Bellwork

Answer each of the following questions:

1. What is a function rule?

   An equation relating variables to each other

2. How can you distinguish between which type of function rule to use when setting up equations?

   The characterists that the information portrays about the variables.

Creating and Solving Equations

Types of Equations:
1. Linear (Covered in Math I)
2. Quadratic (Covered in Unit 2A, 2B, & 2C)
3. Exponential (Covered in Unit 3)

At the moment we will be only working with the basics of each of these functions.
- Setting them up
- Plugging in values for every variable but one of them and solving for it.

Linear Equations

Point-Slope Form:

$y - y_1 = m(x - x_1)$

Where...

(x_1, y_1) is a point on the line

m = Slope of the line

= Rate of Change

Slope-Intercept form:

$y = mx + b$

Where...

(x, y) a point on the line.

m = Slope of the line

= Rate of Change

b = y-intercept

Slope-Intercept Form
Main Equation of Focus

What to look for in the story problem:

- Find the item that represents the rate.
- Is the rate constant?

Procedure:

- Step 1: Write the equation $y = mx + b$
- Step 2: Fill in for m (This is the given rate)
- Step 3: Fill in for b
  (This is the initial amount)

Example

1. The students in Mr. Brewer's class are going to help purchase supplies to help the students at Maple out and each of them are going to bring in \$2.50 each. The teachers have already gathered together \$150. Set up an equation showing how much the students will raise, A, if n students donate.

$$A = \$2.50n + \$150$$

Example Continued

Using the answer from the question on the last page (A = 2.50n + 150), how many students would need to bring in their money to collect $260.

$$\$260 = \$2.50n + \$150$$

$$\underline{-\$150 \qquad\qquad -\$150}$$

$$\frac{\$110}{\$2.50} = \frac{\$2.50n}{\$2.50}$$

44 students = n

Exponential Equations

General Exponential Equation:

$y = ab^x$

Where...

a = The initial amount

b = The multiplier

x = a fraction representing the number of times multiplied divided by the time it takes in hours.

Exponential Equations

What to look for in the story problem:

- Look for key words like doubles, triples, half-life, etc.

Procedure:

- Step 1: Identify the initial amount given.
- Step 2: Identify the multiplier.
- Step 3: Identify the exponent by figuring out how many multipliers occur per number of hours.
- Step 4: Plug into the general equation.

Example

2. A recently discovered strain of bacteria is found to double every 15 minutes. Write an equation that will model the population, p, of the bacteria after t hours if we have found 15 micrometers of the bacteria to begin with.

$$p = 15(2)^{(4/1)t}$$

Note: The exponent is because the bacteria will multiply 4 times per 1 hour.

Example Continued

Using the previous equation ($P = 15(2)^{4t}$), how many micrometers are present after 6 hours of not being treated?

$p = 15(2)^{4(6)}$

$p = 15(2)^{24}$

$p = 15(16,777,216)$

$\boxed{p = 251,658,240}$

Quadratic Equations

General Quadratic Equation:

$$y = ax^2 + bx + c$$

Equation for Falling Objects:

$$h(t) = -16t^2 + v_0t + h_0$$

Where...

v_0 = The initial velocity of the object

h_0 = The initial height of the object

Quadratic Equations

What to look for in the story problem:

- Find the initial velocity of the object.
- Find the initial height of the object.

Procedure:

- Step 1: Identify the value of v_0
- Step 2: Identify the value of h_0
- Step 3: Set up the general equation and plug in the values of v_0 and h_0. (NOTE: Remove v_0 and h_0 and plug in the values identified.)

Example

3. The height of an object thrown or dropped can be found by plugging into the equation $h(t) = -16t^2 + v_0t + h_0$.

Write the equation of an object thrown from 300 feet below the ground at 64 feet per second.

$$h(t) = -16t^2 + 64t + 300$$

Example Continued

Using the equation from the previous page

$(h(t) = -16t^2 + 64t - 300)$, will the object

ever get above ground if the object reaches

its peak after just 2 seconds?

$h(t) = -16(2)^2 + 64(2) - 300$
$h(t) = -16(4) + 128 - 300$
$h(t) = -64 + 128 - 300$
$h(t) = 64 - 300$
$\boxed{h(t) = -236}$

Since the height is still negative it is still below the ground.

Example

4. The height of an object thrown or dropped can be found by plugging into the equation $h(t) = -16t^2 + v_0t + h_0$.

Write the equation of an object dropped from 7500 feet above the ground.

$$h(t) = -16t^2 + 0t + 7500$$

$$\boxed{h(t) = -16t^2 + 7500}$$

Example Continued

Using the equation from the previous page

$(h(t) = -16t^2 + 7500)$, how high is the

object after 20 seconds?

$$h(t) = -16(20)^2 + 7500$$
$$h(t) = -16(400) + 7500$$
$$h(t) = -6400 + 7500$$
$$\boxed{h(t) = 1100 \text{ feet}}$$