# Algebra 2 Trigonometry - graphing Name:

**Exploring Periodic Data**

 **Periodic function** – repeats a pattern of *y*-values at regular intervals

 One complete pattern is called a **cycle** (a cycle can begin at any point on the graph of the function).

 The **period** of a function is the horizontal length of one cycle.

Example:

 This function is periodic

 In bold is one cycle

Example:

 This function is **not** periodic

 (*y*-values don’t repeat)

Analyze this periodic function. Identify one cycle in two different ways. Then find the period of the function.

Determine whether each function is a periodic function or is not a periodic function.

If it is a periodic function, find the length of one period.

**Amplitude** - of a periodic function is half the difference between the maximum and minimum values of the function (*y*-values)

3

3

**Graphing the sine function –** using the *x*-intercepts, maximum and minimum to graph:

 in radians

 in degrees

**Amplitude** – half the difference between the maximum and minimum

 has an amplitude =

Examples:

**Number of Cycles and the Period of a Sine Graph**

 *b* = the number of cycles in the interval from 0 to 2 (or from 0° to 360°)

 Period of the function = (period = how long before the function starts to repeat)

Example: How many cycles does the sine function have in the interval from 0 to 2?

 The graph has 4 cycles from 0 to 2

 The equation of this graph is:

Example: Sketch one cycle of each sine curve. (assume

 Write an equation for the graph.

 Amplitude =

 Period =

 Amplitude =

 Period =

Example: Sketch one cycle of the graph of the sine function:

 Period =

Example: Sketch one cycle of the graph of the sine function:

Find the equation of each sine curve. Then write an equation for each sine function.

 one cycle = so

 amplitude = so

 goes down first so

 Equation:

 or:

**Graphing the cosine function –** using the *x*-intercepts, maximum and minimum to graph:

Recall the sine graph:

Here is the cosine graph:

The zeros of this graph are at and

Maximum values occur at and

The Minimum value occurs at

 Amplitude =

 *b* = the number of periods from to

 Period =

Example: Use the graph below: Domain:

 Range:

 Amplitude:

 Period:

 Equation:

Example: graph the function:

 Amplitude =

 Period =

Example: graph the function:

 Amplitude =

 Period =

Example: graph the function:

 Amplitude =

 Period =

**Graphing the Sine and Cosine Functions**

 Basic functions:

**Phase shift** – a horizontal translation of a periodic function.

 moves the graph of , *h* units to the right.

 (when *h* is negative, the graph moves to the left)

Examples: What is the value of *h* in each translation? Describe each **phase shift**.

 shift 3 units to the left

 shift 2 units to the right

Example: Sketch the graph of

 shift units to the right

**Vertical Translation** – a shift of a graph up or down

 moves the graph units up if

 units down if

Example: Graph shift 3 units down

**Translations of Sine and Cosine functions**

Parent Function Translated Function

Examples: Graph one cycle of each trigonometric function:

**APPLICATIONS:**

Ocean waves pass a buoy that is 8 m above the sea floor when at rest in still water. The waves reach a height of 20 m at high tide and 12 m at low tide. The high tide occurs every 14 hours, and the low tide occurs 7 hours after the high tide.



If represents the time halfway between a high tide and a low tide, which function BEST represents the height of the waves at time *t* (in hours)?

The table below shows water temperatures in the Gulf of Mexico on several days of the year.

 **Water Temperatures in the Gulf of Mexico**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day of the Year | 16 | 47 | 75 | 106 | 136 | 176 | 197 | 228 | 259 | 289 | 320 | 350 |
| Temperature (°F) | 71 | 69 | 70 | 73 | 77 | 82 | 85 | 86 | 84 | 82 | 78 | 74 |

Plot the data. Then write a cosine model for the data.