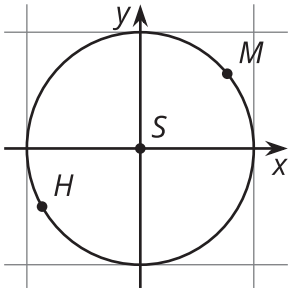
Unit 6 Family Support Materials

Trigonometric Functions

In this unit, your student will learn about periodic functions. These types of functions have a special feature: Their output values repeat over and over and over again. This is a feature that none of the other functions students have studied with changing outputs up to now have, and it is a type of function students need if they want to model situations involving circular motion or other relationships where the same values repeat over and over again.

For example, consider the orbit of Mars around the sun, which can be modeled by a circle. Once every 687 days Mars completes a full circle, and we say that the orbit of Mars has a period of 687 days. Here is a very simple sketch of the orbit of Mars, M, with an x- and y-axis centered on the Sun, S:



Using the period, we know that every 687 days Mars will be at the point marked M. We can also say, since Mars' speed is pretty constant, that 343.5 days later Mars will be at point H since that is half the period. Using different increments of the period, we could predict the location of Mars at different points in its orbit throughout the Martian year.

Here are some other things that can be modeled by periodic functions:

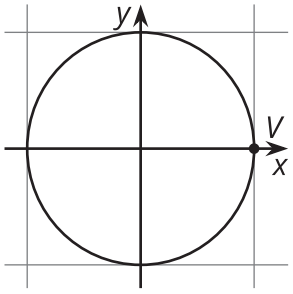
- Height off the ground at different rotations while riding a Ferris wheel
- Average daily temperatures in a city over a year
- Position of a pendulum
- Traffic congestion at a particular location

CC BY NC 2024
Illustrative Mathematics®

Here is a task to try with your student:

Venus' orbit has a period of about 225 days.

1. About how many orbits has Venus completed after 450 days?
2. About how many orbits has Venus completed after 365 days?
3. Use the simple sketch of Venus' orbit and the starting point marked V to plot Venus' location after different numbers of days. Assume Venus is rotating counterclockwise around the circle.
   a. 112.5 days (H)
   b. 168.75 days (Q)
   c. 2925 days (T)



Solution:

1. Venus completes 2 full orbits of the Sun in 450 days.
2. Venus completes 1 full orbit and is a bit over halfway (62%) through its next orbit.
3. 