

October 29, 2018 Monday

Pick a column to solve in your Cheat Notebooks!

Simplify each expression.

8)  $-2k + 10 + 4 + k$                       9)  $-5(2n - 1)$

10)  $5x(6 + 10x) - 7x^2$                       11)  $4n(4n - 8) - 3n(n - 3)$

Let  $f(x) = 9 - x$ ,  $g(x) = x^2 + x$ , and  $h(x) = x - 2$ . Compute the following:

12)  $f(x) + g(x)$                       13)  $g(x) - h(x)$

14)  $2g(x) - h(x)$                       15)  $g(x) \cdot h(x)$

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Simplify each expression.

8)  $-2k + 10 + 4 + k = -k + 14$

9)  $-5(2n - 1) = -10n + 5$

10)  $5x(6 + 10x) - 7x^2 = 30x + 50x^2 - 7x^2 = 30x + 43x^2$

11)  $4n(4n - 8) - 3n(n - 3) = 16n^2 - 32n - 3n^2 + 9n = 13n^2 - 23n$

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Let  $f(x) = 9 - x$ ,  $g(x) = x^2 + x$ , and  $h(x) = x - 2$ . Compute the following:

12)  $f(x) + g(x) = 9 - x + x^2 + x = x^2 + 9$

13)  $g(x) - h(x) = (x^2 + x) - (x - 2) = x^2 + x - x + 2 = x^2 + 2$

14)  $2g(x) - h(x) = 2(x^2 + x) - (x - 2) = 2x^2 + 2x - x + 2 = 2x^2 + x + 2$

15)  $g(x) \cdot h(x) = (x^2 + x)(x - 2) = x^3 - 2x^2 + x^2 - 2x = x^3 - x^2 - 2x$

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Practice

Day 5 - Combining Functions

Notes:

- Given the function  $f(x) = 2x + 1$  and  $g(x) = 3x - 4$ . Find  $g(f(x)) - 1(x)$ .  
 $g(2x + 1) = 3(2x + 1) - 4 = 6x + 3 - 4 = 6x - 1$
- Given the function  $f(x) = 2x - 4$  and  $g(x) = x^2 - 3$ . Find  $2f(x) + 3g(x)$ .  
 $2(2x - 4) + 3(x^2 - 3) = 4x - 8 + 3x^2 - 9 = 3x^2 + 4x - 17$
- Given the function  $f(x) = 6x^2 - 4x + 3$  and  $g(x) = 2x^2 - 5x + 6$ . Find  $2f(x) - 3g(x)$ .  
 $2(6x^2 - 4x + 3) - 3(2x^2 - 5x + 6) = 12x^2 - 8x + 6 - 6x^2 + 15x - 18 = 6x^2 + 7x - 12$

Practice:

Given the function  $f(x) = 4x + 8$  and  $g(x) = 2x - 1$ . Find  $2f(x) + 3g(x)$ .  
 $2(4x + 8) + 3(2x - 1) = 8x + 16 + 6x - 3 = 14x + 13$

Given the function  $f(x) = 3x^2 - 2x + 1$  and  $g(x) = x^2 - 4x + 5$ . Find  $g(f(x)) - 1(x)$ .  
 $g(3x^2 - 2x + 1) = (3x^2 - 2x + 1)^2 - 4(3x^2 - 2x + 1) + 5 = 9x^4 - 12x^3 + 6x^2 - 12x^2 + 8x - 4 + 5 = 9x^4 - 12x^3 - 6x^2 + 8x + 1$

Example:

Given  $f(x) = 4x^2 - 2x + 5$  and  $g(x) = x^2 + 7x - 8$ . Find  $f(g(2)) - 1(3) + 5$ .  
 $f(g(2)) = f(4^2 - 2(2) + 5) = f(16 - 4 + 5) = f(17) = 4(17)^2 - 2(17) + 5 = 1156 - 34 + 5 = 1127$   
 $1127 - 1(3) + 5 = 1127 - 3 + 5 = 1129$

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Practice

Given the functions  $f(x) = 5x - 3$  and  $g(x) = x + 3$ . Find  $f(g(x))$ .  
 $f(x + 3) = 5(x + 3) - 3 = 5x + 15 - 3 = 5x + 12$

12. Find  $4f(x) + 6g(x)$                       13. Find  $f(x) - 1(x)$

14. Find  $-2f(x) + 2g(x)$                       15. Find  $f(3) + g(-4)$

Given the functions  $f(x) = 3x^2 - 2x + 1$  and  $g(x) = x^2 - 4x + 5$ . Find  $f(g(x))$ .  
 $f(x^2 - 4x + 5) = 3(x^2 - 4x + 5)^2 - 2(x^2 - 4x + 5) + 1$

16. Find  $3f(x) + 2g(x)$                       17. Find  $g(x) - f(x)$                       18. Find  $f(x) \cdot g(x)$

19. Find  $2f(x) + 3g(x)$                       20. Find  $-5g(x) - f(x)$

21. Find  $f(2) - 1(-1)$                       22. Find  $3f(x) + g(x)$

23. Find  $1(-2) + g(5)$                       24. Find  $1(-7) + g(6)$

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October 30, 2018, Tuesday

Perform the indicated operation.

1)  $f(x) = -x^3 - 4$                       2)  $f(a) = 4a - 1$   
 $g(x) = 2x - 3$                        $g(a) = a^2 - 5a$   
 Find  $f(x) - g(x)$                       Find  $f(a) \cdot g(a)$

3)  $f(x) = 4x + 3$   
 $g(x) = x + 3$   
 Find  $f(9) - g(9)$

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Notes  
 Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Day 4 - Arithmetic Sequences**

**Define:**  
 What is a sequence?  
 A **sequence** is a function whose domain is a set of \_\_\_\_\_. The values in the range are called the \_\_\_\_\_.  
 A sequence can be specified by an \_\_\_\_\_ or \_\_\_\_\_.

**in an arithmetic sequence, the difference between one term and the next is \_\_\_\_\_.**

**Explore:**  
 Every day, a radio station asks a question for a prize of \$150. If the 9th caller does not answer correctly, the prize money increased by \$150 each day until someone correctly answers the question. Make a list of the prize money for a week from Monday to Friday if no one gets it right.

Monday	\$150
Tuesday	
Wednesday	
Thursday	
Friday	

List of prize money amounts: \_\_\_\_\_  
 These prize amounts form a sequential \_\_\_\_\_.

**Writing Sequence:**  
 As we mentioned earlier, a sequence can be defined by an equation or rule. The rule is a way to find the value of each term. When we write rules, we must use proper notation.  
 $a_n$  is the \_\_\_\_\_  
 $n$  is the \_\_\_\_\_

Ex: If we were mention the 5th term in a sequence we would write \_\_\_\_\_  
 When writing the rule of an arithmetic sequence we want to find the \_\_\_\_\_ between terms. This will help us to formulate our rule.

Using the radio example from above, let us see if we can identify the terms and determine a rule for the nth term in the sequence:

$a_1$	
$a_2$	
$a_3$	
$a_4$	
$a_5$	

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Notes  
 Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Practice:**  
 Write a rule for the nth term:

1. 3, 5, 7, 9, _____	2. 2, 6, 10, 14, _____	3. 7, 4, 1, -2, _____
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Write the first five terms of the sequence. Identify the domain and range.

1. $a_n = 6n$	2. $a_n = 2 - n$	3. $a_n = 5n + 1$
4. $a_n = 3n + 4$	5. $a_n = \frac{n}{2}$	6. $a_n = -7n - 8$

7. What is the seventh term of the sequence  $a_n = \frac{n+3}{2n}$ ?

a.  $\frac{5}{7}$       b. 5      c. 10      d. 14

For each sequence, describe the pattern, write the next term, and write a rule for the nth term.

8. -2, -5, -8, -11, ...	9. 1, 16, 31, 46, ...
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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Homework  
 Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Day 6 - Arithmetic Sequences (EOC Practicell)**

1. 4, 11, 18, ...  
 In the sequence above, the first term is 4 and each term after the first is 7 more than the previous term. What is the 12th term of the sequence?  
 a. 77      b. 81      c. 84      d. 86

2. Find the 25th term of the sequence 7, 11, 15, 19, 23, ...  
 a. 103      b. 104      c. 107      d. 111

3. Which represents the nth term of this sequence? 31, 36, 41, 46, 51, ...  
 a.  $51 + (n-1)6$       b.  $51 + (n-1)5$       c.  $31 + (n-1)6$       d.  $31 + (n-1)5$

4. What is the 9th term in this sequence? 20, 14, 8, 2, ...  
 a. 62      b. -4      c. -22      d. -28

5. What are the first four terms in the sequence whose nth term is  $a_n = (-2)^{n-1} + 1$ ?  
 a. 3, 4, 5, 6      b. -1, 1, -1, 1      c. -1, 5, -7, 17      d. -2, 4, -8, 16

6. The 8th term of an arithmetic sequence is 36. If the common difference is 2, what is the first term in the sequence? (Hint: work backward!)

a. 22      b. 24      c. 38      d. 64

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October 31, 2018, Wednesday

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Notes  
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**Day 7 - Arithmetic Sequences (Word Problems)**

In our lesson from Day 6, we formed a conjecture of how to write an equation or rule for arithmetic sequences. We actually have a formula that allows us to formulate the exact rule for each arithmetic sequence.

**Explicit Formula for Arithmetic Sequences:**  

$$a_n = a_1 + d(n-1)$$

**Where:**  
 •  $a_n$  is the term  
 •  $a_1$  is the \_\_\_\_\_ term in the sequence  
 •  $n$  is the term number  
 •  $d$  is the \_\_\_\_\_

When using this formula, be sure to \_\_\_\_\_ than \_\_\_\_\_.

**Example 1:**  
 Arithmetic Sequence: 5, 9, 13, 17, ...  
 Write the rule for the sequence:  
 $d =$  \_\_\_\_\_  
 $a_1 =$  \_\_\_\_\_  
 Find the 15th term in the sequence:  
 $a_n =$  \_\_\_\_\_  
 $n =$  \_\_\_\_\_  
 97 is what term in the sequence?  
 $a_n =$  \_\_\_\_\_  
 $n =$  \_\_\_\_\_

**Example 2:**  
 Arithmetic Sequence: 5, 2, -1, -4, ...  
 Write the rule for the sequence:  
 $d =$  \_\_\_\_\_  
 $a_1 =$  \_\_\_\_\_  
 Find the 27th term in the sequence:  
 $a_n =$  \_\_\_\_\_  
 $n =$  \_\_\_\_\_  
 -100 is what term in the sequence?  
 $a_n =$  \_\_\_\_\_  
 $n =$  \_\_\_\_\_

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Notes  
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**Example 3:**  
 After the first day of work, Annie realized that she sent 127 e-mails. Each day, Annie's e-mail count increased by 15. If she keeps this up, how many e-mails will she have sent after 3 weeks?  
 $d =$  \_\_\_\_\_  
 $a_1 =$  \_\_\_\_\_  
 Formula: \_\_\_\_\_ After 3 weeks: \_\_\_\_\_

**Example 4:**  
 The table below shows the number of people who bought the iPhone 7, at a cell phone store, each week after it came out:

Week	1	2	3	4	5
# of People	70	60	50	40	30

$d =$  \_\_\_\_\_  
 $a_1 =$  \_\_\_\_\_  
 Formula: \_\_\_\_\_ Weeks: \_\_\_\_\_

**Example 5:**  
 After knee surgery, your trainer tells you to return to your jogging program slowly. He suggests jogging for 12 minutes each day for the first week. Each week thereafter, he suggests that you increase that time by 6 minutes per day. How many weeks will it be before you are up to jogging 60 minutes per day?  
 $d =$  \_\_\_\_\_  
 $a_1 =$  \_\_\_\_\_  
 Formula: \_\_\_\_\_ Weeks: \_\_\_\_\_

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Homework  
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**Day 7 - Arithmetic Sequences (Word Problems)**

Write the rule for each arithmetic sequence:

1. 5, 7, 9, 11, 13, ...      2. -4, -5, -6, -7, -8, ...

3. 10, 15, 20, 25, ...      4. -9, -2, 5, 12, 19, ...

5. 23, 30, 37, 44, ...      6. 8, 6.5, 5, 3.5, 2, ...

Find the  $n$ th term for each arithmetic sequence:

7.  $a_1 = -5, d = 4, n = 9$       8.  $a_1 = 13, d = -0.2, n = 29$

9.  $a_1 = 3, d = -4, n = 6$       10.  $a_1 = -5, d = 1/2, n = 10$

Complete each statement:

11. 97 is the \_\_\_\_\_th term of: -3, 1, 5, 9      12. 10 is the \_\_\_\_\_th term of: 14, 12.5, 11, 9.5

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Homework  
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**Write the formula for the sequence that represents the following scenario:**

13. After making his first deposit, Paul has \$758 in his checking account. The next month, the balance is \$836. The balance after the third month is \$914.

$d =$  \_\_\_\_\_  
 $a_1 =$  \_\_\_\_\_  
 Formula: \_\_\_\_\_

14. The table shows the number of people at a school who caught the flu each month after the flu shot was given:

Month	1	2	3	4	5
# of People	30	25	20	15	10

$d =$  \_\_\_\_\_  
 $a_1 =$  \_\_\_\_\_  
 Formula: \_\_\_\_\_

Find the indicated term(s) in each arithmetic sequence:

15.  $a_1$  is -3,  $d = 3, n =$  ...      16. Find the 38th term of 103, 99, 95, ...

17. Find the 43rd term of -124, -122, -120, ...      18. The first term is 4 and the common difference is -4. Find the next 3 terms.

19. The first term is -7 and the common difference is 3. Find the next 3 terms.      20.  $a_n$  for 182, 176, 170, ...

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November 1, 2018, Thursday

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Task  
 Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Day 8 - Writing Linear Equations from Context**

**The Yo-Yo Problem**

Andy wants to buy a very special yo-yo. He is hoping to be able to save enough money to buy it in time to take a class in which he would learn how to do many fancy tricks. The 5-concave aluminum yo-yo costs \$89.99 plus 6% sales tax. Andy has already saved \$17.25, and he is earning \$7.20 a week by doing odd jobs and chores.

- How much sales tax will Andy have to pay?
- What will be the total cost of the yo-yo, including tax?
- Let  $w$  be the number of weeks that it will take Andy to save enough money to buy the yo-yo. Write an algebraic equation that will help you solve the problem.
- How many weeks will it take him to save enough money for the yo-yo?

**Money Pattern**

- Create a pattern using coins. Stage one of the pattern is shown above—one penny surrounded by six additional coins. To create each additional stage of the design, place more coins extending out from the six that surround the center penny. On a separate sheet, sketch the first four stages of the pattern.
- Using your pattern or the sketches of your coin pattern, create a table of values.

Stage Number, $n$	0	1	2	3	4	5
Number of Pennies Required	1					

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Task  
 Name: \_\_\_\_\_ Date: \_\_\_\_\_

- How many coins are needed to make stage 6, stage 7, and stage 8 of the money pattern? How did you determine your answer?
- Write an algebraic model that expresses the relationship between the stage number,  $n$ , and the number of coins required to make that design,  $p$ .

Linear Model:  $y = mx + b$        $m =$  rate of change (slope)       $b =$  start value

1) 

Month	Count
January	125
February	150
March	175
April	200
May	225

 Rebecca opens an exercise studio at the beginning of the year with 100 members. By the end of January she was already up to 125 members. The table shows the membership growth from January-May. Write an equation that represents the data in the table.

2) The graph shows the relationship between the number of pizzas and the number of people the pizzas will feed at a party. Write an equation that represents the graph. How many people will 8 pizzas feed?

3) A plumber charges \$50 just to show up at your house for a service call. He charges an additional \$75 for each hour he is at your house. Write an equation representing this scenario. How much will you have to pay for 3 hours worth of work?

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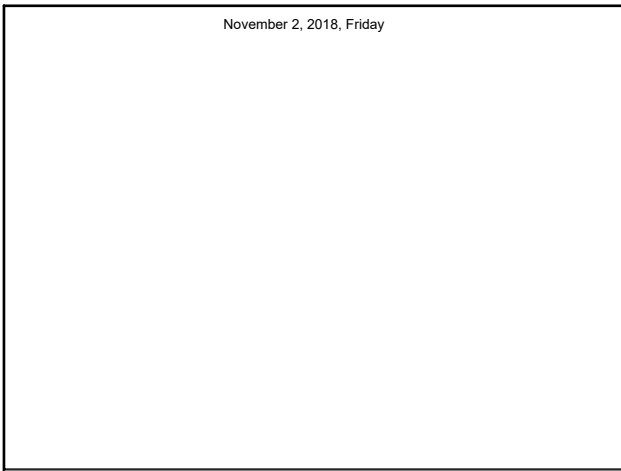
Foundations of Algebra Unit 4 - Characteristics of Linear Equations Homework  
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**Day 8 - Writing Linear Equations from Context**

Linear Model:  $y = mx + b$        $m =$  rate of change (slope)       $b =$  start value

- A cell phone company charges \$20 a month for the base plan. They then charge 10 cents for every text, minute, or kilobyte of data you use. Write an equation to express your cell phone bill. If you use 500 texts, how much will your cell phone bill be?
- Your parents tell you that they will give you \$500 at the beginning of the year and every day your grades drop below a C they take away \$10. Write an equation to represent how much money you will have. How many days will you have to make below a C to have no money left?
- Grove Gear is preparing for the McEachern game. They buy 350 Hillgrove blankets. If they sell 75 blankets a week, how many blankets will they have left over after 3 weeks?
- You rent a bouncy slide for your little brother's birthday party. If the company charges \$150 for delivery and an additional \$40 per hour. Write a linear model for this situation. How many hours will you be able to rent for \$600?

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November 2, 2018, Friday

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Task  
 Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Day 9 - Writing Linear Equations from Word Problems**

**Cara's Candles**  
 Cara likes candles. She also likes mathematics and was thinking about using algebra to answer a question that she had about two of her candles.

- Her tall candle is 16 centimeters tall. Each hour it burns makes the candle lose 2.5 centimeters in height.
- Her short candle is 12 centimeters tall and loses 1.5 centimeters in height for each hour that it burns.

- Write an equation to represent the **tall candle**: \_\_\_\_\_
- Write an equation to represent the **short candle**: \_\_\_\_\_

**Finish the table for Cara.**

Time (hours)	16 cm candle height (cm)	12 cm candle height (cm)
0	16	12
1	13.5	10.5
2		
3		
4		
5		
6		
7		

- Create a graphical representation of both candles.
- Is it possible for the candles to ever be the same height? If not, what would need to be true in order for them to be able to reach the same height?
- What time are the candles the same height?
- What is the height of the candles at that time?
- Cara has another candle that is 15 cm tall. How fast must it burn in order to also be 6 cm tall after 4 hours?
- If Cara had a candle that burned 3 cm every hour, how tall would it need to be to also reach the same height as the other three candles after 4 hours?

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Task

**Bottles of Water**

- Write an equation for the problem scenario depicted in the graph.  
 $m = \dots$   $b = \dots$  equation: \_\_\_\_\_
- What does the slope of your equation represent?

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**Mike's Mowing**

- Write the equation of the line for both mowing companies?  
**Carl's Cuts:**  $m = \dots$   $b = \dots$  equation: \_\_\_\_\_  
**Mike's Mowing:**  $m = \dots$   $b = \dots$  equation: \_\_\_\_\_
- What does the slope represent in each equation?
- What does the y-intercept represent in each equation?
- What does the intersection point represent in this scenario?

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Foundations of Algebra Unit 4 - Characteristics of Linear Equations Homework

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Day 9 - Graphing Linear Functions (Review)**

Graph the following:

- $m = -3, b = 4$
- $y = \frac{1}{3}x - 3$
- $y = -2x + 4$
- $y = -\frac{1}{2}x - 2$
- Write the equation for the line below  
 $y = \dots$
- Solve for "y", then graph:  
 $-2x - 3y = -12$

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