

Goal 1: I can determine if a graph, table, equation or verbal situation is linear or exponential and write an equation to model the function.

- Which situation represents exponential growth over time?
 - The number of ants in a population that increases by 1,000 ants each day.
 - The temperature of a glass of water that increases by 10 degrees every half hour until it reaches room temperature.
 - The number of people who go to a play if each person who sees the play returns the next evening and brings 2 friends.
 - The size of a population of bacteria that increases by 1,000 in the first hour, then by 1,000 during the next 2 hours, then by 1,000 during the next 4 hours, and continues to grow according to the same pattern.
- Which scenario describes a pattern of exponential decay?
 - A backgammon competition has 10 players exiting after each round of games
 - A table tennis club has had 10,9, and 8 new members in three years, respectively.
 - A billiards organization lost 5%, 4%, and 3% of its members in three years, respectively.
 - An elimination chess tournament has half the number of players in each successive round.
- Which statement describes the recursive formula: $f(n) = f(n - 1) + 7$, $f(1) = -4$
 - The recursive formula represents an arithmetic sequence and the explicit form of the equation can be written as $f(n) = -11 + 7n$
 - The recursive formula represents an arithmetic sequence and the explicit form of the equation can be written as $f(n) = -4 + 7n$
 - The recursive formula represents a geometric sequence and the explicit form of the equation can be written as $f(n) = -4(7)^n$
 - The recursive formula represents a geometric sequence and the explicit form of the equation can be written as $f(n) = -4(7)^{n-1}$
- In the year 2000 the population of Pikeville was approximately 15,000. Since then, the population has increased every 5 years at a fairly steady rate, as recorded in the table.

Year	Interval	Population
2000	0	15,310
2005	1	18,002
2010	2	21,548
2015	3	25,642

- Which function is a reasonable fit to the given data?

- $P = 15,000(1.2)^x$
 - $P = 3500x + 15,000$

- $P = 15,000(1.02)^x$
 - $P = 350x^2 + 2400x + 15,000$
- Which equation of an exponential function has a graph that passes through the points (1,5) and (2,15)?

- $y = 5^x$
 - $y = 3^x$

- $y = \frac{5}{3}(3)^x$
 - $y = \frac{3}{5}(3)^x$
- Are the following situation linear, exponential or neither?

A restaurant charges 5% for tax.

$$f(x) = x^2 + 3$$

Mold grows at a rate of 12% each day.

$$g(x) = 12 - 1.25x$$

Goal 2: I can interpret linear and exponential functions.

1. The number of kilograms, y , of a radioactive element that remains after t hours can be modeled by the equation $y = 0.23(0.91)^t$.

What is the rate of decrease of this radioactive element?

- A. 9% per hour
- B. 23% per hour
- C. 77% per hour
- D. 91% per hour

2. What is the rate of growth for the function $f(t) = 5(3)^x$?

- A. 300%
- B. 3%
- C. 200%
- D. 5%

3. Which table represents 10% annual growth in an annual budget over the entire period shown?

A.	<table><tr><th>Year</th><th>Budget</th></tr><tr><td>2006</td><td>\$1,200</td></tr><tr><td>2007</td><td>\$1,080</td></tr><tr><td>2008</td><td>\$972</td></tr></table>	Year	Budget	2006	\$1,200	2007	\$1,080	2008	\$972
Year	Budget								
2006	\$1,200								
2007	\$1,080								
2008	\$972								
B.	<table><tr><th>Year</th><th>Budget</th></tr><tr><td>2006</td><td>\$1,300</td></tr><tr><td>2007</td><td>\$1,430</td></tr><tr><td>2008</td><td>\$1,573</td></tr></table>	Year	Budget	2006	\$1,300	2007	\$1,430	2008	\$1,573
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4. The amount of radioactive substance left at the end of x days can be represented by an exponential function. The initial amount is 100 grams, and the amount left after three days is 72.9 grams. Which function models the amount of radioactive substance left at the end of x number of days?

- A. $f(x) = 0.85^x$
- B. $f(x) = 0.90^x$
- C. $f(x) = 100(0.85)^x$
- D. $f(x) = 100(0.90)^x$

5. I know... what do you know?

x	2	4	6	8	10
y	18	17	16	15	14

x	4	5	6	7	8
y	18	16.65	15.40	14.25	13.18

The number of Michigan State fans in Spartan Nation is represented by the equation: $S(t) = 6.25(1.26)^t$ where S represents the number of fans (in millions) and t represents the time in years.

The number of Michigan fans is represented by the equation: $W(t) = 6.25 + 26t$ where W represents the number of fans, and t represents the time in years.

The number of Ohio State fans is represented by the equation: $O(t) = 10(1.004)^t$ where O represents the number of fans (in thousands) and t represents the time in years.

6. Write an equation to show a function that is increasing by 25 each month.

7. Write an equation to show a function that is decreasing by 25% each month.

Goal 3: I can evaluate and interpret the meaning of a solution, within the context of a problem.

1. A scientist was studying the tree frog population in a small region of the Everglades. The table below shows the results of his study for several weeks.

Number of Weeks	Number of Frogs
0	10
3	20
6	40
9	80

If the trend in the table continues, approximately how many tree frogs will there be at the end of week 16?

- A. 320 B. 400 C. 480 D. 640

2. Vance recorded the number of bacteria colonies on a dish each day for six days. Here are his results:

1, 5, 25, 125, 625, 3125

If the growth rate of the bacteria continues, how many colonies should he expect on day 7?

- A. 9375 B. 12,500 C. 15,625 D. 18,750

3. A copy machine depreciates at the rate of 15% each year. If the original cost of the copy machine was \$20,000, what is the approximate value of the machine at the end of 3 years?

- A. \$14,450 B. \$14,000 C. \$12,283 D. \$11,000

4. A population of rabbits doubles approximately **every two years**. Starting with 10 rabbits, about how many rabbits would you expect to have in 10 years?

- A. 50 B. 100 C. 320 D. 640

5. On each bounce, a ball dropped from 100 feet rises to $\frac{1}{2}$ the height from which it has fallen. How high does the ball rise, in feet, on the 10th bounce?

- A. $\frac{25}{64}$ B. $\frac{25}{128}$ C. $\frac{25}{256}$ D. $\frac{25}{512}$

6. The function $f(t) = 410(0.876)^t$ models the population of an endangered species, t years after 1990. What is the approximate population in 2005?

7. The function $g(t) = 500 - 24.5t$ models the amount of money in your account after t days. How much will you have in your account after 2 weeks?

8. Review how to complete unit conversions.

How do you convert 210 days into months?

How do you convert 35 months into years?

How do you convert 56 inches into feet?

How do you convert 4 feet into inches?

Goal 4: I can compare linear and exponential functions.

1. Veronica won a contest and can choose the option by which the prize will be awarded to her. The amount, in dollars, she will be paid of reach of the first 5 days from Option 1 and Option 2 are shown in the table.

Payment Options

Day	Option 1	Option 2
1	100	1
2	100	2
3	100	4
4	100	8
5	100	16

Which option will provide Veronica with the greater total prize, in dollars, if the payments continue indefinitely?

- A. Option 1 because the total payment is increasingly linearly.
- B. Option 1 because the total payment is increasingly exponentially.
- C. Option 2 because the total payment is increasing linearly.
- D. Option 2 because the total payment is increasing exponentially.

2. For what positive integer value of x will the value of $g(x) = 3^x$ first exceed the value of $f(x) = 2x + 25$?

- A. 3
- B. 4
- C. 25
- D. 26

3. If $f(x) = 5 + 12x$ and $g(x)$ is the line that passes through the points (7, 11) and (10, 29)....

- a. What is the difference in the y-intercept of $f(x)$ and the y-intercept of $g(x)$?
- b. What is the difference in the rate of change of $f(x)$ and the rate of change of $g(x)$?

Julie received money for her 10th birthday and wants to invest the money to help her save for college. She can either invest the money with her parents, or with a bank. Her parents have used a table to show how much money she will earn each year.

Parent's Plan:

year	1	2	3	4
balance	1300	1350	1400	1450

Bank's Plan:

A 15-year certificate of deposit is earning interest rate of 3.4%, compounded annually.

- Write an equation to represent both plans. Let $p(t)$ represent the balance in her account after t years if she saves money with her parents. Let $b(t)$ represent the balance in her bank account after t years. (Goal 1)
- How much money will Julie have in her account after 18 months in both scenarios? (Goal 3)
- Evaluate $p(7)$ and $b(7)$. What does it mean in the context of the problem? (Goal 3)
- Find $p(t) = 1700$ and $b(t) = 1700$. What does it mean in the context of the problem? (Goal 3)
- If Julie plans to invest her money for 15 years, which plan should Julie choose; her parent's plan or the bank's plan? Be sure to provide clear, descriptive evidence for your reasoning. **You may use graphs, tables or equations to help you explain your reasoning.** (Goal 4)