On all Creating and Solving worksheets
#1 & 2 = Linear
#3 & 4 = Exponential
#5 & 6 = Quadratic

Creating and Solving Equations: Day 1

Unit 1: Extending the Number System

1. Hoopeston Sports Boosters invest $3000 in hoodies to show support for the football team.

A. Write an equation that will model the profit, p, from selling n hoodies at $25 each.

p is a total profit
n = # of hoodies
$25 is the rate per hoodie

$$p = 25n - 3000$$

$3000 was invested.

B. How many hoodies will the Boosters have to sell to match their investment?

Match investment means $0 profit. So plug in 0 for p and solve.

$$0 = 25n - 3000$$
$$+3000 \quad +3000$$
$$\frac{3000}{25} = \frac{25n}{25} \rightarrow n = 120$$

2. Hoopeston Music Boosters invest $1000 in creating calendars.

A. Write an equation that will model the profit, p, from selling n calendars at $20 each.

p is a total profit
n = # of calendars
$20 is the rate per calendar

$$p = 20n - 1000$$

$1000 was invested.

B. How much profit will the Boosters make off selling 365 calendars?

Since we are selling 365 calendars then $n = 365$ plug in.

$$p = 20(365) - 1000$$
$$p = 7300 - 1000$$
$$p = \$6300$$

3. Mr. Elliot's class is studying bacteria cultures from around the community. After swabbing some samples and doing some investigation they figure out that a certain bacteria that they collected will triple in size every 20 minutes.

A. If the class collected just 30 micrometers of the bacteria, write an equation that will show the population, p, of the bacteria after t hours.

Exponent: $\frac{3 \text{ sets of } 20\text{min}}{\text{in 1 hour}} \cdot t$

$= \frac{3}{1}t$

$= 3t$

$$p = 30(3)^{3t}$$

30 micrometers to begin
p = total population
triple in size = 3

B. How many micrometers of the bacteria will they have in the classroom after just 7 hours?

t = time so plug in 7 for t.

$$p = 30(3)^{3(7)}$$
$$p = 30(3)^{21}$$
$$p = 30(10460353203)$$
$$p = 313{,}810{,}596{,}090 \text{ micrometers}$$

On a calculator:

$$p = 30(3)^{3(7)}$$
$$p = 30(3)^{21}$$
$$p = 30(1.04603532E10)$$
$$p = 3.13810596\,1E11$$

meaning $3.13810596\,1 \times 10^{11}$

4. The physicians at Carle tell you that you have an infection growing from a cold you've had for a while. When first diagnosed your bacteria level was 250,000 micrometers and you were prescribed some medication.

Exponent: Cuts in half once every 3 hrs. $\frac{1 \text{ cut}}{3 \text{ hrs}} = \frac{1}{3}$

A. If the medication cuts the level of bacteria in half every 3 hours, write an equation showing the level of bacteria, L(t), after t hours.

Start with 250,000
Cuts in half = $\frac{1}{2}$

$L(t) = 250{,}000\left(\frac{1}{2}\right)^{\frac{1}{3}t}$ OR $250{,}000\left(\frac{1}{2}\right)^{\frac{t}{3}}$

B. Will your body be free from the bacteria after one day? If not, what level of the bacteria is still in your body?

24 hours in 1 day. Plug in 24 for t.

$L(24) = 250{,}000\left(\frac{1}{2}\right)^{\frac{1}{3}(24)} = 250{,}000\left(\frac{1}{2}\right)^{8} = 250{,}000\left(\frac{1}{256}\right) = 976.5625$ micrometers

Not bacteria free

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

Underlined part Always stays in the equation.

A. Write the equation that would model the height of a ball, h(t), if it is thrown from an initial height of 6 feet with velocity of 50 feet per second.

V_0 = Initial velocity = 50 ft/sec
h_0 = Initial/Release height = 6 ft

$h(t) = -16t^2 + 50t + 6$

B. Will the ball hit the ground after 3 seconds? If not, what will the height of the ball be at that point?

3 seconds is time, so plug in 3 for t.

$h(3) = -16(3)^2 + 50(3) + 6 = -16(9) + 150 + 6 = -144 + 150 + 6$
$= 6 + 6$
$= 12$ ft NOT on Ground

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

A. Write the equation that would model the height of an egg, h(t), if it is dropped from the top of the Willis Tower in Chicago which is 1729 feet tall.

Dropped implies V_0 = 0 ft/sec
h_0 = Initial height = 1729

$h(t) = -16t^2 + 0t + 1729$
or
$h(t) = -16t^2 + 1729$

B. How long will it take for the egg to hit the ground?

Ground height is 0 so h(t) becomes 0.
Solve for t.

$0 = -16t^2 + 1729$
$-1729 \quad -1729$
$\frac{-1729}{-16} = \frac{-16t^2}{-16}$
$\sqrt{108.0625} = \sqrt{t^2}$
10.39531144 seconds $\approx t$