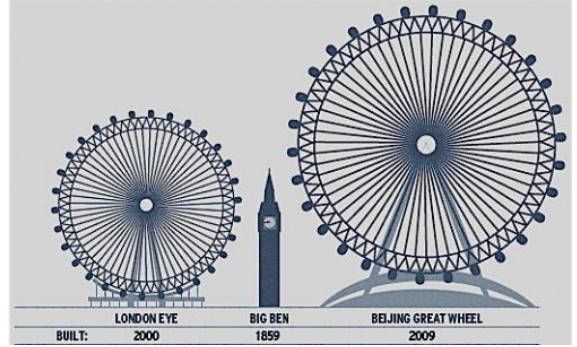


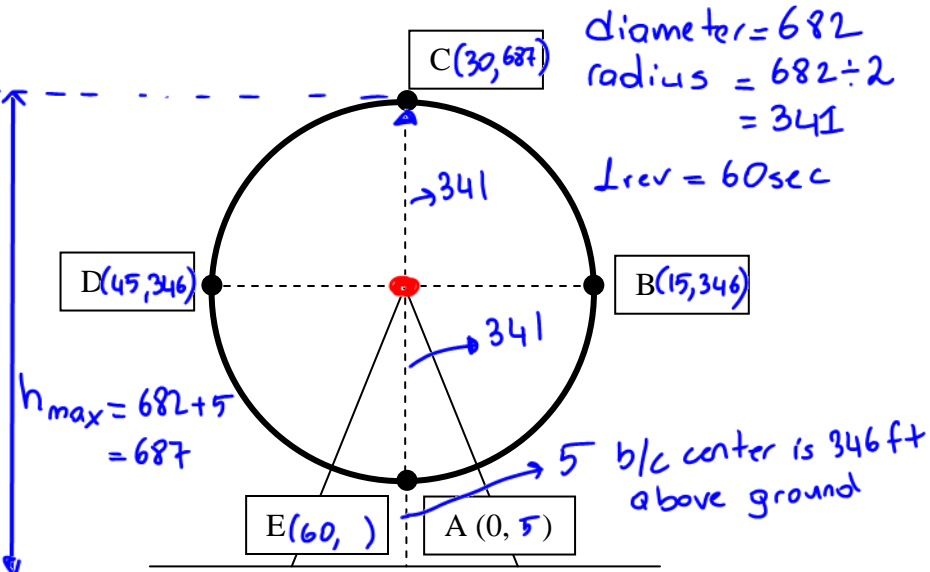
MODELLING PERIODIC BEHAVIOUR

The largest Ferris Wheel opened in Chaoyang Park, Beijing just in time for the 2008 Olympics. The 682-foot-high wheel, which has its centre 346 feet above the ground, will give up to 3,840 passengers per hour a fantastic view of the city, and surrounding area. Each of the wheel's 48 capsules holds 40 people.



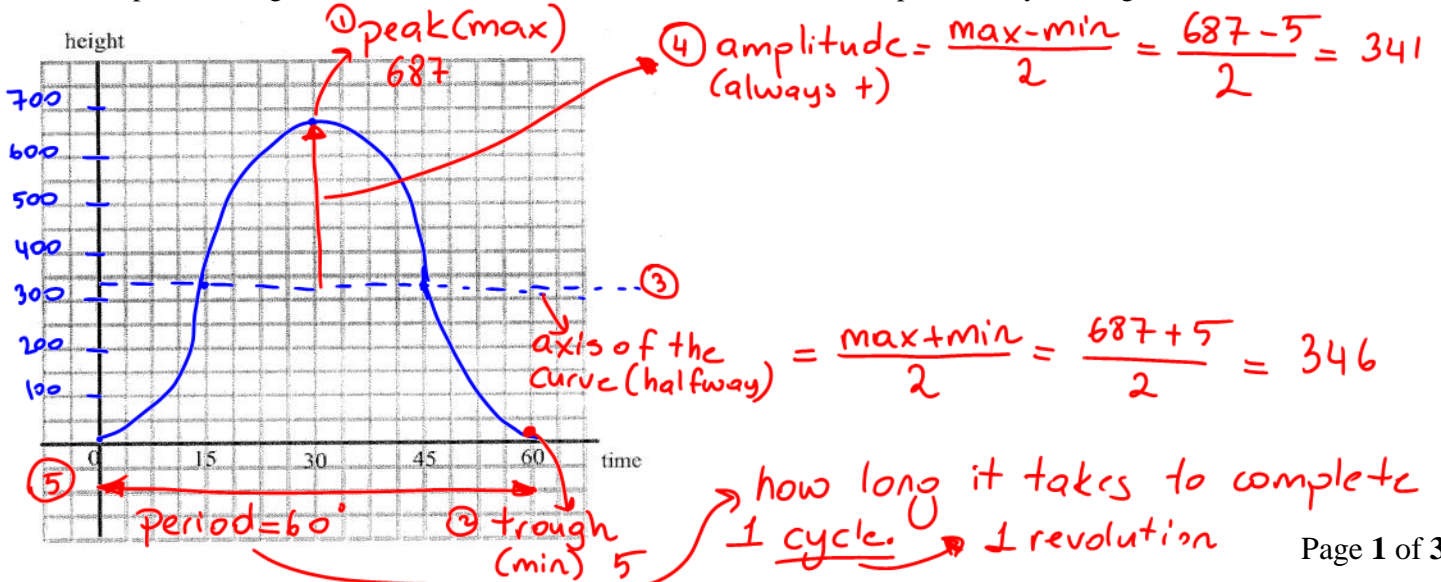
Suppose that you and a group of friends are riding the Ferris wheel. The ride then begins with you at point A. The Ferris wheel turns counter clockwise at a constant speed. The wheel takes 60 seconds to complete one revolution.

- Point A is when you get on the wheel. Determine the time and height at point A. A(0, 5)
- Point C is the maximum height you will reach. Determine the time and height at point C. C(30, 687)
- Point B is half way between A and C. Determine the time and height at point B. B(15, 346)
- Point D is half way between C and E. Determine the time and height at point D. D(45, 346)
- Point E is when you complete one revolution. Determine the time and height at point E. (60, 5)



Rotation of Wheel in Seconds	Height Relative to the ground in Feet
0	5
15	346
30	687 $\rightarrow h_{max}$
45	346
60	5

6. Plot the points on a grid. Sketch a curve of best fit to show the relationship between your height, h, and the time, t.



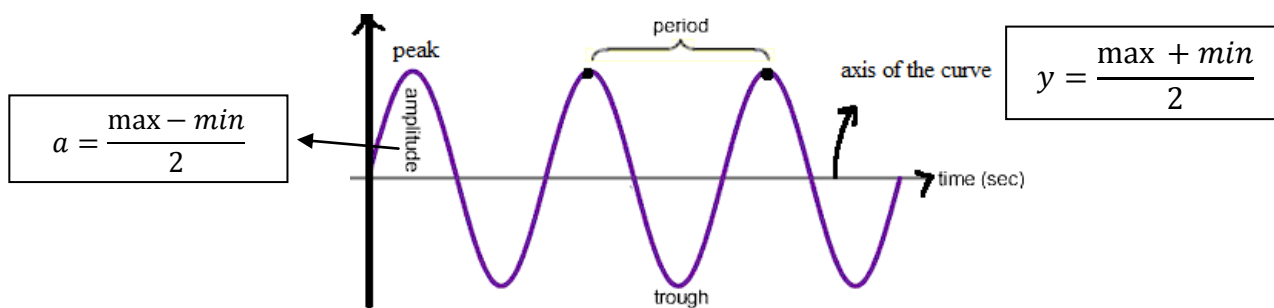
KEY IDEAS

- A function is **PERIODIC** if it has a pattern of y-values that repeats at regular intervals.
- One complete pattern of a periodic function is called a **CYCLE**. A cycle may begin at any point on the graph.
- The horizontal distance from the beginning of one cycle to the beginning of the next cycle is called the **period**.
- The horizontal line that is halfway between the maximum (peak) and minimum (trough) values of a periodic curve is called the **AXIS OF THE CURVE**.

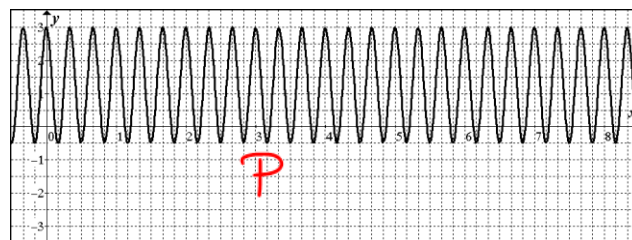
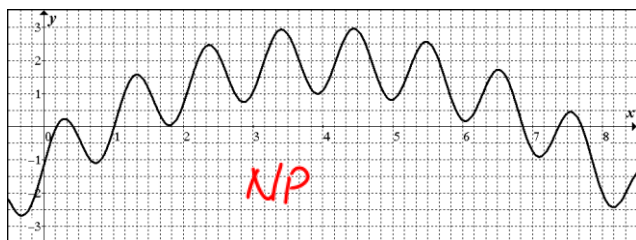
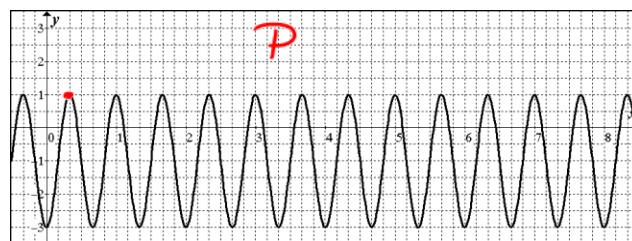
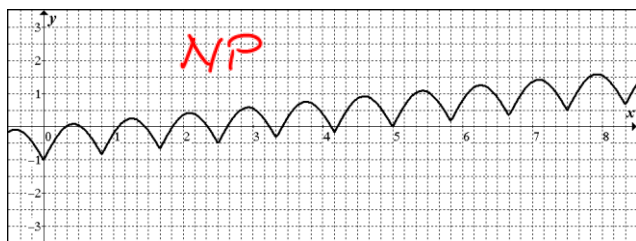
The equation of the **AXIS OF THE CURVE** is $y = \frac{\max + \min}{2}$

- The magnitude of the vertical distance from the **AXIS OF THE CURVE** to either the max (peak) or min (trough) value is called the **amplitude** of the function. The amplitude is **always positive**.

The **amplitude**, a , is calculated as $a = \frac{\max - \min}{2}$



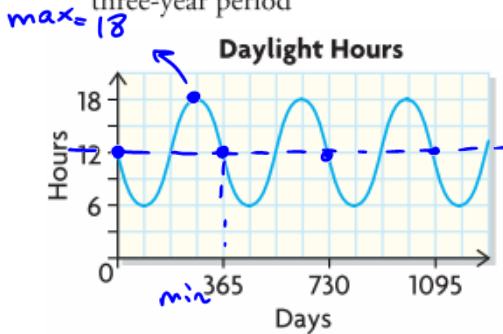
Example 1: Determine if the function is periodic.



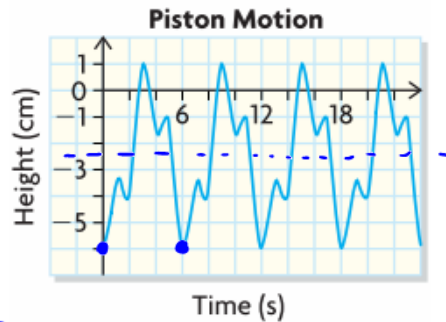
Day 3: Periodic Functions & Their PropertiesChapter 6: Sinusoidal Functions

Example 2: Determine whether the term *periodic* can be used to describe the graph for each situation. If so, state the period, max, min, equation of the axis, and amplitude.

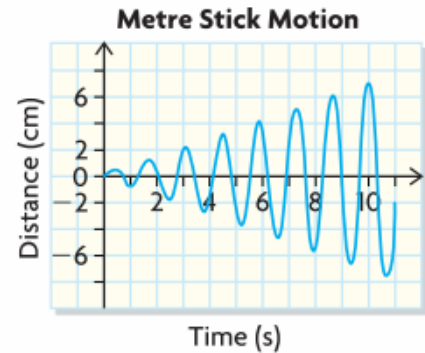
- a) the average number of hours of daylight over a three-year period



- b) the motion of a piston on an automated assembly line



- c) a student is moving a metre stick back and forth with progressively larger movements



Period: 365 days

Max: 18 hours

Min: 6 hours

$$\text{Axis} \Rightarrow y = \frac{18+6}{2}$$

$$\boxed{y = 12}$$

$$\text{Amplitude} \Rightarrow a = \frac{18-6}{2}$$

$$\boxed{a = 6}$$

Period = 6 sec

Max: 1 cm

Min: -6 cm

$$y = \frac{1+(-6)}{2}$$

$$\boxed{y = -2.5}$$

$$a = \frac{1-(-6)}{2}$$

$$\boxed{a = 3.5}$$

The shape of the graph does not repeat over the same interval, so the function is not periodic.