Linear and Exponential Functions | 4.1

Ready, Set, Go!

Topic: Recognizing arithmetic and geometric sequences

Predict the next 2 terms in the sequence. State whether the sequence is arithmetic, geometric, or neither. Justify your answer.

1. 4, -20, 100, -500, ...
   \( G \rightarrow \text{alternates} 
   \) \( x^5 \)

2. 3, 5, 8, 12, ...
   \( A \rightarrow +3 \)

3. 64, 48, 36, 27, ...
   \( N \)

4. 1.5, 0.75, 0, -0.75, ...
   \( A \rightarrow -0.75 \)

5. 40, 10, \( \frac{5}{2} \), \( \frac{5}{8} \), ...
   \( G \rightarrow \times \frac{1}{4} \)

6. 1, 11, 111, 1111, ...
   \( N \)

7. -3.6, -5.4, -8.1, -12.15, ...
   \( G \rightarrow \times 1.5 \)

8. -64, -47, -30, -13, ...
   \( A \rightarrow -17 \)

9. Create a predictable sequence of at least 4 numbers that is NOT arithmetic or geometric.
   \[ 2, 4, 16, 256, \ldots \]

Set
Topic: Discrete and continuous relationships

Identify whether the following statements are best represented by a discrete or a continuous relationship.

10. \( C \) The hair on your head grows \( \frac{1}{2} \) inch per month. \( \text{continuous} \)
11. \( D \) For every ton of paper that is recycled, 17 trees are saved. \( \text{discrete} \)
12. \( C \) Approximately 3.24 billion gallons of water flow over Niagara Falls daily. \( \text{continuous} \)
13. \( D \) The average person laughs 15 times per day. \( \text{discrete} \)
14. \( D \) The city of Buenos Aires adds 6,000 tons of trash to its landfills every day. \( \text{discrete} \)
15. \( D \) During the Great Depression, stock market prices fell 75%. \( \text{discrete} \)
16. Apples are on sale at the market 4 pounds for $2.00. What is the price (in cents) for one pound? 
\[ 2 = 4x \]
\[ x = \frac{1}{2} \Rightarrow \frac{50}{4} \] 

17. Three apples weigh about a pound. About how much would one apple cost? (Round to the nearest cent.) 
\[ 3x = \frac{1}{2} \]
\[ x = \frac{1}{6} \Rightarrow \frac{17}{4} \] 

18. One dozen eggs cost $1.98. How much does 1 egg cost? (Round to the nearest cent.) 
\[ 12x = 1.98 \]
\[ x = 0.165 \] 

19. One dozen eggs cost $1.98. If the charge at the register for only eggs, without tax, was $11.88, how many dozen were purchased? 
\[ 11.88 = 1.98x \]
\[ x = 6 \] 

20. Best Buy Shoes had a back to school special. Buy 1 pair, get the second pair FREE! The total bill for four pairs of shoes came to $69.24 (before tax.) What was the average price for each pair of shoes? 
\[ 69.24 = 4x \]
\[ x = 17.31 \] 

21. If you only purchased 1 pair of shoes at Best Buy Shoes instead of the four described in problem 20, how much would you have paid, based on the average price? (Remember that you will NOT get the Buy 1, Get 1 Free special.) 
\[ 69.24 = 2x \]
\[ x = 34.62 \]

Solve for x. Show your work.

22. \[ 6x = 72 \]
\[ \frac{12x}{12} = \frac{72}{12} \]
\[ x = 12 \] 

23. \[ 4x = 200 \]
\[ \frac{4x}{4} = \frac{200}{4} \]
\[ x = 50 \] 

24. \[ 3x = \frac{50}{3} \]
\[ \frac{9x}{3} = \frac{50}{3} \]
\[ x = \frac{50}{3} = 16 \frac{2}{3} \] 

25. \[ 12x = 25.80 \]
\[ \frac{12x}{12} = \frac{25.80}{12} \]
\[ x = 2.15 \] 

26. \[ \frac{1}{2}x = 17.31 \]
\[ \frac{x}{2} = \frac{17.31}{2} \]
\[ x = 17.31 \] 

27. \[ 4x = \frac{69.24}{4} \]
\[ \frac{4x}{4} = \frac{69.24}{4} \]
\[ x = 17.31 \] 

28. \[ 12x = 198 \]
\[ \frac{12x}{12} = \frac{198}{12} \]
\[ x = 16.5 \] 

29. \[ 1.98x = 11.88 \]
\[ \frac{1.98x}{1.98} = \frac{11.88}{1.98} \]
\[ x = 6 \] 

30. \[ \frac{1}{4}x = 2 \]
\[ \frac{4x}{4} = \frac{2}{4} \]
\[ x = 8 \] 

31. Some of the problems 22 – 30 could represent the work you did to answer questions 16 – 21. Write the number of the equation next to the story it represents.
Ready, Set, Go!

Ready
Topic: Rates of change in linear models

State which situation has the greater rate of change

1. The amount of stretch in a short bungee cord stretches 6 inches when stretched by a 3 pound weight. A slinky stretches 3 feet when stretched by a 1 pound weight.
   
   \[ \frac{6\text{ inches}}{3\text{ pounds}} = 2\text{ inches/pound} \quad \text{and} \quad \frac{3\text{ feet}}{1\text{ pound}} = 3\text{ feet/pound} \]
   
   * The slinky has a greater rate of change.

2. A sunflower that grows 2 inches every day or an amaryllis that grows 18 inches in one week.
   
   \[ \frac{2\text{ inches}}{1\text{ day}} = 2\text{ inches/day} \quad \text{and} \quad \frac{18\text{ inches}}{7\text{ days}} = 2.57\text{ inches/day} \]
   
   * Amaryllis has a greater rate of change.

3. Pumping 25 gallons of gas into a truck in 3 minutes or filling a bathtub with 40 gallons of water in 5 minutes.
   
   \[ \frac{25\text{ gallons}}{3\text{ minutes}} = \frac{25}{3}\text{ gallons/minute} \quad \text{and} \quad \frac{40\text{ gallons}}{5\text{ minutes}} = 8\text{ gallons/minute} \]
   
   * Pumping gas into a truck has a greater rate of change.

4. Riding a bike 10 miles in 1 hour or jogging 3 miles in 24 minutes.
   
   \[ \frac{10\text{ miles}}{60\text{ minutes}} = \frac{1}{6}\text{ miles/minute} \quad \text{and} \quad \frac{8\text{ miles}}{24\text{ minutes}} = \frac{1}{3}\text{ miles/minute} \]
   
   * Riding the bike has a greater rate of change.

Set
Topic: Patterns of change

Identify the pattern of change in each situation as:

1. equal differences over equal intervals, or
2. equal factors over equal intervals.

5. | x  | y  |
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>-13</td>
</tr>
<tr>
<td>-1</td>
<td>-5</td>
</tr>
<tr>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>neither</td>
<td></td>
</tr>
</tbody>
</table>

6. | x  | y  |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>-4</td>
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<td>4</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>neither</td>
<td></td>
</tr>
</tbody>
</table>

7. | x  | y  |
<table>
<thead>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>-14</td>
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<td>5</td>
<td>-8</td>
</tr>
<tr>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>neither</td>
<td></td>
</tr>
</tbody>
</table>

8. \( f(1) = 3, f(n + 1) = 7f(n) \)

9. \( f(1) = 6, f(n + 1) = f(n) - 5 \)

10. \( f(1) = 9, f(n + 1) = 2f(n) \)
Go

Topic: Solving one-step equations

Solve the following equations. Remember that what you do to one side of the equation must also be done to the other side. (Show your work, even if you can do these in your head.)

Example: Solve for \( x \). \( 1x + 7 = 23 \) Add \(-7\) to both sides of the equation.

\[
\begin{align*}
1x + 7 &= 23 \\
-7 &= -7 \\
1x + 0 &= 16 \\
\text{Therefore } 1x &= 16
\end{align*}
\]

Example: Solve for \( x \). \( 9x = 63 \) Multiply both sides of the equation by \( \frac{1}{9} \).

\[
\begin{align*}
9x &= 63 \\
\left(\frac{1}{9}\right)9x &= \left(\frac{1}{9}\right)63 \\
\left(\frac{1}{9}\right)x &= \frac{63}{9} \\
1x &= 7
\end{align*}
\]

Note that multiplying by \( \frac{1}{9} \) gives the same result as dividing everything by 9.

11. \( 1x + 16 = 36 \) \( \frac{16}{1} \)
   \[
   \begin{align*}
   x &= 20
   \end{align*}
   \]

12. \( 1x - 13 = 10 \) \( +13 \)
   \[
   \begin{align*}
   x &= 23
   \end{align*}
   \]

13. \( 1x - 8 = -3 \) \( +8 \)
   \[
   \begin{align*}
   x &= 5
   \end{align*}
   \]

14. \( 8x = 56 \)
   \[
   \begin{align*}
   x &= 7
   \end{align*}
   \]

15. \( -11x = 88 \) \( -11 \)
   \[
   \begin{align*}
   x &= -8
   \end{align*}
   \]

16. \( 425x = 850 \) \( \frac{425}{425} \)
   \[
   \begin{align*}
   x &= 2
   \end{align*}
   \]

17. \( \frac{6}{1} - \frac{1}{6}x = 10 \cdot \frac{6}{1} \)
   \[
   \begin{align*}
   x &= 60
   \end{align*}
   \]

18. \( \frac{9}{8} \cdot \frac{7}{4} - \frac{4}{7}x = -1 \cdot \frac{7}{4} \)
   \[
   \begin{align*}
   x &= \frac{3}{4}
   \end{align*}
   \]

19. \( \frac{4}{3} \cdot \frac{3}{4}x = -9 \cdot \frac{4}{3} \)
   \[
   \begin{align*}
   x &= -36
   \end{align*}
   \]
Ready, Set, Go!

Ready

Topic: Recognizing the greater rate of change when comparing 2 functions in a graph.

Decide which function is growing faster.

1. \( f(x) \)
2. \( h(x) \)
3. \( m(x) \)
4. \( r(x) \)
5. \( f(x) \)
6. \( p(x) \)

7a. Examine the graph at the left from 0 to 1. Which function do you think is growing faster? \( S(x) \)

7b. Now look at the graph from 2 to 3. Which function do you think is growing faster on this interval? \( r(x) \)
Set
Topic: Representations of linear and exponential functions

In each of the following problems, you are given one of the representations of a function. Complete the remaining 3 representations. Identify the rate of change for the relation.

8. Equation:

<table>
<thead>
<tr>
<th>Table</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rides</td>
<td>Cost</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
</tr>
</tbody>
</table>

Create a context
You and your friends go to the state fair. It costs $5 to get into the fair and $3 each time you go on a ride.

rate of change = slope = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{3}{1}

9. Equation:

<table>
<thead>
<tr>
<th>Table</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Amount</td>
</tr>
<tr>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>54</td>
</tr>
<tr>
<td>3</td>
<td>162</td>
</tr>
<tr>
<td>4</td>
<td>486</td>
</tr>
<tr>
<td>5</td>
<td>1458</td>
</tr>
<tr>
<td>6</td>
<td>4374</td>
</tr>
</tbody>
</table>

Create a context

rate of change \Rightarrow is constantly changing
must look at the instantaneous rate of change
\Rightarrow growing by a factor of 3
Go

Topic: Solving one-step equations with justification.

Recall the two properties that help us solve equations.

The **Additive property of equality** states:
You can add any number to both sides of an equation and the equation will still be true.

The **Multiplicative property of equality** states:
You can multiply any number to both sides of an equation and the equation will still be true.

Solve each equation. Justify your answer by identifying the property(s) you used to get it.

<table>
<thead>
<tr>
<th>Example 1: $x - 13 = 7$</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x + 0 = 20$ addition</td>
<td></td>
</tr>
<tr>
<td>$x = 20$ additive identity (You added 0 and got x.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Example 2: $\frac{5}{5}x = 35$</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{5}{5}x = \frac{35}{5}$ multiplicative property of equality (multiplied by $\frac{5}{5}$)</td>
<td></td>
</tr>
<tr>
<td>$1x = 7$ multiplicative identity (A number multiplied by its reciprocal = 1)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10. $3x = 15$</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{3x}{3} = \frac{15}{3}$ multiplicative property of equality</td>
<td></td>
</tr>
<tr>
<td>$x = 5$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11. $x - 10 = 2$</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x - 10 + 10 = 2$ Additive property of equality</td>
<td></td>
</tr>
<tr>
<td>$x = 12$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>12. $-16 = x + 11$</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-11$ Additive property of equality</td>
<td></td>
</tr>
<tr>
<td>$-27 = x$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>13. $6 + x = 10$</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6 - 6$ Additive property of equality</td>
<td></td>
</tr>
<tr>
<td>$x = 4$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>14. $6x = 18$</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{6x}{6} = \frac{18}{6}$ multiplicative property of equality</td>
<td></td>
</tr>
<tr>
<td>$x = 3$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>15. $-3x = 2$</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-\frac{3}{3}x = \frac{2}{3}$ multiplicative property of equality</td>
<td></td>
</tr>
<tr>
<td>$x = \frac{2}{3}$</td>
<td></td>
</tr>
</tbody>
</table>
Ready, Set, Go!

Ready

Topic: Comparing rates of change in both linear and exponential situations.

Identify whether situation "a" or situation "b" has the greater rate of change.

1.

\[
\frac{\Delta y}{\Delta x} = \frac{5}{1}
\]

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(x)</td>
<td>(y)</td>
</tr>
<tr>
<td>-10</td>
<td>-48</td>
</tr>
<tr>
<td>-9</td>
<td>-43</td>
</tr>
<tr>
<td>-8</td>
<td>-38</td>
</tr>
<tr>
<td>-7</td>
<td>-33</td>
</tr>
</tbody>
</table>

2.

a. When \(x = 1\), \(y = 2\)

\[
\frac{\Delta y}{\Delta x} = \frac{6}{1}
\]

b. "b" increases at a greater rate.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(x)</td>
<td>(y)</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

3.

a. Lee has $25 withheld each week from his salary to pay for his subway pass.

\[
y = 25x
\]

b. Jose owes his brother $50. He has promised to pay half of what he owes each week until the debt is paid.

\[
y = 50(2)^x
\]
Linear and Exponential Functions

4.4

4.

\[
\frac{\Delta y}{\Delta x} = \frac{2}{1}
\]

5.

a. \( y = 2(5)^x \)

b. The number of rhombi in each shape.

Figure 1  Figure 2  Figure 3

\[
\begin{array}{ccc}
3 & 5 & 7 \\
2 & 5 & 7 \\
1 & 2 & 3
\end{array}
\]

b. In the children's book, *The Magic Pot*, every time you put one object into the pot, two of the same object come out. Imagine that you have 5 magic pots.

\[
y = 2(2)^{x-1}
\]

6. The population of a town is decreasing at a rate of 1.5% per year.

 exponential

7. Joan earns a salary of $30,000 per year plus a 4.25% commission on sales.

 neither

8. \( 3x + 4y = -3 \)

 linear

9. The number of gifts received each day of "The 12 Days of Christmas" as a function of the day. ("On the 4th day of Christmas my true love gave to me, 4 calling birds, 3 French hens, 2 turtledoves, and a partridge in a pear tree.") Neither

\[
f(\text{days of christmas}) = \# \text{ gifts received}
\]

10.

11.

<table>
<thead>
<tr>
<th>Side of a square</th>
<th>Area of a square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 inch</td>
<td>1 in²</td>
</tr>
<tr>
<td>2 inches</td>
<td>4 in²</td>
</tr>
<tr>
<td>3 inches</td>
<td>9 in²</td>
</tr>
<tr>
<td>4 inches</td>
<td>16 in²</td>
</tr>
</tbody>
</table>

 neither
Go

Topic: Geometric means

For each geometric sequence below, find the missing terms in the sequence.

### 12.

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>2</td>
<td>6</td>
<td>18</td>
<td>54</td>
<td>162</td>
</tr>
</tbody>
</table>

For $r = -3$:

\[ 2r = \frac{2}{2} \]
\[ 2r^2 = \frac{2}{2} \]
\[ 2r^3 = \frac{2}{2} \]
\[ 2r^4 = \frac{2}{2} \]
\[ r \cdot r \cdot r \cdot r = 81 \]
\[ r = \pm 3 \]

### 13.

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>$\frac{1}{9}$</td>
<td>$-\frac{1}{3}$</td>
<td>1</td>
<td>-3</td>
<td>9</td>
</tr>
</tbody>
</table>

For $r = \frac{1}{3}$:

\[ \frac{1}{3}r = \frac{1}{9} \]
\[ \frac{1}{3}r^2 = \frac{1}{9} \]
\[ \frac{1}{3}r^3 = \frac{1}{9} \]
\[ \frac{1}{3}r^4 = \frac{1}{9} \]
\[ r \cdot r \cdot r \cdot r = 81 \]
\[ r = \pm 3 \]

### 14.

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>10</td>
<td>5</td>
<td>2.5</td>
<td>1.25</td>
<td>0.625</td>
</tr>
</tbody>
</table>

For $r = \frac{1}{4}$:

\[ 10r = 10 \]
\[ 10r^2 = \frac{10}{2} \]
\[ 10r^3 = \frac{10}{8} \]
\[ 10r^4 = \frac{10}{62.5} \]
\[ r = \frac{1}{2} \]

### 15.

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>8</td>
<td>$g^2$</td>
<td>$g^2$</td>
<td>$g^2$</td>
<td>$g^2$</td>
</tr>
</tbody>
</table>

### 16.

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>-3</td>
<td>$9$ or $-9$</td>
<td>$-27$</td>
<td>$81$ or $-81$</td>
<td>$-243$</td>
</tr>
</tbody>
</table>

For $r = \frac{-243}{8}$:

\[ \frac{3r^4}{8} = \frac{-243}{8} \]
\[ r^4 = -81 \]
\[ r \cdot r \cdot r \cdot r = -81 \]
\[ r = \pm 3 \]
The first and 5th terms of a sequence are given. Fill in the missing numbers for an arithmetic sequence. Then fill in the numbers for a geometric sequence.

<table>
<thead>
<tr>
<th></th>
<th>Arithmetic</th>
<th>Geometric</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>84</td>
<td>164</td>
</tr>
<tr>
<td></td>
<td>1.44</td>
<td>32</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Geometric</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>14 1/4</td>
<td>25 1/2</td>
</tr>
<tr>
<td></td>
<td>36 3/4</td>
<td>50</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Geometric</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>-6250</td>
<td>-6250</td>
</tr>
<tr>
<td></td>
<td>-4690</td>
<td>-3130</td>
</tr>
<tr>
<td></td>
<td>-1570</td>
<td>-10</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Geometric</td>
<td>-6250</td>
<td>-6250</td>
</tr>
<tr>
<td>4.</td>
<td>-12</td>
<td>-12</td>
</tr>
<tr>
<td></td>
<td>-9.1875</td>
<td>-6.375</td>
</tr>
<tr>
<td></td>
<td>-3.5625</td>
<td>-0.75</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>-0.75</td>
<td>-0.75</td>
</tr>
<tr>
<td>Geometric</td>
<td>-12</td>
<td>-12</td>
</tr>
<tr>
<td>5.</td>
<td>-1377</td>
<td>-1377</td>
</tr>
<tr>
<td></td>
<td>-1037</td>
<td>-697</td>
</tr>
<tr>
<td></td>
<td>-387</td>
<td>-17</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>-17</td>
<td>-17</td>
</tr>
<tr>
<td>Geometric</td>
<td>-1377</td>
<td>-1377</td>
</tr>
</tbody>
</table>
Set
Topic: comparing the rates of change of linear and exponential functions.

Compare the rates of change of each pair of functions by identifying the interval where it appears that \( f(x) \) is changing faster and the interval where it appears that \( g(x) \) is changing faster. Verify your conclusions by making a table of values for each equation and exploring the rates of change in your tables.

6. \( f(x) = (1.5)^x \)
   
   \[ g(x) = \frac{1}{2} x + 2 \]

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
<th>( g(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>1.5</td>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
<td>2.25</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>3.375</td>
<td>3.75</td>
</tr>
<tr>
<td>4</td>
<td>5.0625</td>
<td>5.0625</td>
</tr>
</tbody>
</table>

7. \( f(x) = -3^x + 1 \)
   
   \[ g(x) = -2x - 2 \]

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
<th>( g(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>-2</td>
</tr>
<tr>
<td>1</td>
<td>-2</td>
<td>-4</td>
</tr>
<tr>
<td>2</td>
<td>-8</td>
<td>-8</td>
</tr>
<tr>
<td>3</td>
<td>-26</td>
<td>-30</td>
</tr>
</tbody>
</table>

8. \( f(x) = 2^x \)
   
   \[ g(x) = 8x \]

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
<th>( g(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>32</td>
</tr>
</tbody>
</table>

\( x \) when \( x < 3 \), \( g(x) \) is changing faster. When \( x > 3 \), \( f(x) \) is changing faster.
Go

Topic: Writing explicit equations for linear and exponential models.

Write the explicit equation for the tables and graphs below.

9. \[ f(x) = -4 - 7(x-2) \]
   or \[ f(x) = 10 - 7x \]

10. \[ f(x) = 2 \times 5^x \]

11. \[ f(x) = -24(\frac{1}{2})^{x-2} \]
   or \[ f(x) = -(\frac{1}{2})^x \]

12. \[ f(x) = 81 \times \frac{1}{3} \]
   or \[ f(x) = -\frac{1}{3}^x \]

13. \[ f(x) = \frac{1}{3}x + 2 \]

14. \[ f(x) = 1(4)^x \]

15. \[ f(x) = -x + 1 \]

16. \[ f(x) = 1(2)^x \]

17. \[ f(x) = -2x - 4 \]

18. \[ f(x) = -(2)^x + 2 \]
Ready, Set, Go!

Ready
Topic: Comparing Linear and Exponential Models

Compare different characteristics of each type of function by filling in the cells of each table as completely as possible.

<table>
<thead>
<tr>
<th></th>
<th>( y = 4 + 3x )</th>
<th>( y = 4(3^x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Type of growth</td>
<td>linear</td>
<td>exponential</td>
</tr>
<tr>
<td>2. What kind of sequence corresponds to each model?</td>
<td>arithmetic</td>
<td>geometric</td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>y</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>13</td>
</tr>
</tbody>
</table>

3. Make a table of values

4. Find the rate of change
5. Graph each equation.

Compare the graphs.

What is the same?
- They both cross y-axis at 4
What is different?
- The linear graph is a constant rate of change.
- The exponential grows by a factor of 3

6. Find the y-intercept for each function.

\( y \)-intercept is 4
7. Find the $y$-intercepts for the following equations
   a) $y = 3x$
      $y$-intercept is 0  \[ y = 3(0) = 0 \]
   b) $y = 3^x$
      $y$-intercept is 1  \[ y = 3^0 = 1 \]

8. Explain how you can find the $y$-intercept of a linear equation and how that is different from finding the $y$-intercept of a geometric equation.

**Set**

Topic: Finding patterns

**Use the picture below to answer questions 9-12**

9. Graph.

10. Table

<table>
<thead>
<tr>
<th>Stage</th>
<th># of small triangles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

*it is not growing by a constant rate of change (common difference) or by a common factor but there is a pattern to the increase values*

11. Write an explicit function to describe the pattern

   \[ f(x) = x^2 \]
Go

Topic: Equivalent equations

Prove that the two equations are equivalent by simplifying the equation on the right side of the equal sign. The justification in the example is to help you understand the steps for simplifying. **You do NOT need to justify your steps.**

Example:

<table>
<thead>
<tr>
<th>Example</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2x - 4 = 8 + x - 5x + 6(x - 2))</td>
<td>Add (x - 5x) and distribute the 6 over ((x - 2))</td>
</tr>
<tr>
<td>(= 8 - 4x + 6x - 12)</td>
<td>Combine like terms.</td>
</tr>
<tr>
<td>(= -4 + 2x)</td>
<td></td>
</tr>
<tr>
<td>(2x - 4 = 2x - 4)</td>
<td>Commutative property of addition</td>
</tr>
</tbody>
</table>

12. \(x - 5 = 5x - 7 + 2(3x + 1) - 10x\)
   \(\underline{x - 5 = \frac{30x}{2} - \frac{2}{2} - 10x}\)
   \(x - 5 = x - 5\)

13. \(6 - 13x = 24 - 10(2x + 8) + 62 + 7x\)
   \(\underline{6 - 13x = 24 - \frac{20x}{2} - \frac{80}{2} + \frac{62}{2} + \frac{7x}{2}}\)
   \(6 - 13x = -13x + 6\)
   \(6 - 13x = 6 - 13x\)

14. \(14x + 2 = 2x - 3(-4x - 5) - 13\)
   \(\underline{14x + 2 = -12x + 15 - 13}\)
   \(14x + 2 = 14x + 2\)

15. \(x + 3 = 6(x + 3) - 5(x + 3)\)
   \(\underline{x + 3 = \frac{30x}{3} + \frac{18}{3} - \frac{5x}{3} - \frac{15}{3}}\)
   \(x + 3 = x + 3\)

16. \(4 = 7(2x + 1) - 5x - 3(3x + 1)\)
   \(\underline{4 = \frac{14x}{2} + \frac{7}{2} - \frac{5x}{2} - 9 - 3}\)
   \(4 = 4\)

17. \(x = 12 + 8x - 3(x + 4) - 4x\)
   \(\underline{x = \frac{12}{1} + \frac{8x}{1} - \frac{3x}{1} - \frac{12}{1} - \frac{4x}{1}}\)
   \(x = x\)

18. Write an expression that equals \((x - 13)\). It must have at least 2 sets of parentheses and 1 minus sign. Verify that it is equal to \((x - 13)\). **VARIOUS ANSWERS POSSIBLE!**

\[ x - 13 = 3(x + 1) - 2(x + 8) \]
\[ x - 13 = \frac{3x}{3} + \frac{3}{3} - \frac{2x}{2} - \frac{16}{2} \]
\[ x - 13 = x - 13 \]
Ready, Set, Go!

Ready

Topic: Writing equations of lines.

Write the equation of a line in slope-intercept form: \( y = mx + b \), using the given information.

1. \( m = -7, b = 4 \) \[ y = -7x + 4 \]
2. \( m = \frac{3}{8}, b = -3 \) \[ y = \frac{3}{8}x - 3 \]
3. \( m = 16, b = -\frac{1}{5} \) \[ y = 16x - \frac{1}{5} \]

Write the equation of the line in point-slope form: \[ y - y_1 = m(x - x_1) \], using the given information.

4. \( m = 9, (0, -7) \) \[ y + 7 = 9(x - 0) \]
5. \( m = \frac{2}{3}, (-6, 1) \) \[ y - 1 = \frac{2}{3}(x + 6) \]
6. \( m = -5, (4, 11) \) \[ y - 11 = -5(x - 4) \]

7. \( (2, -5), (-3, 10) \)

Find slope first!
\[
\frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10 + 5}{-3 - 2} = \frac{15}{-5} = -3
\]
\[ y - (-5) = -3(x - 2) \]
\[ y + 5 = -3(x - 2) \]

8. \( (0, -9), (3, 0) \)
\[ m = \frac{0 + 9}{3 - 0} = 3 \]
\[ y - (-9) = 3(x - 0) \]
\[ y + 9 = 3(x - 0) \]

9. \( (-4, 8), (3, 1) \)
\[ m = \frac{1 - 8}{3 + 4} = \frac{-7}{7} = -1 \]
\[ y - 8 = -(x + 4) \]
\[ y - 8 = -1(x + 4) \]
Set Topic: Graphing linear and exponential functions

Make a graph of the function based on the following information. Add your axes. Choose an appropriate scale and label your graph. Then write the equation of the function.

10. The beginning value is 5 and its value is 3 units smaller at each stage.
   Equation: \( f(x) = 5 - \frac{3}{4}x \)

11. The beginning value is 16 and its value is \( \frac{1}{4} \) smaller at each stage.
   Equation: \( f(x) = 16 \left( \frac{1}{4} \right)^x \)

12. The beginning value is 1 and its value is 10 times as big at each stage.
   Equation: \( f(x) = 1 \cdot 10^x \)

13. The beginning value is -8 and its value is 2 units larger at each stage.
   Equation: \( f(x) = -8 + 2x \)
Rewrite the equations in slope-intercept form.

Example: $4(3x + y) = 8x + 16$  Distribute the 4 over $(x + y)$ first. Eliminate parentheses.
$12x + 4y = 8x + 16$  You want the $4y$ alone on the left. So subtract $-12x$.

$-12x$ - $12x$

$4y = -4x + 16$  Remember that you want $1y$, so divide both sides by 4.

$\frac{4}{4}y = \frac{-4}{4}x + \frac{16}{4}$  Reduce the fractions. $y = -1x + 4$

14. $2y + 10 = 6x + 12$

$-10$ - $10$

$\frac{2y}{2} = \frac{6x}{2} + \frac{2}{2}$

$y = 3x + 1$

17. $(y + 11) = -7(x - 2)$

$y + 11 = 7x + 14$

$-11$ - $11$

$y = 7x + 3$

20. $y - 2 = \frac{1}{5}(10x - 25)$

$y - 2 = 2x - 5$

$+2$ + $2$

$y = 2x - 3$

15. $5x + y = 7x + 4$

$-5x$ - $5x$

$\frac{y}{2} = \frac{2x + 2}{2}$

$y = 2x + 4$

18. $(y - 5) = 3(x + 2)$

$y - 5 = 3x + 6$

$+5$ + $5$

$\frac{y}{3} = \frac{3x + 11}{3}$

$y = 3x + 11$

19. $3(2x - y) = 9x + 12$

$6x - 3y = 9x + 12$

$-6x$ - $-6x$

$\frac{-3y}{3} = \frac{3x + 12}{3}$

$-3$ - $-3$

$y = x + 4$

21. $y + 13 = -1(x + 3)$

$y + 13 = x - 3$

$-13$ - $-13$

$y = x - 16$

22. $y + 1 = \frac{3}{4}(x + 3)$

$y + 1 = \frac{3}{4}x + \frac{9}{4}$

$-1$ - $-1$

$\frac{y}{4} = \frac{3}{4}x + \frac{5}{4}$
Ready, Set, Go!

Ready

Topic: Simple interest

When a person borrows money, the lender usually charges "rent" on the money. This "rent" is called interest. Simple interest is a percent “r” of the original amount borrowed “P” multiplied by the time “t”, usually in years. The formula for calculating the interest is \[ i = Prt \].

Calculate the simple interest owed on the following loans.

1. \[ P = \$1000 \quad r = 11\% \quad t = 2 \text{ years} \]
   \[ i = 1000 \times 0.11 \times 2 = \$220.00 \]

2. \[ P = \$6500 \quad r = 12.5\% \quad t = 5 \text{ years} \]
   \[ i = 6500 \times 0.125 \times 5 = \$4062.50 \]

3. \[ P = \$20,000 \quad r = 8.5\% \quad t = 6 \text{ years} \]
   \[ i = 20000 \times 0.085 \times 6 = \$10,200.00 \]

4. \[ P = \$700 \quad r = 20\% \quad t = 6 \text{ months} \]
   \[ i = 700 \times 0.2 \times 0.5 = \$70.00 \]

Juanita borrowed $1,000 and agreed to pay 15% interest for 5 years. Juanita did not have to make any payments until the end of the 5 years, but then she had to pay back the amount borrowed “P” plus all of the interest “i” for the 5 years “t.” Below is a chart that shows how much money Juanita owed the lender at the end of each year of the loan.

<table>
<thead>
<tr>
<th>End of year</th>
<th>Interest owed for the year</th>
<th>Total Amount owed to the lender to pay back the loan.</th>
<th>Interest owed is 15% at end of each year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$1000 \times 0.15 = $150</td>
<td>A = Principal + interest = $1150</td>
<td>1000 \times (1.15) = 1150</td>
</tr>
<tr>
<td>2</td>
<td>$1000 \times 0.15 = $150</td>
<td>A = P + i + i = $1300</td>
<td>1000 \times (1.15 \times 1.15) = 1322.50</td>
</tr>
<tr>
<td>3</td>
<td>$1000 \times 0.15 = $150</td>
<td>A = P + i + i + i = $1450</td>
<td>1000 \times (1.15 \times 1.15 \times 1.15) = 1520.81</td>
</tr>
<tr>
<td>4</td>
<td>$1000 \times 0.15 = $150</td>
<td>A = P + i + i + i + i = $1600</td>
<td>1000 \times (1.15 \times 1.15 \times 1.15 \times 1.15) = 1744.01</td>
</tr>
<tr>
<td>5</td>
<td>$1000 \times 0.15 = $150</td>
<td>A = P + i + i + i + i + i = $1750</td>
<td>1000 \times (1.15 \times 1.15 \times 1.15 \times 1.15 \times 1.15) = 2011.36</td>
</tr>
</tbody>
</table>

5. Look for the pattern you see in the chart above for the amount (A) owed to the lender. Write an function that best describes A with respect to time (in years).

   \[ A(t) = P + i \cdot t \]

6. At the end of year 5, the interest was calculated at 15% of the original loan of $1000. But by that time Juanita owed $1600 (before the interest was added.) What percent of $1600 is $150?

   \[ \frac{150}{1600} = \frac{x}{100} \]
   \[ x = 9.375 \% \]

7. Consider if the lender charged 15% of the amount owed instead of 15% of the amount of the original loan. Make a fourth column on the chart and calculate the interest owed each year if the lender required 15% of the amount owed at the end of each year. Note that the interest owed at the end of the first year would still be $150. Fill in the 4th column.
Set

Topic: The 4 forms of a linear equation

Below are the 4 forms of the same linear equation. For each equation, do the following:
(a) Circle the rate of change
(b) Name the point that describes the y-intercept
(c) Name the point that describes the x-intercept

<table>
<thead>
<tr>
<th>Slope-intercept</th>
<th>Point-slope</th>
<th>Standard</th>
<th>Recursive formula</th>
<th>(b)</th>
<th>(c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. ( y = 3x - 2 )</td>
<td>( y - 13 = 3(x - 5) )</td>
<td>( 3x - y = 2 )</td>
<td>( f(0) = -2 ) ( f(n) = f(n-1) + 3 )</td>
<td>-2</td>
<td>( \frac{2}{3} )</td>
</tr>
<tr>
<td>9. ( y = \frac{1}{4}x + 7 )</td>
<td>( y - 5 = \frac{1}{4}(x + 8) )</td>
<td>( x - 4y = -28 )</td>
<td>( f(0) = 3 ) ( f(n) = f(n-1) + \frac{7}{4} )</td>
<td>7</td>
<td>-28</td>
</tr>
<tr>
<td>10. ( y = -\frac{3}{2}x + 3 )</td>
<td>( y + 1 = -\frac{3}{2}(x - 6) )</td>
<td>( 2x + 3y = 9 )</td>
<td>( f(0) = 3 ) ( f(n) = f(n-1) - \frac{3}{2} )</td>
<td>3</td>
<td>( \frac{9}{2} )</td>
</tr>
</tbody>
</table>

Go

Topic: Solving two-step equations

Solve the following equations. Check your answer by replacing \( x \) with your solution.

11. \( 6x - 4 = 5 + 9x \)
   \[ -9x \]
   \[ -3x - 4 = 5 \]
   \[ -3x = 9 \]
   \[ x = -3 \]

12. \( 2x + 4 = 3x - 4 \)
   \[ -3x \]
   \[ -x + 4 = -4 \]
   \[ -x = -8 \]
   \[ x = 8 \]

13. \( 12x + 6 = 5x - 8 \)
   \[ -5x \]
   \[ 7x + 6 = -8 \]
   \[ 7x = -14 \]
   \[ x = -2 \]

14. \( 2x + 2 = 6x - 18 \)
   \[ -2x \]
   \[ 2 = 4x - 18 \]
   \[ 20 = 4x \]
   \[ x = 5 \]

15. What does it mean when you have solved an equation?

   It means finding the solution set that when substituted in for \( x \) will produce a true statement.
Name:  

**Linear and Exponential Functions | 4.9**

**Ready, Set, Go!**

**Ready**
Topic: Evaluating equations

**Fill out the table of values for the given equations.**

1. \( y = 17x - 28 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>-79</td>
</tr>
<tr>
<td>1</td>
<td>-11</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>57</td>
</tr>
</tbody>
</table>

2. \( y = -8x - 3 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>77</td>
</tr>
<tr>
<td>-6</td>
<td>45</td>
</tr>
<tr>
<td>2</td>
<td>-19</td>
</tr>
<tr>
<td>9</td>
<td>-75</td>
</tr>
</tbody>
</table>

3. \( y = \frac{1}{2}x + 15 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-26</td>
<td>( \frac{1}{2}(-26) + 15 )</td>
</tr>
<tr>
<td>-14</td>
<td>( \frac{1}{2}(-14) + 15 )</td>
</tr>
<tr>
<td>-1</td>
<td>( \frac{1}{2}(-1) + 15 )</td>
</tr>
<tr>
<td>9</td>
<td>( \frac{1}{2}(9) + 15 )</td>
</tr>
</tbody>
</table>

4. \( y = 6^x \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>( \frac{1}{6^3} = \frac{1}{216} )</td>
</tr>
<tr>
<td>-1</td>
<td>( \frac{1}{6} )</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>36</td>
</tr>
<tr>
<td>5</td>
<td>7776</td>
</tr>
</tbody>
</table>

5. \( y = 10^x \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>( \frac{1}{10^3} = \frac{1}{1000} )</td>
</tr>
<tr>
<td>-1</td>
<td>( \frac{1}{10} )</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>( 10^6 )</td>
</tr>
</tbody>
</table>

6. \( y = \left(\frac{1}{5}\right)^x \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>( \frac{1}{5}^{-4} = \frac{1}{\left(\frac{1}{5}\right)^4} = \frac{5^4}{1} )</td>
</tr>
<tr>
<td>-2</td>
<td>( \frac{1}{5}^{-2} = \frac{1}{\left(\frac{1}{5}\right)^2} = 25 )</td>
</tr>
<tr>
<td>0</td>
<td>( \frac{1}{5}^0 = 1 )</td>
</tr>
<tr>
<td>3</td>
<td>( \frac{1}{\left(\frac{1}{5}\right)^3} = \left(\frac{1}{5}\right)^3 )</td>
</tr>
<tr>
<td>5</td>
<td>( \frac{1}{3125} )</td>
</tr>
</tbody>
</table>

SECONDARY 1 // MODULE 4

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Set
Topic: Evaluate using the formulas for simple interest or compound interest.

Given the formula for simple interest: \( i = Prt \), calculate the simple interest paid.

(Remember, \( i \) = interest, \( P \) = the principal, \( r \) = the interest rate per year as a decimal, \( t \) = time in years)

7. Find the simple interest you will pay on a 5 year loan of $7,000 at 11% per year.

\[ i = 7000 \times 0.11 \times 5 = 3850 \]

8. How much interest will you pay in 2 years on a loan of $1500 at 4.5% per year?

\[ i = 1500 \times 0.045 \times 2 = 135 \]

Use \( i = Prt \) to complete the table. All interest rates are annual.

<table>
<thead>
<tr>
<th></th>
<th>( i )</th>
<th>( P )</th>
<th>( r )</th>
<th>( x )</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>$4059</td>
<td>$11,275</td>
<td>12%</td>
<td>( x )</td>
<td>3 years</td>
</tr>
<tr>
<td>10.</td>
<td>$1428</td>
<td>$5100</td>
<td>4%</td>
<td>( x )</td>
<td>( y ) years</td>
</tr>
<tr>
<td>11.</td>
<td>$93.75</td>
<td>$1250</td>
<td>15%</td>
<td>( x )</td>
<td>6 months</td>
</tr>
<tr>
<td>12.</td>
<td>$54</td>
<td>$900</td>
<td>8%</td>
<td>( x )</td>
<td>9 months</td>
</tr>
</tbody>
</table>

Given the formula for compound interest: \( A = P(1 + r)^t \), write a compound interest function to model each situation. Then calculate the balance after the given number of years.

(Remember: \( A \) = the balance after \( t \) years, \( P \) = the principal, \( t \) = the time in years, \( r \) = the annual interest rate expressed as a decimal)

13. $22,000 invested at a rate of 3.5% compounded annually for 6 years.

\[ A = 22000(1 + 0.035)^6 \]

\[ = 27,043.62 \]

14. $4300 invested at a rate of 2.8% compounded annually for 15 years.

\[ A = 4300(1 + 0.028)^{15} \]

\[ = 6506.77 \]

15. Suppose that when you are 15 years old, a magic genie gives you the choice of investing $10,000 at a rate of 7% or $5,000 at a rate of 12%. Either choice will be compounded annually. The money will be yours when you are 65 years old. Which investment would be the best? Justify your answer.

Option 1

\[ 10,000(1.07)^{50} = \$ 294,510.25 \]

Option 2

\[ 5000(1.12)^{50} = \$ 1,445,010.95 \]

I would choose option 2 because it increases at a higher rate. 12% vs 7%
Go

Topic: Using order of operations when evaluating expressions

Evaluate the equations for the given values of the variables.

16. \( pq + 6 + 10; \) when \( p = 7 \) and \( q = -3 \)

\[
\begin{align*}
7(-3) &+ 6 + 10
\end{align*}
\]

\[
\begin{align*}
-21 &+ 6 + 10
\end{align*}
\]

\[
\begin{align*}
-21 &+ 6 + 10
\end{align*}
\]

\[
\begin{align*}
-7 &+ \frac{20}{2}
\end{align*}
\]

\[
\begin{align*}
13 &+ \frac{1}{2}
\end{align*}
\]

17. \( m + n(m - n); \) when \( m = 2 \) and \( n = 6 \)

\[
\begin{align*}
2 + 6(2 - 6)
\end{align*}
\]

\[
\begin{align*}
2 + 6(-4)
\end{align*}
\]

\[
\begin{align*}
2 - 24
\end{align*}
\]

18. \( (b - 1)^2 + ba^2; \) when \( a = 5 \) and \( b = 3 \)

\[
\begin{align*}
(3-1)^2 + 3(5)^2
\end{align*}
\]

\[
\begin{align*}
2^2 + 3(25)
\end{align*}
\]

\[
\begin{align*}
4 + 75
\end{align*}
\]

19. \( y(x - (9 - 4y)); \) when \( x = 4 \) and \( y = -5 \)

\[
\begin{align*}
-\varepsilon(4 - (9 - 4(-5))
\end{align*}
\]

\[
\begin{align*}
-\varepsilon(4 - (9 + 20))
\end{align*}
\]

\[
\begin{align*}
-\varepsilon(4 - 29)
\end{align*}
\]

20. \( x - (x - (x - y^3)); \) when \( x = 7 \) and \( y = 2 \)

\[
\begin{align*}
7(7 - (7 - 2^3))
\end{align*}
\]

\[
\begin{align*}
7(7 - (7 - 8))
\end{align*}
\]

\[
\begin{align*}
7(7 - (-1))
\end{align*}
\]

21. \( an^4 + a(n - 7)^2 + 2n; \) when \( a = -2 \) and \( n = 4 \)

\[
\begin{align*}
-2(4^4) &+ -2(4-7)^2
\end{align*}
\]

\[
\begin{align*}
-2(25) &+ -2(-3)^2
\end{align*}
\]

\[
\begin{align*}
-512 &+ (-2)(9)
\end{align*}
\]

\[
\begin{align*}
-512 &+ 18
\end{align*}
\]

\[
\begin{align*}
-530
\end{align*}
\]
**Linear and Exponential Functions | 4.10**

**Ready, Set, Go!**

**Ready**
Topic: Let's get ready for the test

1. Give an example of a discrete function.
   
   getting paid $10 month for allowance

2. Give an example of a continuous function.
   
   filling a bucket with water

3. The first and 5\textsuperscript{th} terms of a sequence are given. Fill in the missing numbers for an arithmetic sequence. Then fill in the numbers for a geometric sequence.

<table>
<thead>
<tr>
<th>Arithmetic</th>
<th>-6250</th>
<th>-4690</th>
<th>-3130</th>
<th>-1570</th>
<th>-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometric</td>
<td>-6250</td>
<td>±1250</td>
<td>250</td>
<td>±50</td>
<td>-10</td>
</tr>
</tbody>
</table>

4. Compare the rate of change in the pair of functions in the graph by identifying the interval where it appears that \( f(x) \) is changing faster and the interval where it appears that \( g(x) \) is changing faster. Verify your conclusions by making a table of values for each function and exploring the rates of change in your tables.

5. Identify the following sequences as linear, exponential, or neither.

   a. -23, -6, 11, 28, …
   b. 49, 36, 25, 16, …
   c. 5125, 1025, 205, 41, …
   d. 2, 6, 24, 120, …
   e. 0.12, 0.36, 1.08, 3.24, …
   f. 21, 24.5, 28, 31.5, …

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Set
Describe the defining characteristics of each type of function by filling in the cells of each table as completely as possible.

<table>
<thead>
<tr>
<th>y = 6 + 5x</th>
<th>y = 6(5^x)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6. Type of growth</strong></td>
<td><strong>linear</strong></td>
</tr>
<tr>
<td><strong>7. What kind of sequence corresponds to each model?</strong></td>
<td>arithmetic</td>
</tr>
<tr>
<td>x</td>
<td>y</td>
</tr>
<tr>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>26</td>
</tr>
</tbody>
</table>

**8. Make a table of values**

**9. Find the rate of change**

rate of change is growing

**10. Graph each equation. Compare the graphs.**

What is the same? Starting point
What is different? Growth rates are different

**11. Find the y-intercept for each function.**

y-intercept = 6

**12. Write the recursive form of each equation.**

\[ f(0) = 6 \]
\[ f(x) = f(x-1) + 5 \]

\[ f(0) = 6 \]
\[ f(x) = f(x-1) \times 5 \]
Recall the following formulas: \[ \text{Simple interest } i = prt \] \[ \text{Compound interest } A = P(1+r)^t \]

Using the formulas for simple interest or compound interest, calculate the following.

25. The simple interest on a loan of $12,000 at an interest rate of 17% for 6 years.
   \[ i = 12000(0.17)(6) \]
   \[ = $12,240 \]

26. The simple interest on a loan of $20,000 at an interest rate of 11% for 5 years.
   \[ i = 20000(0.11)(5) \]
   \[ = $11,000 \]

27. The amount owed on a loan of $20,000, at 11%, compounded annually for 5 years.
   \[ A = 20000(1 + 0.11)^5 \]
   \[ = 20000(1.11)^5 \]
   \[ = $33,701.16 \]

28. Compare the interest paid in \#26 to the interest paid in \#27. Which kind of interest do you want if you have to take out a loan?
   I would want a simple interest because the interest rate is based on the initial loan. You pay less interest with this. Banks don't make as much money so this is not a reality. \#27 compounds the interest.

29. The amount in your savings account at the end of 30 years, if you began with $2500 and earned an interest rate of 7% compounded annually.
   \[ A = 2500(1.07)^{30} \]
   \[ = $19,030.64 \]