

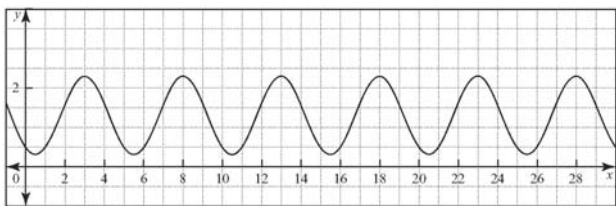
Name: _____

Date: _____

5.5 Data Collecting and Modelling**BLM 5-10**

1. Anna collected data on the average mean temperature for her city.

| Month ($t = 0$ is January) | Mean Temperature ($^{\circ}\text{C}$) |
|-----------------------------|---|
| 0 | -9 |
| 1 | -7 |
| 2 | -1.5 |
| 3 | 6 |
| 4 | 13.75 |
| 5 | 19 |
| 6 | 21 |
| 7 | 19 |
| 8 | 13.25 |
| 9 | 5.75 |
| 10 | -1.75 |
| 11 | -7 |

- Graph the data.
 - Is the data representative of a sinusoidal function? Explain.
 - Model the data using a cosine function. State the equation of the function.
 - Graph the data and the cosine function on the same axes.
 - Comment on the fit of the function.
2. A motion sensor recorded the motion of a child on a swing. The data was graphed, as shown.
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- Is the function periodic? Explain.
 - Use the graph to estimate the maximum and minimum values of the swing.
 - Use your answer in part b) to determine the amplitude of the function.
 - Determine the vertical shift of the function.
 - Determine the horizontal shift of the function, if the motion were to be modelled using a sine function.
 - Estimate the period of the function.
3. The height of the blade of a wind turbine as it turns through an angle of θ is given by the function $h(\theta) = 8.5 \sin(\theta + 180^{\circ}) + 40$, with height measured in metres.
- Find the maximum and minimum positions of the blade.
 - Explain what the value of 40 in the equation represents.
 - Explain what the value of the amplitude represents.
 - Sketch the function over two cycles.
4. Pedro's blood pressure can be modelled using the equation $P = -21 \cos 300t + 90$, where t is in seconds and P is the height of a column of mercury in millimetres.
- Determine the period of the function.
 - What is the frequency of his heart rate, in beats per minute?
 - Determine the minimum and maximum values of the function.
 - Sketch the function from $t = 0$ to $t = 6$.
5. A unicorn on a carousel moves up and down as the carousel turns. It completes 5 cycles with an amplitude of 25 cm every time the carousel completes one revolution.
- Model this using a cosine function, using h for the height of the unicorn and θ for the angle that the carousel has rotated.
 - Determine the first three angles of rotation at which the displacement of the unicorn is 15 cm.
 - Sketch the function for two full rotations of the carousel.
6. The number of millions of visitors that a tourist attraction gets can be modelled using the equation $y = 2.3 \sin [30(x + 1)] + 4.1$, where $x = 1$ represents January, $x = 2$ represents February, and so on.
- Determine the period of the function and explain its meaning.
 - Graph the function for 12 months.
 - Which month has the most visitors?
 - Which month has the least visitors?

