

Today's Date:

**February 27, 2008**

**(8.5) & (8.6) - Exponential Growth and Decay**

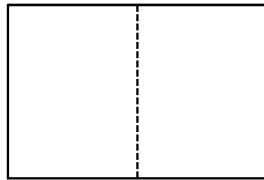
# Exponential Growth

increases by the same percent  
in each unit of time.

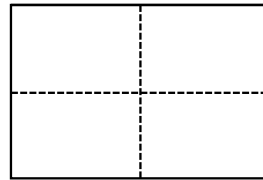
# Paper Folding Activity



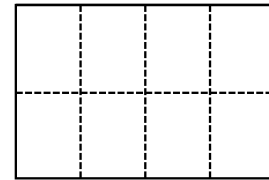
0 folds  
1 rectangle



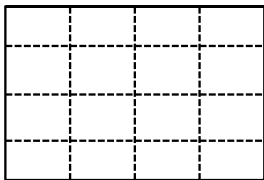
1 folds  
2 rectangles



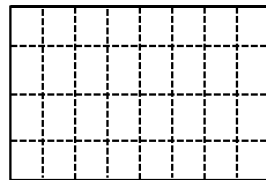
2 folds  
4 rectangles



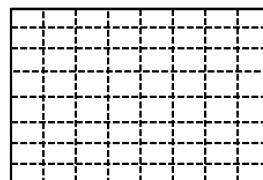
3 folds  
8 rectangles



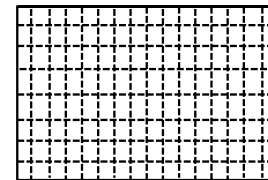
4 folds  
16 rectangles



5 folds  
32 rectangles



6 folds  
64 rectangles



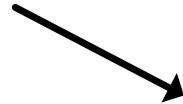
7 folds  
128 rectangles

## Exponential Growth Model

$$y = c(1+r)^t$$

## Exponential Growth Model

Exponential  
Growth


$$y = c(1+r)^t$$

## Exponential Growth Model

Exponential Growth

Initial Amount

$$y = c(1+r)^t$$

The diagram shows the equation  $y = c(1+r)^t$  with several annotations. The text 'Exponential Growth' is on the left with an arrow pointing to the variable  $y$ . The text 'Initial Amount' is centered above the equation with a red arrow pointing down to the variable  $c$ . The variable  $c$  is colored red, the variable  $r$  is colored green, and the variable  $t$  is colored blue.

## Exponential Growth Model

Exponential Growth

Initial Amount

$$y = c(1+r)^t$$

- \*  $(1+r)$  is the Growth Factor always **greater than 1**
- \*  $r$  is the growth rate(%)

## Exponential Growth Model

Exponential Growth

Initial Amount

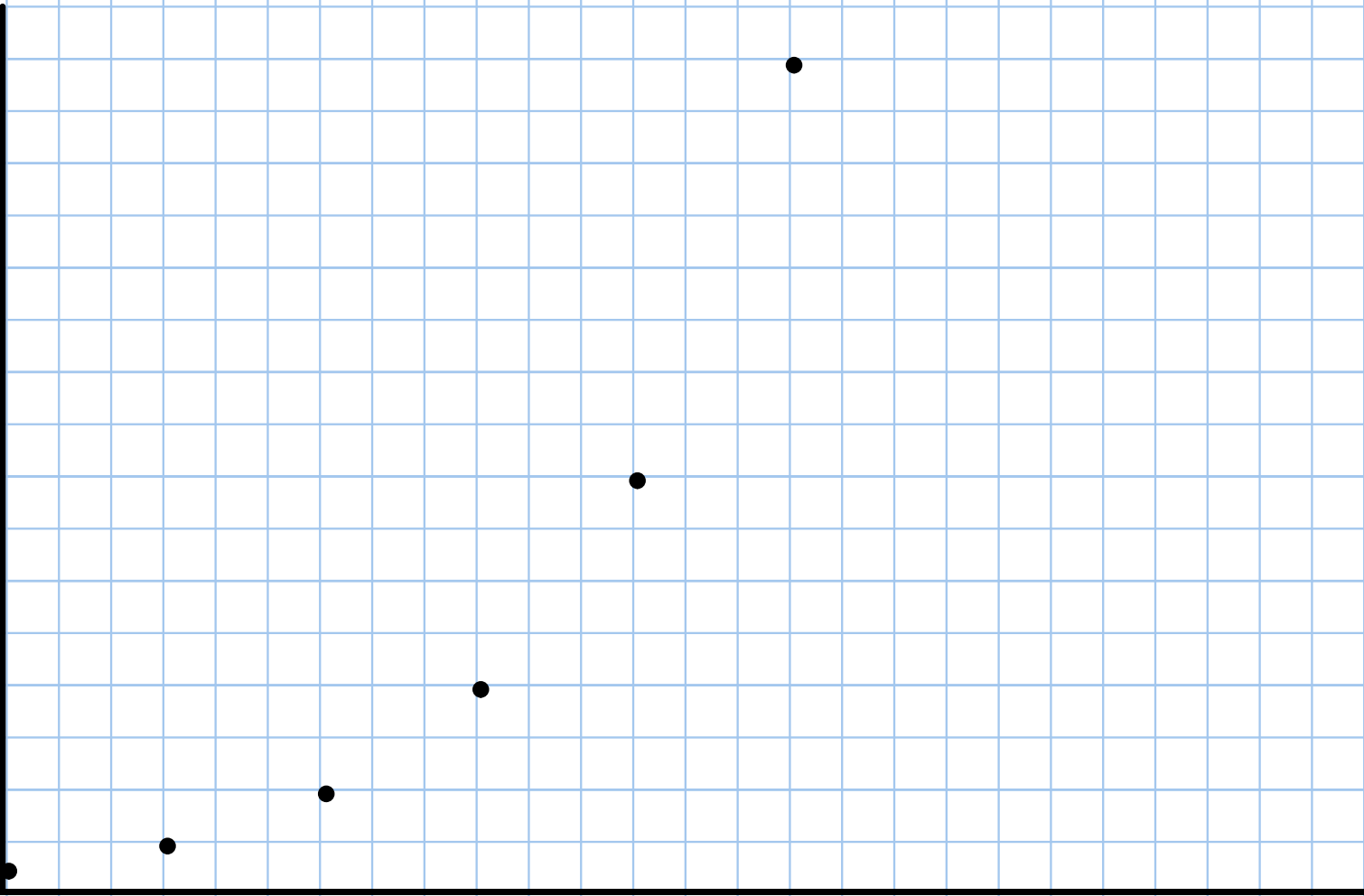
Time Period

$$y = c(1+r)^t$$

- \*  $(1+r)$  is the Growth Factor  
always **greater than 1**
- \*  $r$  is the growth rate(%)



# Graph of Exponential Growth :



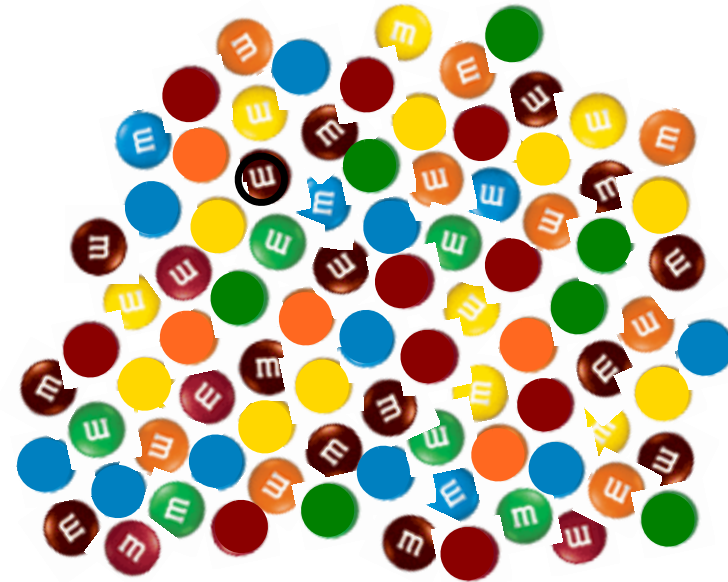
# Exponential Decay -

decreases by the same percent  
in each unit of time.

M-Ms Activity:



85 M-Ms




44 M-Ms

## Exponential Decay Model

$$y = c(1 - r)^t$$

## Exponential Decay Model

Exponential  
Decay


$$y = c(1 - r)^t$$

## Exponential Decay Model

Exponential  
Decay

Initial  
Amount

$$y = c(1 - r)t$$

The diagram shows the exponential decay formula  $y = c(1 - r)t$ . The variable  $y$  is in black. The variable  $c$  is in red, with a red arrow pointing down from the text "Initial Amount" above it. The variable  $r$  is in green. The variable  $t$  is in blue. The text "Exponential Decay" is in black with an arrow pointing to the  $y$  variable.

## Exponential Decay Model

Exponential  
Decay

Initial  
Amount

$$y = c(1-r)t$$

- \*  $(1-r)$  is the Decay Factor  
always **less than 1**
- \*  $r$  is the decay rate (%)

## Exponential Decay Model

Exponential  
Decay

Initial  
Amount

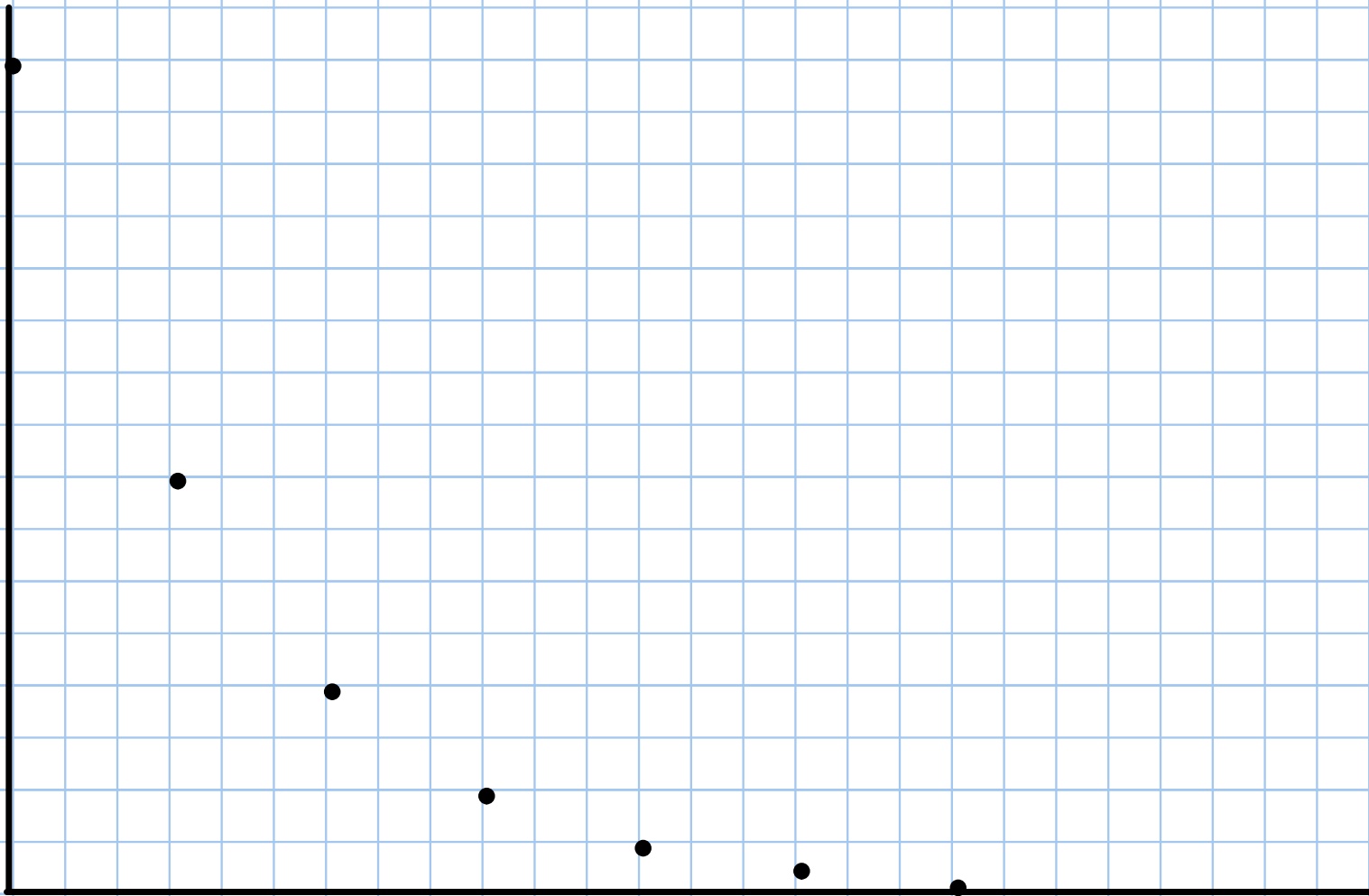
Time  
Period

$$y = c(1-r)^t$$

- \* $(1-r)$  is the Decay Factor  
always **less than 1**
- \*  $r$  is the decay rate (%)



# Graph of Exponential Decay:



Directions: Classify as Exponential Growth or Decay. Identify the growth or decay factor and the % increase or decrease.

>1

1.  $y = 15(\underline{1.5})^t \rightarrow \text{Exp. Growth}; 1.5; 0.5 \approx 50\%$   
 $1+r$

2.  $y = 3(\underline{1/2})^t \rightarrow \text{Exp. Decay}; 1/2; 1/2 \approx 50\%$   
 $1 - 1/2 = r$

3.  $y = 57(1.009)^t \rightarrow \text{Exp. Growth}; 1.009; 0.009$

4.  $y = 0.044(\underline{0.23})^t \rightarrow \text{Exp. Decay}; 0.23; 0.77$   
 $1 - 0.23 = r(\%)$

Directions Solve using an exponential Growth or Decay Model.

5. A savings certificate of \$1000 pays 6.5% annual interest compounded yearly. What is the balance when the certificate matures after 5 years?



$$y = c(1+r)^t$$

$$y = 1000(1 + 0.065)^5$$

$$y = 1000(1.065)^5$$

$$y = 1000(1.37)$$

$$y = \$1370$$

6. From 1997 to 2007, the ratio of students per computer at a school has dropped by about 16.8% per year. If there were 7.8 students per computer in 1997, what is the average number of students per computer in 2007?

$$y = c(1-r)^t$$

$$y = 7.8(1-0.168)^{10}$$

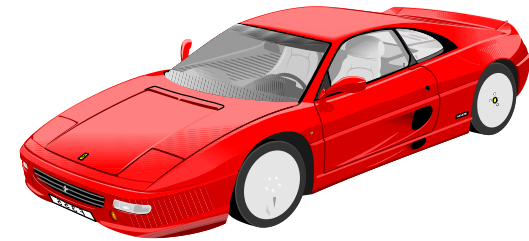
$$y = 7.8(0.832)^{10}$$

$$y = 7.8(0.16)$$

$$y = 1.25 \text{ Students/PC}$$



7. You bought a used car for \$2300. The value of the car depreciates at a rate of 8% per year. Find the value of the car in two years.



$$y = c(1-r)^t$$

$$y = 2300(1-0.08)^2$$

$$y = 2300(0.92)^2$$

$$y = 2300(0.85)$$

$$y = \$1955$$

8. An experiment started with 100 bacteria. They double in number every hour. Write a model for the # of bacteria after 8 hours.

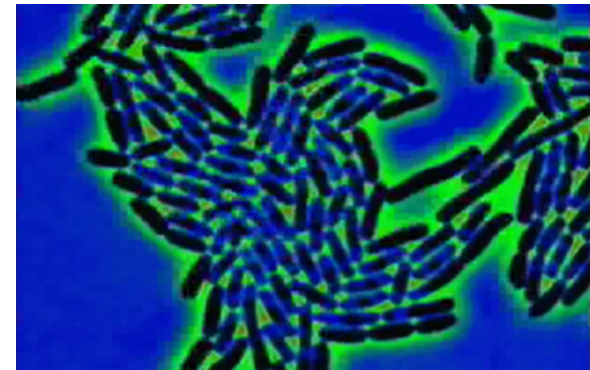
$$y = c(1+r)^t$$

$$y = 100(1+1)^8$$

$$y = 100(2)^8$$

$$y = 100(256)$$

$$y = 25,600 \text{ bacteria}$$



## Tonight's Assignment

p.480

# 10,14,16, 22

p. 488

# 12, 17-22, 26