a function** is the <u>horizontal length</u> of one cycle.
- The **amplitude** of a periodic function is one half the difference between the max value and the min value. The amplitude is always positive.

Formulas and concepts:

Given $y = a\cos[k(x - d)] + c$:

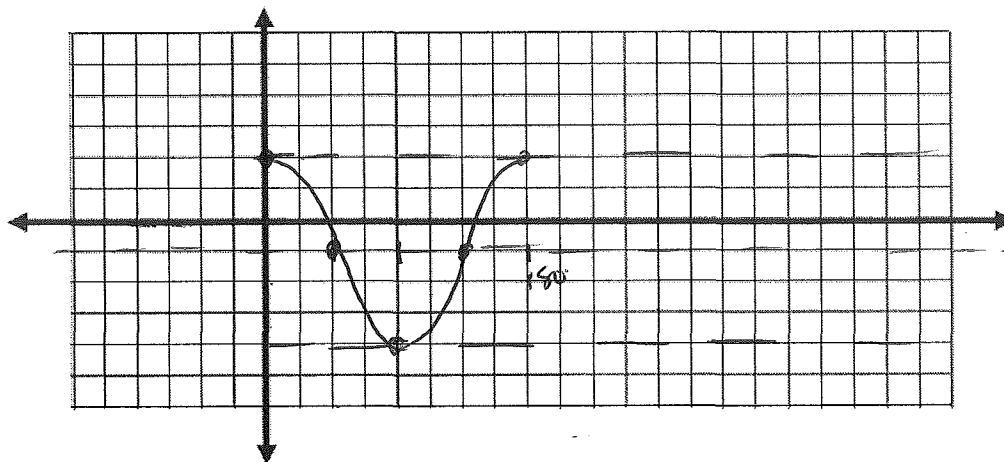Max=__$c + |a|$__   Min=__$c - |a|$__   Amplitude=__$|a| \Rightarrow \dfrac{max - min}{2}$__

Axis of curve:__$y = c$__   Period=__$\dfrac{360}{k}$__ $(x, y) \rightarrow (\dfrac{x}{k} + d \quad , \quad ay + c)$
$\qquad\qquad\qquad \hookrightarrow \dfrac{max + min}{2}$
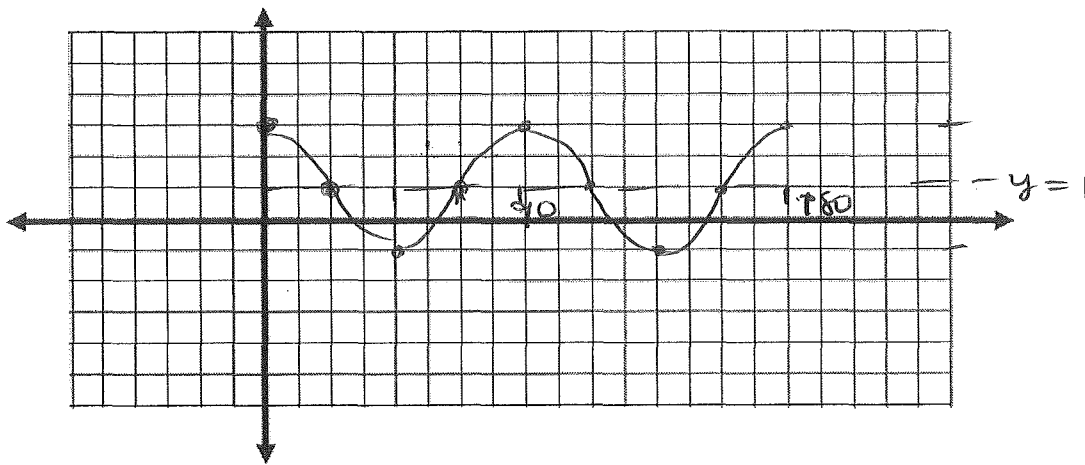
*Amplitude is __always positive.__

Example 1: Sketch the graph of a sinusoidal function that has a period of 180, an amplitude of 3, and whose equation of the axis is y = -1.
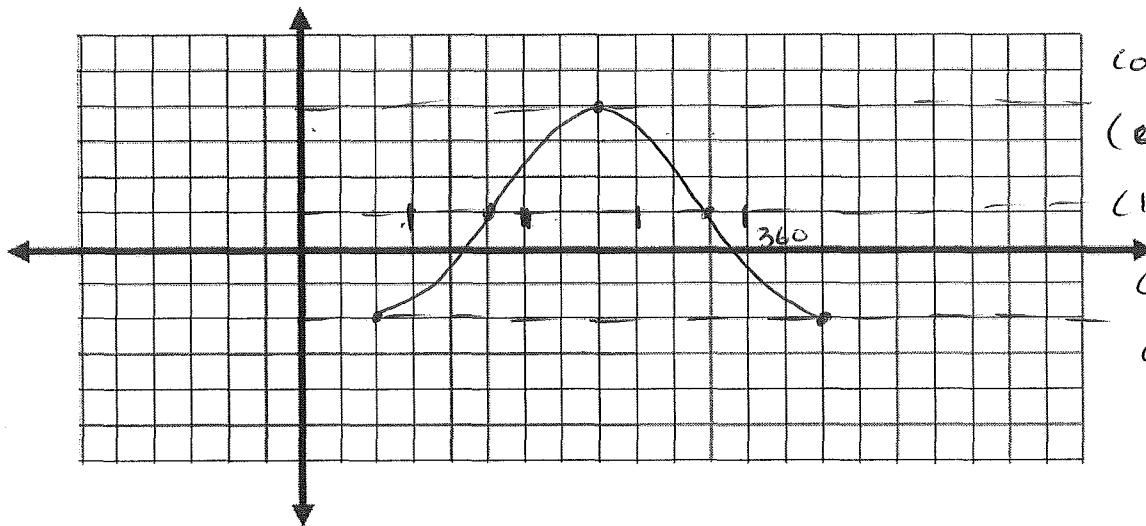

$max = -1 + 3 = 2$

$min = -1 - 3 = -4$

$y = -1$

Example 2: Sketch 2 cycles of the graph of a sinusoidal function that has a period of 90, an amplitude of 2, and whose equation of the axis is $y = 1$.

$-y=1$

Example 3: For the function $g(x) = -3\cos(x - 60) + 1$:

a)   Sketch one cycle of g(x)

$(x, y) \rightarrow (x+60, -3y+1)$

$(0, 1) \rightarrow (60, -2)$

$(90, 0) \rightarrow (150, 1)$

$(180, -1) \rightarrow (240, 4)$

$(270, 0) \rightarrow (330, 1)$

$(360, 1) \rightarrow (420, -2)$

b) Complete the table for the function g(x).

Period	Amplitude	Phase Shift	Domain of 1 Cycle	Range
$360°$	3	$60°$ to the right	$\{x \in R \mid 0 \le x \le 360\}$ OR $\{x \in R \mid 60 \le x \le 420\}$	$\{y \in R \mid -2 \le y \le 4\}$