

Algebra 1 A
Semester Exam Review
2015-2016

Here are the formulas that will be in the exam booklet.

Equations of Lines: Slope-Intercept Form: $y = mx + b$

Point-Slope Form: $y - y_1 = m(x - x_1)$

Standard Form: $Ax + By = C$

Exponential Function $y = a \cdot (b)^x$

Explicit Formula for an Arithmetic Sequence: $f(n) = f(0) + nd$ or $f(n) = f(1) + (n-1)d$

Explicit Formula for a Geometric Sequence: $f(n) = f(0) \cdot r^n$ or $f(n) = f(1) \cdot r^{n-1}$

Recursive Formulas for an Arithmetic Sequence:

Start at $n = 0$

$f(0) =$ initial value

$f(n) = f(n-1) + d$

Start at $n = 1$

$f(1) =$ initial value

$f(n) = f(n-1) + d$

Recursive Formulas for a Geometric Sequence:

Start at $n = 0$

$f(0) =$ initial value

$f(n) = r \cdot f(n-1)$

Start at $n = 1$

$f(1) =$ initial value

$f(n) = r \cdot f(n-1)$

Compound Interest Formula:

$$A = P(1+r)^t$$

Unit 1, Topic 1

1. Jack wants to put a fence around his property. He knows that the perimeter of the fence is given by the formula $P = 2L + 2W$. Solve this formula for W .

-
2. Gino knows that the formula for converting degrees Celsius (C) to degrees Fahrenheit (F) is $F = \frac{9}{5}C + 32$.

Which of the following is correctly solved for C ?

- A. $C = \frac{5F - 160}{9}$
- B. $C = 5F - \frac{160}{9}$
- C. $C = \frac{5F + 160}{9}$
- D. $C = \frac{5}{9}F + 160$

For items 3 through 5, solve each equation. Then select the appropriate choice from the three choices below the problem, and fill in that blank space for that choice only.

3. $4x + 2x + 18 = 5x + x + 18$

- A. There is one solution, and it is _____.
- B. The equation is always true, because _____.
- C. The equation is never true, because _____.
-

4. $5(x - 2) = 6x + 20$

- A. There is one solution, and it is _____.
- B. The equation is always true, because _____.
- C. The equation is never true, because _____.
-

5. $9(x - 3) = 9x + 15$

- A. There is one solution, and it is _____.
- B. The equation is always true, because _____.
- C. The equation is never true, because _____.

6. A food truck sells three items: hot dogs, sodas, and fries. In order to make a spreadsheet, the food truck owner needs to define some variables.

Symbol	Meaning
H	Number of hot dogs sold in a day
S	Number of sodas sold in a day
F	Number of orders of fries sold in a day
P_H	Price, in dollars, charged for one hot dog
P_S	Price, in dollars, charged for one soda
P_F	Price, in dollars, charged for one order of fries
C	Total number of customers

- a. Write an inequality for the following statement:
The number of hot dogs sold in a day was at least 400.
- b. What does the inequality $S \cdot P_S \geq 1000$ mean?
- c. Write an expression for the total number of hot dogs, sodas, and orders of fries sold in a day.
- d. Write an expression for the average number of sodas sold per customer in a day.
- e. On a recent day, less than \$2,000 was made selling hot dogs and fries. Write an inequality for this statement.
- f. On another day, the food truck sold a total of 1,500 hot dogs, fries, and sodas. There were 700 hot dogs sold. The number of sodas sold was three times the number of orders of fries. Determine how many orders of fries were sold.

7. Sherri solved the equation $\frac{1}{5}(x-20) = 45$. For each step, write the name of the property that Sherri used.

Step	Property Used
$\frac{1}{5}(x-20) = 45$	Original Equation
$\frac{1}{5} \cdot x - \frac{1}{5} \cdot 20 = 45$ $\frac{1}{5}x - 4 = 45$	
$\frac{1}{5}x - 4 = 45$ $\begin{array}{r} +4 \quad +4 \\ \hline \frac{1}{5}x \quad = 49 \end{array}$	
$5 \cdot \frac{1}{5}x = 5 \cdot 49$ $x = 245$	

8. Sherri has also been asked to create a two-step equation with solution $x = 10$. For each step of her answer below, give the property that she used.

Step	Property Used
$x = 10$	Starting Point (solution)
$x - 3 = 7$	
$5(x - 3) = 35$	
$5x - 15 = 35$	

9. On certain multiple choice tests, students earn points for correct answers, but lose points for wrong answers.

The formula to calculate a student's score on a test is

$$S = 2C - \frac{W}{4}$$

S is the student's score, C is the number of correct answers, and W is the number of wrong answers.

Using the formula $S = 2C - \frac{W}{4}$, answer the following questions.

- a. Saul took the test and got 36 items correct and 12 wrong. What was his score?
- b. Francoise took the test and got a score of 53. She got 29 items correct. How many did she get wrong? Show how you determined your answer.
- c. Darko took the test and got a score of 80. He got 8 answers wrong. How many answers did he get correct? Show how you determined your answer.

Unit 1, Topic 2

10. Cammi wishes to make bracelets for her friends. She buys a starter kit for \$20.00 and it costs \$3.75 in supplies for each bracelet she makes. She cannot spend more than \$41.25 to make bracelets.

Let b represent the number of bracelets that she can make.

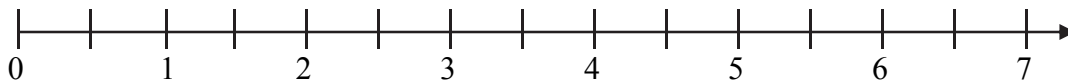
Which of the following inequalities could be solved to determine the maximum number of bracelets she can make?

- A. $20.00b - 3.75 \leq 41.25$
 B. $20.00 + 3.75b \leq 41.25$
 C. $23.75b \leq 41.25$
 D. $20.00b + 3.75 \leq 41.25$

11. Let a and b represent two numbers such that $a > b$. State whether each statement below is true or false. Justify your answer.

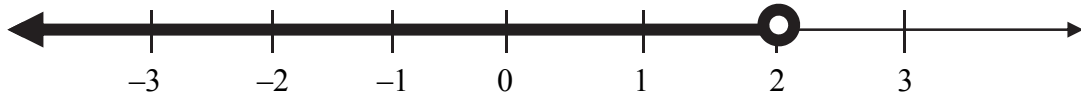
Statement	True or False?	Justification
$a + 8 > b + 8$		
$a - 7 > b - 7$		
$-7a > -7b$		
$\frac{a}{-10} < \frac{b}{-10}$		

12. Mr. Flood needs to hire a plumber to fix a leak. The plumber charges a service fee of \$50 to come out to the house and a rate of \$100 per hour to fix the leak. If the plumber works any fraction of an hour, she will charge for only a portion of the \$100. For example, if she works for three quarters of an hour to fix the leak, she will charge \$75 to fix the leak in addition to the \$50 to come out to the house.
- If the plumber takes 2.7 hours to fix the leak, how much will Mr. Flood have to pay?
 - Mr. Flood hopes to spend at most \$600 to fix the leak. Let h represent the number of hours required to fix the leak. Write an inequality that models this situation.
 - Solve the inequality.
 - Graph the solutions to the inequality on the number line below. The domain of the variable is all positive real numbers.



- What is the meaning of your solution in the context of the problem?

13. Below is the graphical solution to an inequality.



Which of the following inequalities has the solution graphed above?

- A. $-3x > 6$
- B. $-4x - 9 > -17$
- C. $2x + 10 \leq 14$

14. Kendall has \$88 in her piggy bank. She loves Young Teen magazine and starts spending \$3.75 per week to buy it.
- How much money will she have left after 5 weeks of buying the magazine?

 - Kendall needs to make sure that she has at least \$25 left in her piggy bank to buy a present for her sister's birthday.

Let w represent the number of weeks that she has bought Young Teen magazine.

Write an inequality and solve it to determine the number of weeks that Kendall can buy Young Teen magazine and still have enough money left to buy her sister a birthday present.

Unit 1, Topic 3

15. Which of the following expressions is equal to 5^{2x} ?
- A. 25^x
 - B. 10^x
 - C. 2^{5x}
-
16. Vlad wished to solve the equation $64^x = 16^{x+7}$. There are many correct ways to solve this equation. Which of the following is **NOT** a correct first step in solving this equation?
- A. $2^{6x} = 2^{4(x+7)}$
 - B. $4^{3x} = 4^{2(x+7)}$
 - C. $16^{4x} = 16^{x+7}$

17. At the beginning of the year, Jared began collecting comic books. He started with 1 comic book. At the end of each month, Jared has 3 times as many comic books as he had the previous month. Eight months later, Sally decides to collect comic books. At the end of each month, she has 9 times more comic books than she had the month before.

- a. Complete the table with the number of comic books that Jared and Sally have.

Month	Number of Comic Books that Jared has	Number of Comic Books that Sally has
0	1	
1	3	
2	9	
3	27	
4		
5		
6		
7		
8		1
9		9
10		

- b. After how many months will Sally have 6,561 comic books?
- c. Let m represent the number of months after Jared started collecting comic books. Write an expression for the number of comic books that Jared has after m months.
- d. Write an expression for the number of comic books that Sally has after m months (remember that m represents the number of months after Jared started collecting comic books).
- e. Determine after which month Jared and Sally will have collected the same number of comic books.

18. A scientist is studying bacteria growth. At noon, she puts one cell of Cranicus bacteria in a dish. After each hour, there are 8 times as many Cranicus bacteria as there was an hour before. At 4 p.m. she puts one cell of Bevus bacteria in a dish. After each hour, there are 32 times as many Bevus bacteria as there was an hour before.

a. How many Cranicus bacteria will there be at 4 p.m.?

b. How many Bevus bacteria will there be at 6 p.m.?

Let h represent the number of hours after the scientist put the Cranicus bacteria in the dish.

c. What does the expression 8^h represent?

d. What does the expression 32^{h-4} represent? Why is the exponent $h-4$?

e. Fill in the boxes with the correct exponents: $8 = 2^{\square}$, $32 = 2^{\square}$

f. Solve the equation $8^h = 32^{h-4}$ to determine when the number of Cranicus bacteria will equal the number of Bevus bacteria.

19. Solve the following exponential equations.

a. $3^{x+2} = 3^7$

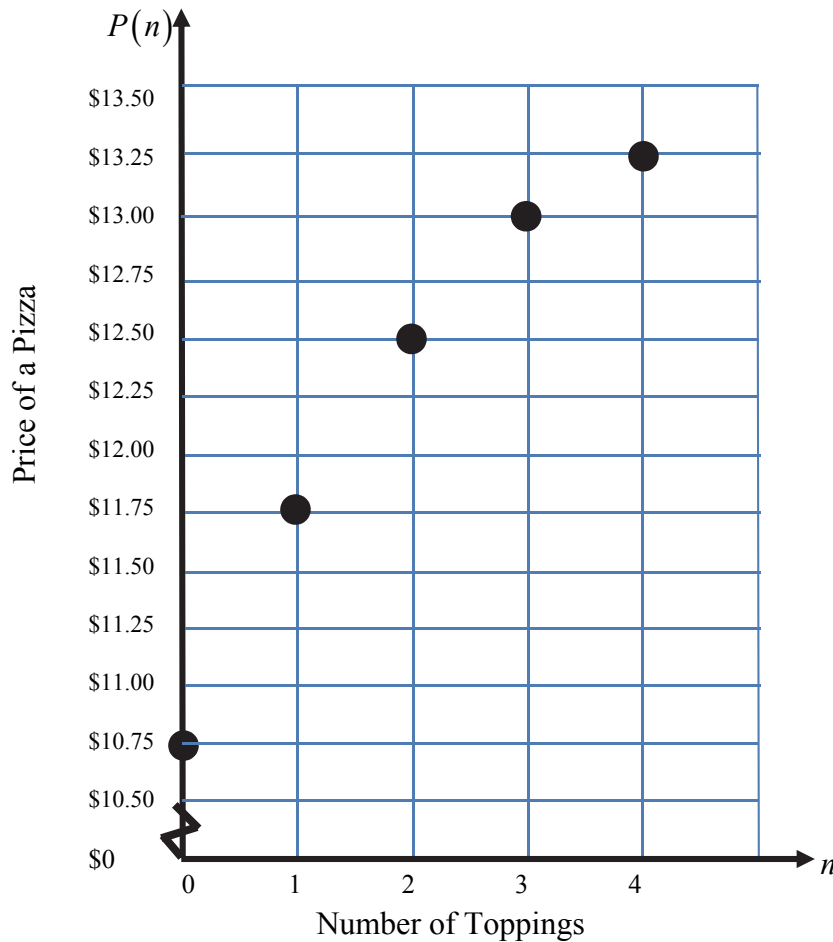
b. $25^{x+1} = 5^{x-3}$

c. $9^{x+2} = 27^x$

d. $\frac{1}{4} = 8^{x-3}$

Unit 2, Topic 1

20. The graph below shows the price of a pizza with up to 4 toppings.



- Relate the variables using the expression “is a function of”.
- Use function notation to describe the point $(2, 12.50)$.
- What is the domain of this function?
- Do these points describe a linear function? Why or why not?
- What is the range of this function?

21. You are playing a carnival game. You now have 50 prize tokens. Each time you win a game, you will get 8 prize tokens. As soon as you get at least 100 prize tokens, you will stop playing.

The function $T(w) = 50 + 8w$ represents the total number of prize tokens that you have after winning w games.

- a. Fill in the missing values in the chart below.

w	$T(w)$
0	
2	
	82

- b. What are the independent and dependent variables?

Independent Variable: _____

Dependent Variable: _____

- c. Relate the variables using the expression “is a function of”.

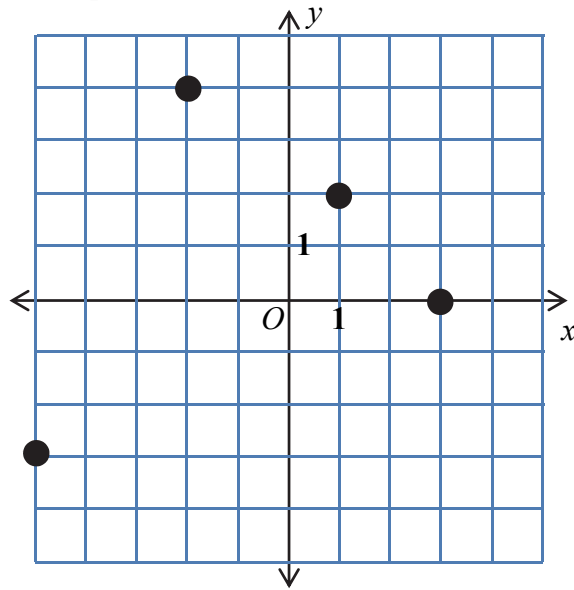
- d. Are the variables discrete or continuous? Why?

- e. What does the statement $T(3) = 74$ mean in this situation?

- f. Complete the domain: $\{0, 1, 2, \text{_____}\}$

- g. What number would replace the variable w in the statement $T(w) = 90$?

22. Look at the graph below.



Which of the following points, if added to the graph above, will cause the relation NOT to be a function?

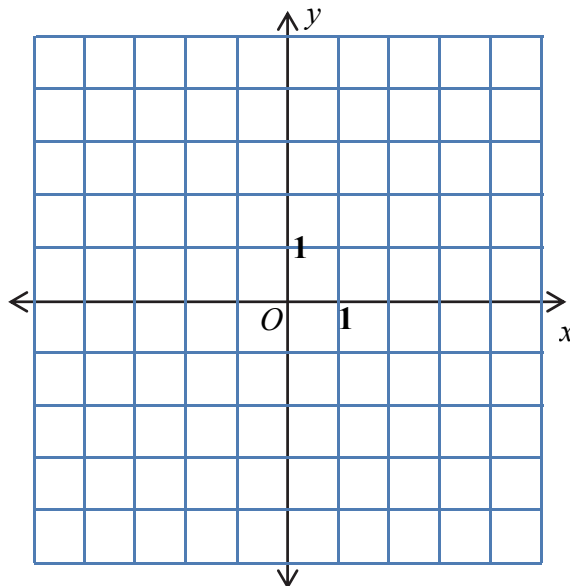
- A. $(2, 3)$
- B. $(4, 2)$
- C. $(3, -2)$
- D. $(0, -4)$
-
23. Which of the following statements is true about the statement $f(5) = 12$?
- A. The point $(5, 12)$ is on the graph of the function f .
- B. The number 5 is an element of the range of f .
- C. 12 would be the value of the independent variable, and 5 would be the value of the dependent variable.

24. If $f(x) = 3x - 2$, what is the value of $f(5)$?

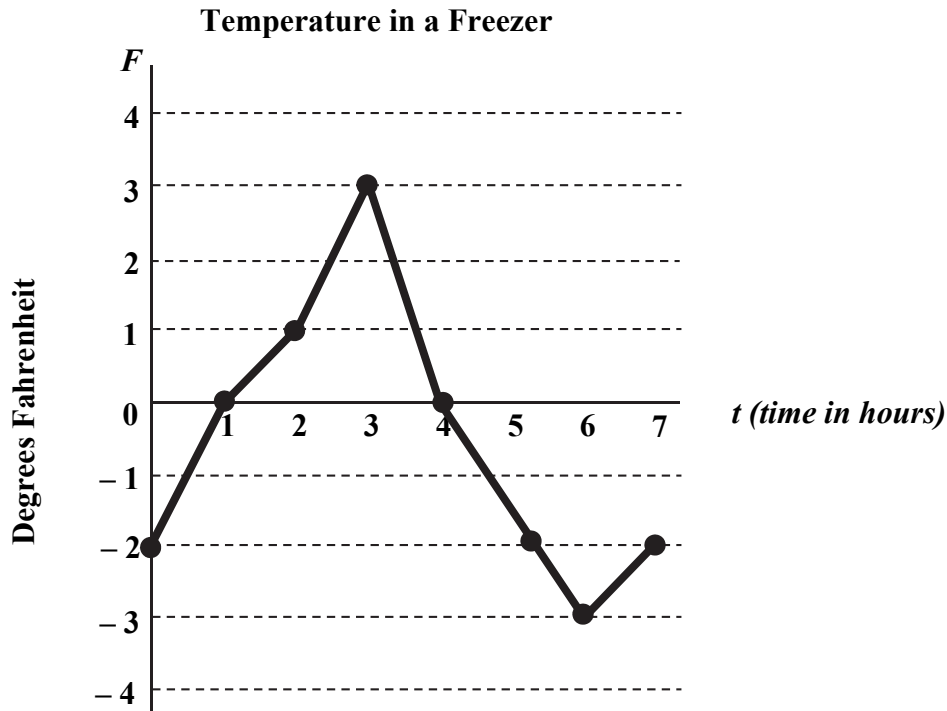
- A. 9
- B. 13
- C. 15
- D. 33

25. Sketch a graph on the axes below for a function $y = f(x)$ with the following characteristics.

- The function has x -intercepts of -3 and 2 .
- The y -intercept is 3 .
- $f(-4) = -5$, $f(4) = -3$
- The function has a maximum value at the point $(-1, 4)$.
- The function is increasing when $-4 \leq x \leq -1$ and decreasing when $-1 \leq x \leq 4$.
- The domain of the function is $-4 \leq x \leq 4$.
- The function is continuous.

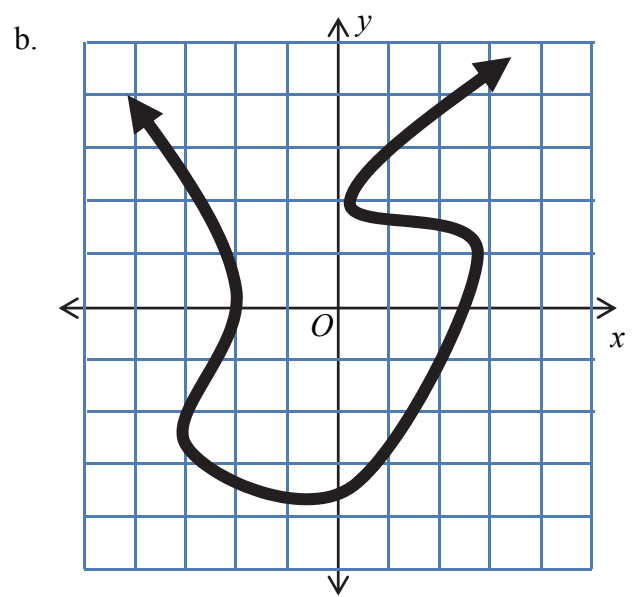
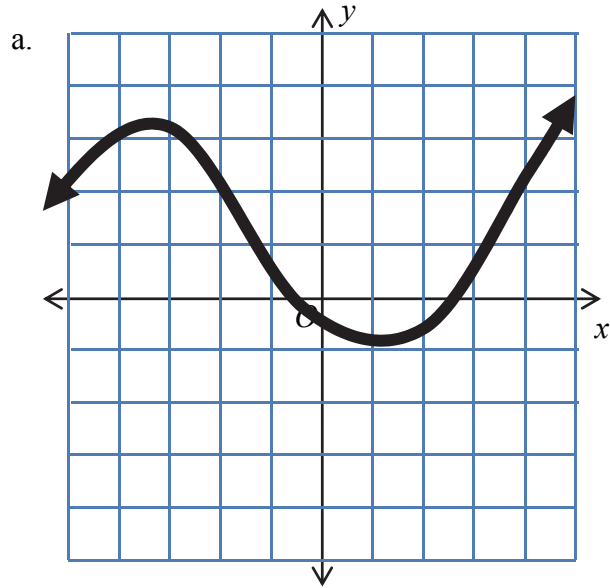


26. The graph below represents the temperature (F) in degrees Fahrenheit inside of a freezer as a function of time. The variable t represents the time, in hours, since midnight.



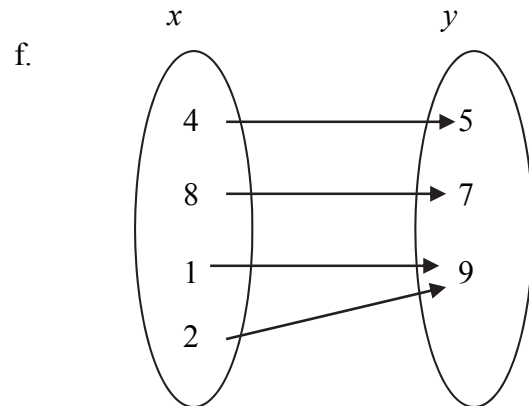
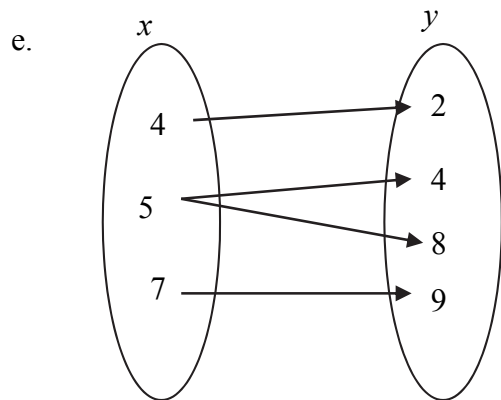
- What is the domain of the function?
- What is the range of the function?
- What is the meaning of the F -intercept?
- At what time t is the minimum temperature reached?
- On what interval of time is the temperature decreasing?
- What does the statement $F(5) = -2$ represent in the context of this situation?

27. For each relation below, determine whether or not the relation represents a function. Justify your answer.

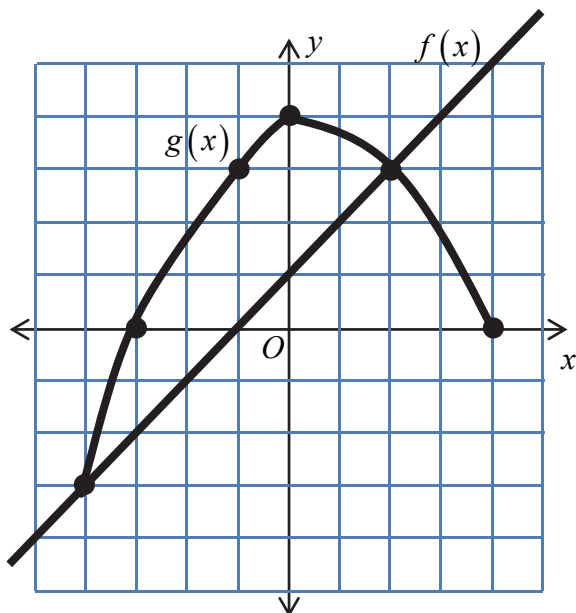


c. $\{(2, 7), (4, -7), (2, 12), (6, 11)\}$

d. $\{(4, 9), (6, 11), (11, 15), (10, 9)\}$



28. The graphs of two functions, f and g , are shown below.



For each problem a, b, and c, write the correct symbol, $<$, $=$, **OR** $>$ in the box between the two statements.

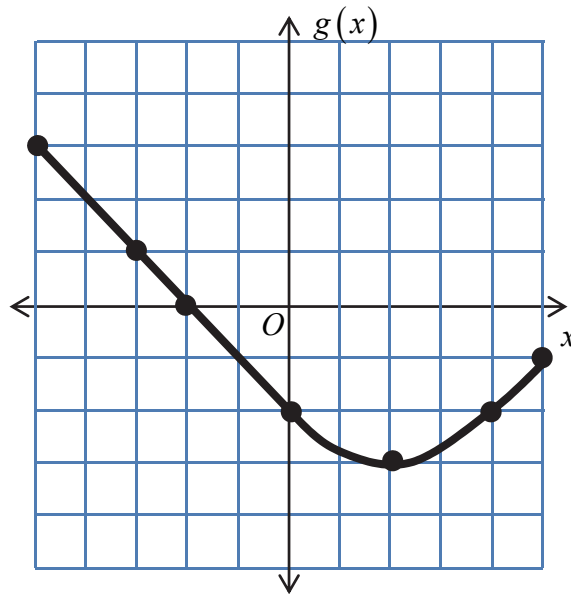
a. $f(2)$ $g(-1)$

b. The x -intercept of the graph of f The y -intercept of the graph of g

c. $f(1) \cdot f(3)$ $g(-1) + g(2)$

29. Two functions, f and g are represented below.

x	$f(x)$
-8	5
-6	6
-3	9
0	8
1	2
4	0
7	-10



Compare the statements in columns A and B. In the empty space at the end of each row in the table, write the column letter (A or B) of the expression that has the greater value. If both expressions are equal, write =.

	Column A	Column B	Which is greater (or are they equal)?
a.	$f(1)$	$g(-3)$	
b.	The maximum value of $f(x)$	The x -intercept of the graph of g	
c.	$\frac{f(0) - f(4)}{4}$	$g(2) \cdot g(4)$	
d.	The value of x that makes $f(x) = 0$	$g(-5) + g(-3)$	
e.	$a + b$, if $f(a) = 5$ and $f(b) = -10$	$g(4)$	

Unit 2, Topic 2

30. Callie makes a \$60,000 starting salary at her new job. She is offered two different options for salary increases.

Option A: An increase in salary of \$3,000 per year.

Option B: An increase in salary of 3% per year.

Let $A(t)$ and $B(t)$ represent her salary after t years using options A and B, respectively.

a. Complete the tables for each option.

Option A	
t	$A(t)$
0	\$60,000
1	
2	
3	

Option B	
t	$B(t)$
0	\$60,000
1	
2	
3	

b. Complete the recursive rules for each option.

Option A

$$A(0) = \underline{\hspace{2cm}}$$

$$A(t) = \underline{\hspace{3cm}}$$

Option B

$$B(0) = \underline{\hspace{2cm}}$$

$$B(t) = \underline{\hspace{3cm}}$$

c. Write an explicit rule for each option.

Option A

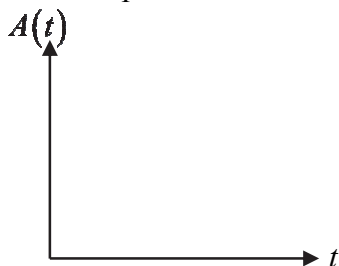
$$A(t) = \underline{\hspace{3cm}}$$

Option B

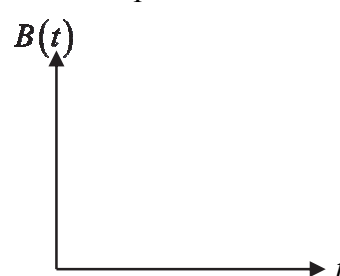
$$B(t) = \underline{\hspace{3cm}}$$

d. Make a sketch of the general shape of the graph of her salary with each option.

Option A



Option B



31. Look at the three sequences below.

Sequence 1 $f(0) = 45$
 $f(n) = f(n-1) - 4$

Sequence 2 $f(n) = 45 - 4n$

Sequence 3 45, 41, 37, 33, 29, 25

Which of the above sequences are arithmetic?

- A. Sequence 1 only
- B. Sequence 3 only
- C. Sequences 1 and 3 only
- D. Sequences 1, 2, and 3

32. Frieda is keeping track of how many coupons she has saved on a piece of paper. She spilled some coffee on the paper.

Her list now looks like this:  represents where the coffee spill occurred.

Started : 30 coupons

After 1 week:  coupons

After 2 weeks:  coupons

After 3 weeks: 240 coupons

- a. Assume that the sequence of the number of coupons is arithmetic.

How many coupons did she have after 1 week? _____

How many coupons did she have after 2 weeks? _____

- b. Assume that the sequence of the number of coupons is geometric.

How many coupons did she have after 1 week? _____

How many coupons did she have after 2 weeks? _____

33. In Art class students create a project with blocks in a pattern. Students will use algebra to describe the pattern. A student writes two formulas on the board.

Recursive: $f(1) = 3, f(n) = 2 \cdot f(n-1)$

Explicit: $f(n) = 3 \cdot 2^{n-1}$

- a. Write the first 5 terms of the sequence.
- b. You want to know the value of $f(30)$. Is it **more efficient** to use the recursive or explicit formula? Explain your answer.

34. Julio is filling out his tax return. He needs to report the value of a computer that he bought several years ago for \$8,192.

He has two options for doing this.

Option A: The value of the computer decreases every year so its value is $\frac{3}{4}$ (or 75%) of its value from the previous year.

- a. Complete the recursive formula for the value of the computer using Option A.

$$A(0) = 8192$$

$$A(n) = \underline{\hspace{2cm}}$$

- b. After 2 years, how much will the computer worth using Option A?

Option B: The value of the computer decreases by \$1,024 each year.

- c. Complete the recursive formula for the value of the computer using Option B.

$$B(0) = 8192$$

$$B(n) = \underline{\hspace{2cm}}$$

- d. After 2 years, how much will the computer be worth using Option B?

- e. After which year will the value using Option A be greater than the value using Option B? Complete the table below to answer this question.

n	$A(n)$	$B(n)$
0	8,192	8,192
1	6,144	7,168
2		
3		
4		
5		
6		
7		
8		

35. Use the word bank below to complete the following statements.

WORD BANK		
<i>difference</i>		<i>ratio</i>
	<i>linear</i>	
<i>arithmetic</i>		<i>exponential</i>
	<i>geometric</i>	

- a. An explicit rule for an arithmetic sequence would be a(n) _____ function.
- b. The recursive formula $f(0) = 20$, $f(n) = 30 \cdot f(n-1)$ represents a(n) _____ sequence; its explicit rule would be a(n) _____ function.
- c. The sequence 10, 12, 14, 16, 18, 20 has a constant _____ of 2.
- d. The sequence 10, 20, 40, 80, 160 has a constant _____ of 2.

36. An office is interested in how much recycling occurs. On the first day of a month, there were 700 pounds of recycled materials. Each day after that 80 more pounds of recycled materials were added.

Let $R(n)$ represent the total number of pounds of recycled materials on day n .

- a. Complete the table for the total number of pounds of recycled materials.

n	$R(n)$
1	700
2	780

- b. On which day will there be 1,580 pounds of recycled materials? Show how you determined your answer.

- c. Write a recursive formula for the number of pounds of recycled materials.

$$R(1) = \underline{\hspace{2cm}}$$

$$R(n) = \underline{\hspace{4cm}}$$

- d. Write an explicit formula for the number of pounds of recycled materials.

$$R(n) = \underline{\hspace{4cm}}$$

37. Look at the pattern of small squares below. The number of small squares, $N(t)$, is a function of the figure number, t .



Figure #1



Figure #2



Figure #3



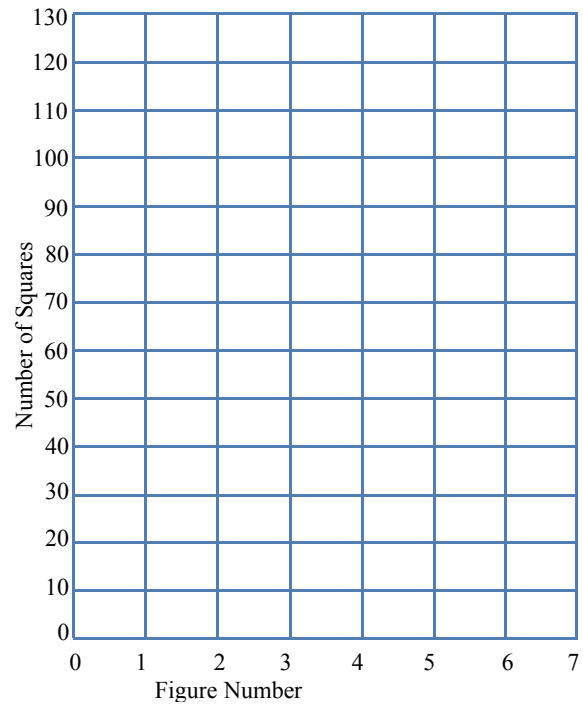
Figure #4

- a. Draw the pattern for Figure #5.
- b. Complete the table for Figures #1 through #7 for the number of small squares.

t	$N(t)$
1	
2	
3	
4	
5	
6	
7	

This item continues on the next page

- c. Make a graph for the number of squares.



- d. Write the recursive formula for the sequence of the number of squares.

$$N(1) = \underline{\hspace{2cm}}$$

$$N(t) = \underline{\hspace{4cm}}$$

- e. Write the explicit formula for the number of squares.

$$N(t) = \underline{\hspace{4cm}}$$

- f. Is the sequence of the number of squares arithmetic, geometric, or neither?
Explain why.

Unit 2, Topic 3

38. Joe's Body Shop charges \$25 for parts and \$50 per hour to fix the brakes on a car. Kathy's Body Shop charges \$70 for parts and \$40 per hour for the same type of work.

Let x represent the length of time to fix the brakes on a car.

- a. Write an expression for the amount that Joe will charge to fix the brakes on a car.
 - b. Write an expression for the amount that Kathy will charge to fix the brakes on a car.
 - c. When will the amount charged by Joe and Kathy be the same? Show how you determine your answer.
39. Brittany is planning a party with her parents. After collecting the following information from two possible locations, Brittany is meeting with her parents to help decide which location they should choose.
- *Over-the-Top Party Palace* charges \$100 for use of their location, plus \$15 per person.
 - *Make 'Em Envious Emporium* charges \$300 for use of their location, plus \$10 per person.

How will they determine which location they should choose? Justify your answer.

40. Look at the system of equations below:

$$\begin{aligned}y &= mx + b \\ y &= 6x + 15\end{aligned}$$

Which of the following statements are true?

- A. All of the statements below are true.
- B. If $m = 6$ and $b \neq 15$, then the lines are parallel and there are no solutions to the system.
- C. If $m \neq 6$, then the lines intersect and there is one solution to the system.
- D. If $m = 6$ and $b = 15$, then the lines are the same and there are infinite solutions to the system.

41. Look at the system of equations below.

$$\begin{cases} y = \frac{4}{5}x + 7 \\ y = \frac{3}{4}x + 7 \end{cases}$$

What is the number of solutions for this system of equations?

- A. 0 solutions
- B. exactly 1 solution
- C. exactly 2 solutions
- D. an infinite number of solutions

42. Look at the system of equations below.

$$\begin{cases} x + 5y = 27 \\ x + 3y = 21 \end{cases}$$

What is the y -coordinate of the solution to the system of equations?

- A. -3
- B. 3
- C. 6
- D. 8

43. Old MacDonald has a farm with cows and goats.

Each day Old McDonald collects 106 gallons of milk. Each cow produces 12 gallons of milk and each goat produces 1 gallon of milk.

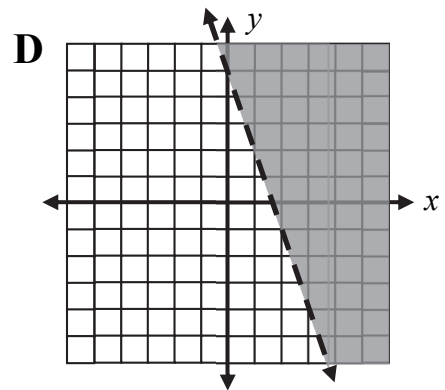
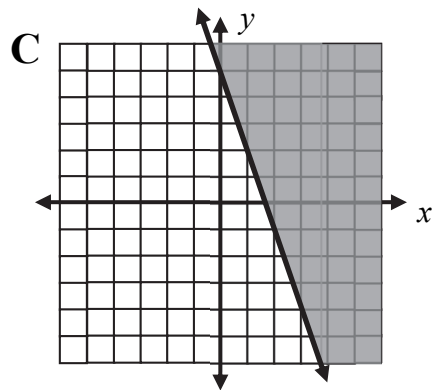
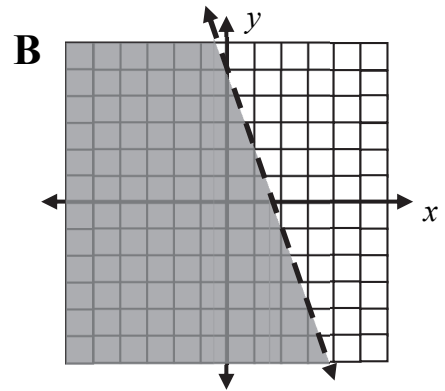
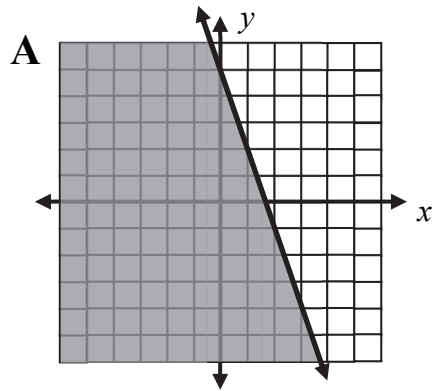
Each day the cows and goats eat 420 pounds of food. Each cow eats 50 pounds of food and each goat eats 2 pounds of food.

Let c represent the number of cows.

Let g represent the number of goats.

- a. Write a system of equations to model the situation.
- b. Determine how many cows and goats Old MacDonald has.

44. Which of the following graphs represents the linear inequality $y > -3x + 5$?



45. A company makes skateboards and scooters. Skateboards cost \$38 each to make. Scooters cost \$47 each to make. They can make at most 1,000 total items. They can spend at most \$25,000 to make all of the items.

Let x represent the number of skateboards they can make.

Let y represent the number of scooters they can make.

Which of the following systems of inequalities could be solved to find the number of skateboards and scooters they can make?

A.
$$\begin{cases} x + y \leq 1000 \\ 85(x + y) \leq 25000 \end{cases}$$

B.
$$\begin{cases} 85(x + y) \leq 1000 \\ x + y \leq 25000 \end{cases}$$

C.
$$\begin{cases} 38x + 47y \leq 1000 \\ x + y \leq 25000 \end{cases}$$

D.
$$\begin{cases} x + y \leq 1000 \\ 38x + 47y \leq 25000 \end{cases}$$

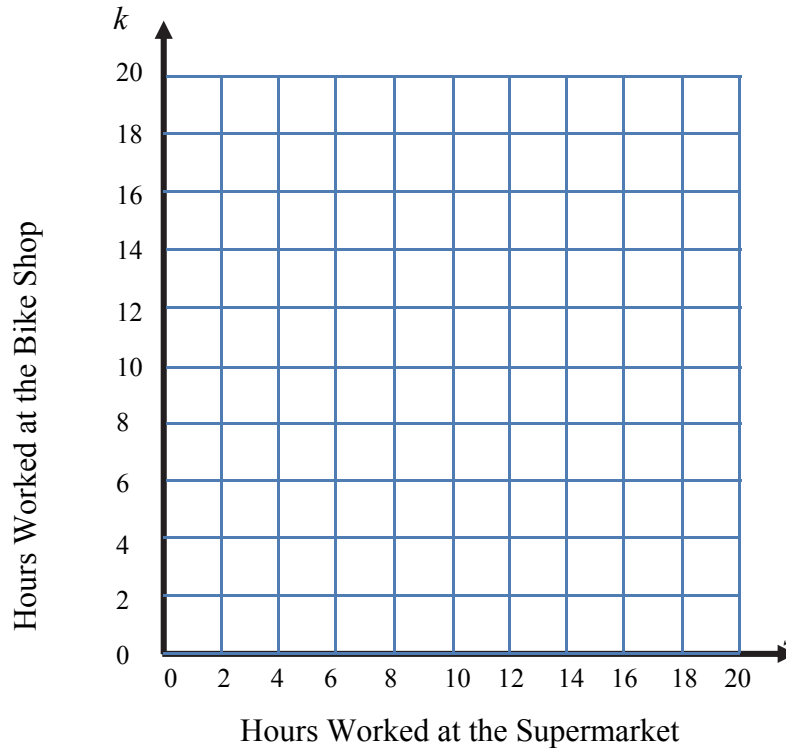
46. Lance needs to work at the supermarket and at his family's bike shop.
- Lance's parents say he can work no more than 14 hours each week.
 - Lance is fine with this as long as he makes at least \$200 a week.
 - The job at the supermarket pays \$25 per hour, while the job at the bike shop pays \$10 per hour.

Let s represent how many hours Lance works at the supermarket.

Let k represent the number of hours Lance works at the bike shop.

- a. Write a system of inequalities to represent this situation.

- b. Graph the solution to the system of inequalities below.



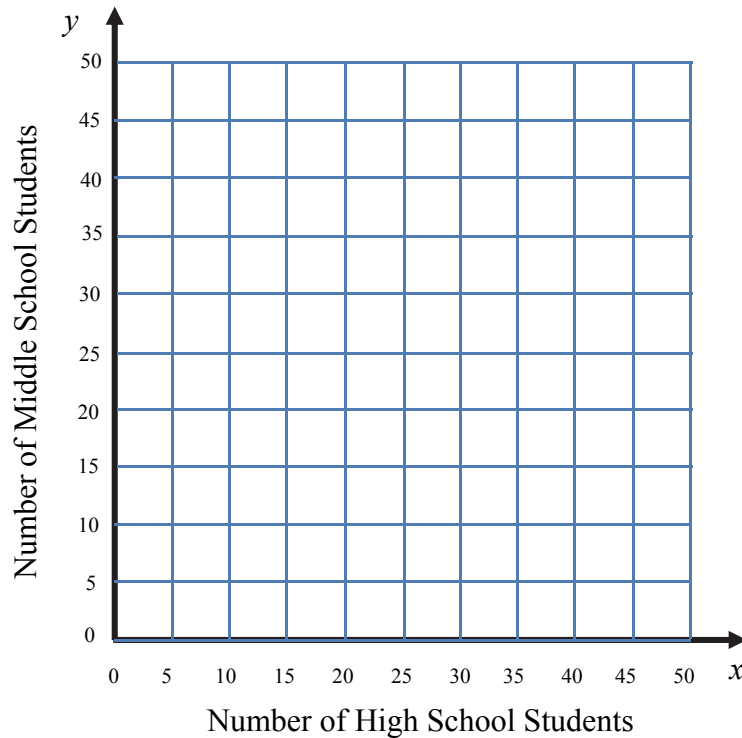
- c. Pick one point in the viable region and show that its coordinates meet the constraints in the problem.

47. Rhonda starts a tutoring business. She decides to charge \$40 per month for each high school student and \$30 per month for each middle school student. She wants to make at least \$1,200 each month. She plans on tutoring 2 hours per month for each high school student, and 3 hours per month for each middle school student. Rhonda decides she can tutor a maximum of 90 hours per month.

Let x represent the number of high school students they tutor.

Let y represent the number of middle school students they tutor.

- a. Write a system of inequalities for this situation.
- b. Sketch the solution to the system below.



- c. State one viable solution, and show that the solution fits the constraints of the problem.
- d. At what point do the lines intersect?