They can because they think they can.

Virgil

We are what we repeatedly do.
Excellence, therefore, is not an act but a habit.

Aristotle
1.1: Graphs and Graphing Utilities

The Cartesian coordinate system is divided into four quadrants by the x-axis and the y-axis, which intersect at the origin.

Graphing equations involves finding ordered pair solutions to the equation and then plotting and connecting them.
Graphs can also be checked with a graphing calculator as long as the equation can be solved for $y$. The window used on these graphs as shown above is [-10,10,1] by [-10,10,1], which is the standard viewing rectangle. (Zoom 6)
The x-intercept is the point \((a, 0)\), where the graph intersects the x-axis. The y-intercept is the point \((0, b)\), where the graph intersects the y-axis. Determine the x-intercept(s) and the y-intercept(s) of each graph below.

- Graph 1: \(x\)-int: 5, or \((5, 0)\)  
  y-int: 1, or \((0, 1)\)

- Graph 2: \(x\)-int: \(-5, 1, 8\)  
  y-int: 2

- Graph 3: \(x\)-int: \(-3\)  
  y-int: None
Convert each English sentence into an algebraic equation and then graph the equation.

The $y$-value is three less than the $x$-value.

\[ y = x - 3 \]

The $y$-value is five decreased by the square of the $x$-value.

\[ y = 5 - x^2 \]

$x$-intercept: \[ 0 = 5 - x^2 \]
\[ x^2 = 5 \]
\[ x = \pm \sqrt{5} \]

$y$-intercept: \[ 5 - 0^2 = 5 \]
The graph shows the percentage of high school seniors who used marijuana. The data can be described by the following mathematical model, where \( n \) is the number of years after 1980.

\[ M = -0.6n + 33 \]

(a) Use the graph to determine the percentage of seniors who used marijuana in 2005.

30%

(b) Use the formula to determine the percentage of seniors who used marijuana in 2005.

\[ M = -0.6(25) + 33 = 18\% \]

Does the formula underestimate or overestimate the actual data shown by the graph? By how much?

underestimates by 12%
Qualitative graphs are graphs that are used to represent situations that do not necessarily have numerical values. Qualitative graphs represent the essential elements of a situation in a graphical form.

Identifying Qualitative Graphs

Indicate which graph matches each of the given statements.

1. A train pulls into a station and lets off its passengers.
   - a) Speed
   - b) Speed
   - c) Speed
   - d) Speed

2. A man takes a ride on a Ferris wheel.
   - a) Distance from ground
   - b) Distance from ground
   - c) Distance from ground
   - d) Distance from ground

3. A woman climbs a hill at a steady pace and then starts to run down one side.
   - a) Speed
   - b) Speed
   - c) Speed
   - d) Speed

6. A wagon moves along then crashes into a wall and stops.
   - A) Speed
   - B) Speed
   - C) Speed
   - D) Speed
7. We climbed a hill and then sled down it.

8. Kendra is speeding along the highway and is stopped by a police officer. The officer gives her a ticket and then she continues on her way.

9. Carlos lives in a large city and travels to school on a local bus that stops at every block to let passengers on and off.

10. This time graph time on the horizontal axis and the distance Carlos has traveled on the vertical axis.
Create a qualitative graph for each of the given situations:

1) You turn on the tap in the bathtub and let the tub fill with water. Use time as the independent variable (x) and water level as the dependent variable (y).

2) The weight of a person is recorded from her birth to age 90. Use age as the independent variable and weight as the dependent variable.

3) A plane flies from Miami to San Francisco. Graph its distance from San Francisco as a function of time since takeoff.