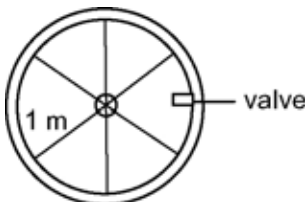


Section 5.3 Investigate the Sine Function

1.
 - a) Draw a sketch of $y = \sin x$ for two periods.
 - b) Determine the period and the amplitude.
 - c) Label all the intercepts and all the maximum and minimum points.
 - d) What are the domain and range?
 - e) Give all the values of x at which $y = -0.5$.
2. A small train at an amusement park starts at a loading dock and travels clockwise along a circular track with radius 100 m. The dock is located at the northernmost point on the track.
 - a) Draw the train track and dock and collect data representing the distance of the train from the dock, relative to the angle of rotation.
 - b) Use your data to sketch a graph of the angle versus distance east or west of the dock.
 - c) How does the graph compare to that of $y = \sin \theta$?
3. A periodic function is simulated by a wheel with a radius of 1 m rotating about an axle counterclockwise. There is a valve that allows the wheel to be inflated located at the rightmost point as shown.

The diagram shows a circle representing a wheel. A horizontal line segment from the center to the right edge is labeled '1 m'. A small rectangle, labeled 'valve', is attached to the right edge of the wheel at the point (1, 0) on a coordinate plane where the center is the origin.

 - a) Sketch a graph of the height of the valve relative to the centre of the wheel as a function of the rotational angle from 0° to 720° .
 - b) What function would define this graph?
 - c) During which intervals is the height of the valve increasing? decreasing?
4. A crank handle is used to operate a fishing rod. The crank handle is 1 unit in length and it rotates counterclockwise from a horizontal starting position. Round your answers to the nearest tenth of a unit where necessary.
 - a) What is the height of the hand crank relative to its centre of rotation after a rotation of 120° ?
 - b) What is the height of the hand crank relative to its centre of rotation after a rotation of 350° ?
 - c) How many degrees has the hand crank rotated through when its height is 0.75 units relative to its centre of rotation?
 - d) Find two rotational angles at which the crank has a height of -0.25 units relative to its centre of rotation.
5.
 - a) Write an equation of the line that passes through all of the intercepts of $y = \sin x$.
 - b) Write an equation of the line that passes through the points on $y = \sin x$ where $x = 90^\circ$ and $x = 270^\circ$.
 - c) Write an equation of the line that passes through the points on $y = \sin x$ where $x = -90^\circ$ and $x = 90^\circ$.
6.
 - a) Sketch a graph of the function $y = \cos \theta$.
 - b) Which function, $y = \sin \theta$ or $y = \cos \theta$, would be more suitable for modelling the height of a point on the minute hand of a clock, relative to time, if it starts out pointing at the 12? Explain your reasoning.