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GLE Grade-Level Expectations

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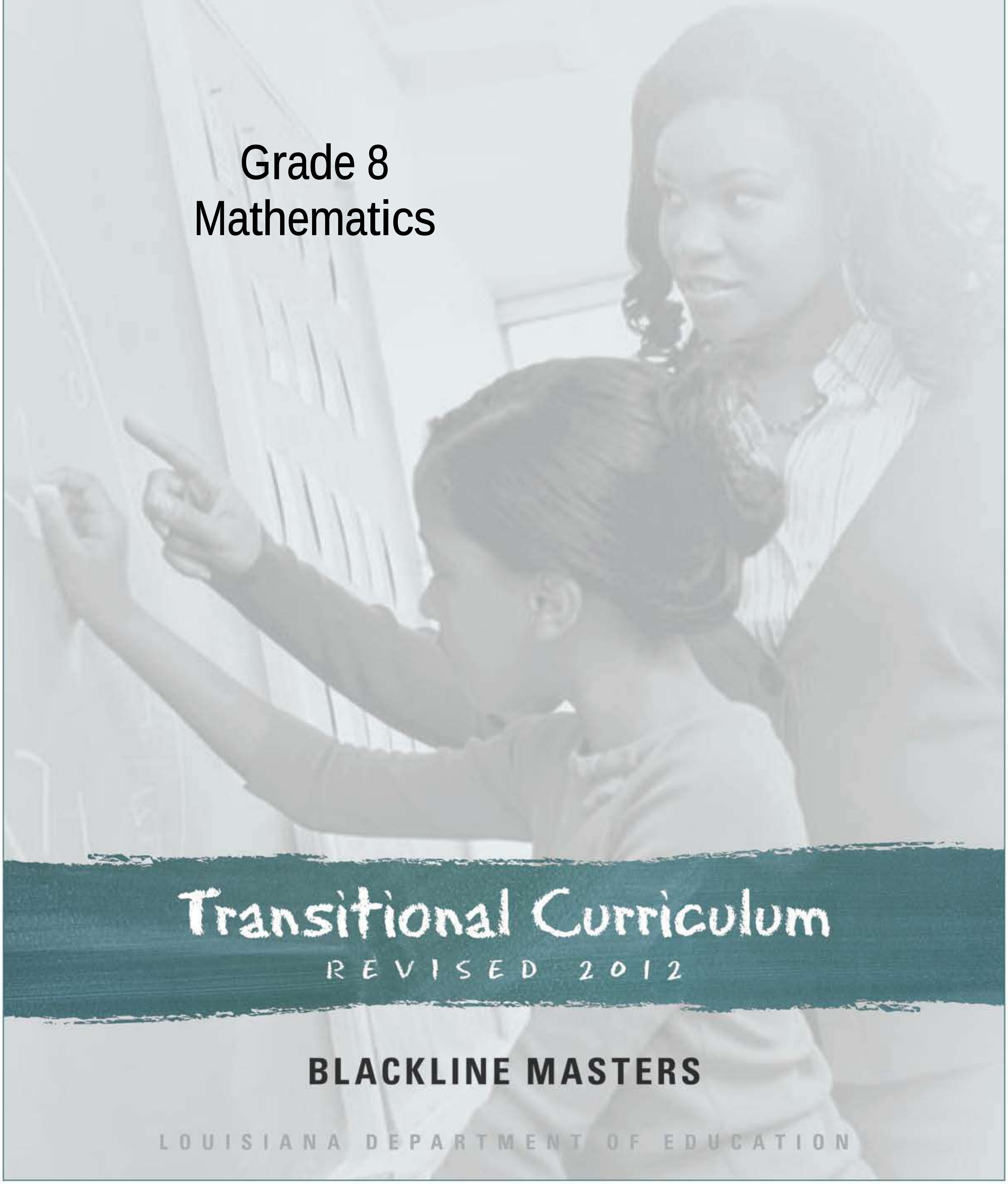


Grade 8
Mathematics

Transitional Curriculum
REVISED 2012

BLACKLINE MASTERS

LOUISIANA DEPARTMENT OF EDUCATION

Unit 1, Activity 1, Rational Number Line Cards - Student 1

Cut these cards apart. Each group of students should have one set of cards.

$\frac{1}{2}$	$\frac{1}{4}$	$-\frac{3}{4}$	$-\frac{1}{8}$
$-\frac{3}{8}$	$\frac{7}{8}$	$\frac{1}{3}$	$\frac{2}{3}$
$\frac{5}{6}$	$\frac{5}{8}$	$\frac{1}{5}$	$-\frac{2}{5}$
$\frac{3}{5}$	$-\frac{4}{5}$	$\frac{1}{10}$	$-\frac{12}{12}$

Unit 1, Activity 1, Rational Number Line Cards - Student 2

Cut these cards apart. Each group of students should have one set of card.

-0.50	0.25	0.75	-0.125
0.375	-0.875	$-0.33\overline{3}$	$0.66\overline{6}$
$0.83\overline{3}$	-0.625	0.20	-0.40
0.60	-0.80	0.10	-1.00

Rational Numbers

Name ___________________________________ Date _________ Hour ____________

Place the following numbers in the most appropriate location along the number line on the next page.

0.1^2 , 0.05 , -0.5 , $\frac{3}{4}$, -1 , 1^3 , -3 , $-\frac{5}{3}$, 2^1 , $\frac{7}{8}$, $-\frac{1}{2}$, $\frac{12}{12}$, 75% , $-2\frac{2}{6}$

Write 3 different inequalities using the numbers from the number line above using symbols <, >, =, ≤, ≥. *(example: -1 < 1)*

1.

2.

3.

Write 2 repeating inequalities using the numbers from the number line above using the symbols. <, >, =, ≤, ≥. *(example: -1 ≤ 1 ≤ 2)*

1.

2.

Unit 1, Activity 1, Rational Number with Answers

Rational Numbers
Place the following numbers in the most appropriate location along the number line.

0.1^2 , 0.05 , -0.5 , $\frac{3}{4}$, -1 , 1^3 , -3 , $-\frac{5}{3}$, 2^1 , $\frac{7}{8}$, $-\frac{1}{2}$, $\frac{12}{12}$, 75% , $-2\frac{2}{6}$

Write 3 different inequalities using the numbers from the number line above using symbols <, >, =, ≤, ≥. *(example: -1 < 1)*
Answers will vary
1.

2.

3.

Write 2 repeating inequalities using the numbers from the number line above using the symbols. <, >, =, ≤, ≥. *(example: -1 ≤ 1 ≤ 2)*
Answers will vary
1

2.

Compare and Order

Name ___________________________________ Date _________ Hour ____________

Use the two numbers in column one and add, subtract, multiply or divide them according to the heading. Determine whether the answer would result in a true statement.

	sum > 1	**difference < 1**	**product < sum**	**product < quotient**
Example 2 ½ , -3	2 ½ + -3 = - ½ NO	2 ½ - (-3) = 5 ½ NO	(5/2)(-3) = -15/2 = - 7 ½ YES	5/2 ÷ - 3/1 = -5/6 YES
$1\frac{1}{2}, \frac{3}{4}$				
$\frac{2,}{3}, \frac{1}{4}$				
$2, \frac{1}{2}$				
$\frac{5}{6}, \frac{7}{8}$				
1, 1				

Unit 1, Activity 1, Compare and Order Word Grid with Answers

Compare and Order

Use the two numbers in column one and add, subtract, multiply or divide them according to the heading. Determine whether the answer would result in a true statement.

	sum > 1	**difference < 1**	**product < sum**	**product < quotient**
Example 2 ½ , -3	2 ½ + -3 = - ½ NO	2 ½ - (-3) = 5 ½ NO	(5/2)(-3) = -15/2 = - 7 ½ YES	5/2 ÷ - 3/1 = -5/6 YES
$1\frac{1}{2}, \frac{3}{4}$	1 ½ + ¾ = 2 ¼ YES	1 ½ - ¾ = ¾ YES	1 ½ (¾) = 9/8 YES	1 ½ ÷ ¾ = 2 YES
$\frac{2,}{3}, \frac{1}{4}$	11/12 NO	5/12 YES	$\frac{2}{3} \times \frac{1}{4} - \frac{2}{12}$ NO	2<2 2/3 YES
$2, \frac{1}{2}$	2 ½ YES	1 ½ NO	1 YES	1 < 4 YES
$\frac{5}{6}, \frac{7}{8}$	1 17/24 YES	-1/24 YES	420/576 = 35/48 YES	35/48 < 20/21 YES
1, 1	2 YES	0 YES	1 < 2 YES	1 = 1 NO

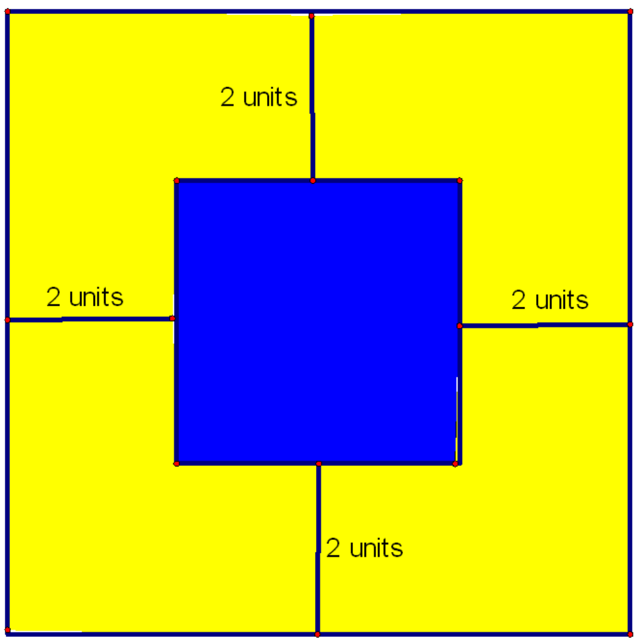
1.5	$-3\frac{1}{2}$	$\sqrt{14}$	2
$\sqrt{21}$	$1.\overline{45}$	$\frac{4}{5}$	-2.2
1.7	$-8.\overline{63}$	$\sqrt{3}$	$-\frac{8}{9}$
4.763	$\sqrt{49}$	$\sqrt{61}$	$-4\frac{5}{6}$
$\sqrt{2}$	$\sqrt{4}$	-5	-0.45

Unit 1, Activity 2, Exploring Squares and Square Roots

Name ______________________________________ Date ____________ Hour __________

1. Find the area of the smaller square if area of the larger square is 81 square units.

2. Label the side lengths of the large and small square.



3. Justify whether the following statement is *sometimes, always or never* true.

The square of a number is greater than the number.

4. For what number(s) is the number, its square and its square root all equal? Explain your answer.

Unit 1, Activity 3, Real Numbers

Real Numbers

A *rational number* is a number that can be represented by $\frac{a}{b}$**, where *a* and *b* are integers and b ≠ 0. Rational numbers are sometimes referred to as rationals; this does not mean the same as when a person is referred to as being a "rational person". It means that the numbers represent a ratio. Some examples of rational numbers are** $\frac{5}{8}$, $1.\overline{3}$, 7.5, -5, and $\sqrt{9}$.

An *irrational number* is a number that cannot be represented as a fraction. When you divide the circumference of a circle by the diameter, the answer you get is always close to 3, never exactly. This ratio is π (pi) and its value is referred to as an approximation; this is because the exact ratio cannot be written as a ratio, even though the approximation of $\frac{22}{7}$ **can be referred to as an approximation of pi. Some examples of irrational numbers are π, 1.233244425555. . .,** $\sqrt{5}$

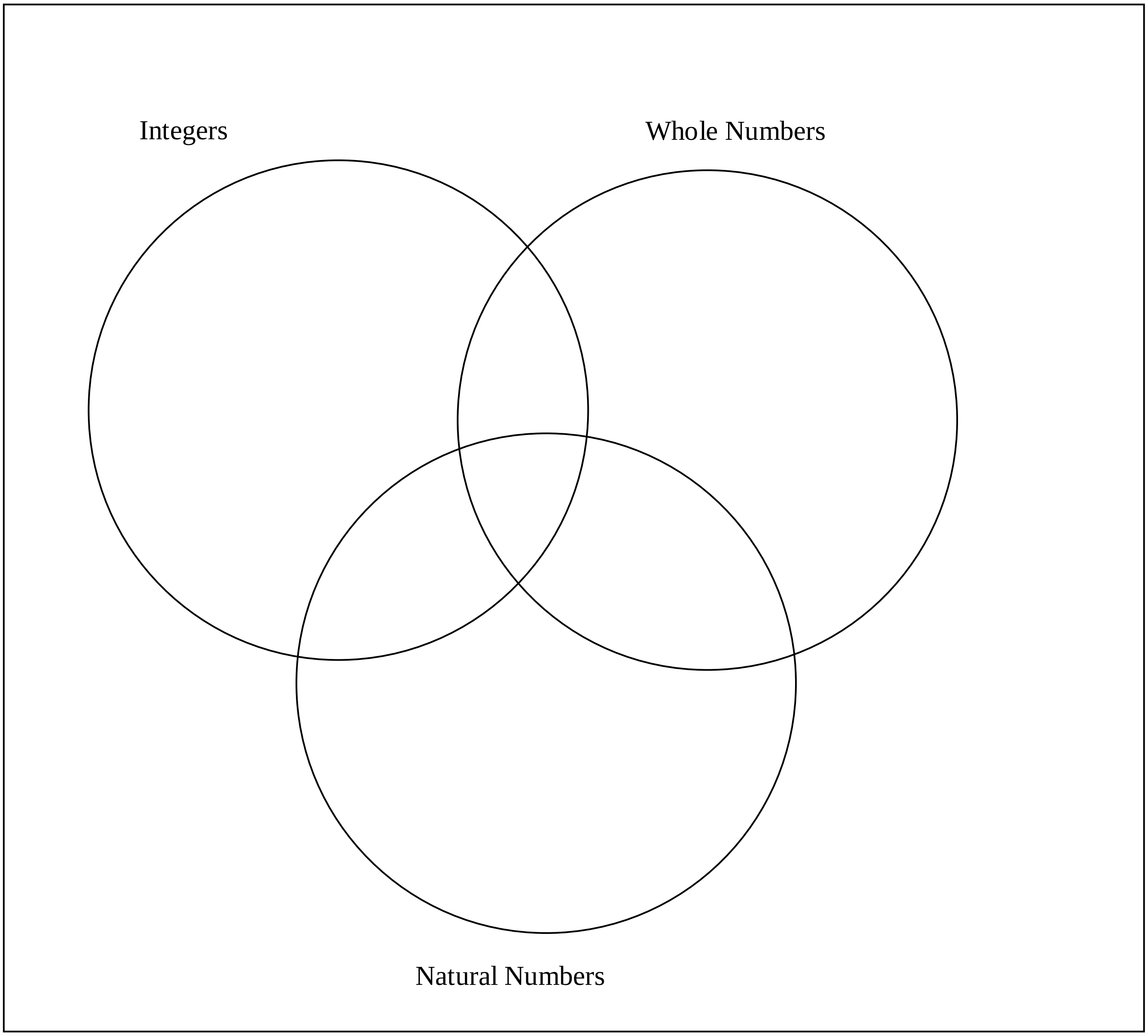
***Natural* or *counting* numbers are the set of numbers used to count objects. {1, 2, 3, 4, 5, . . .}**

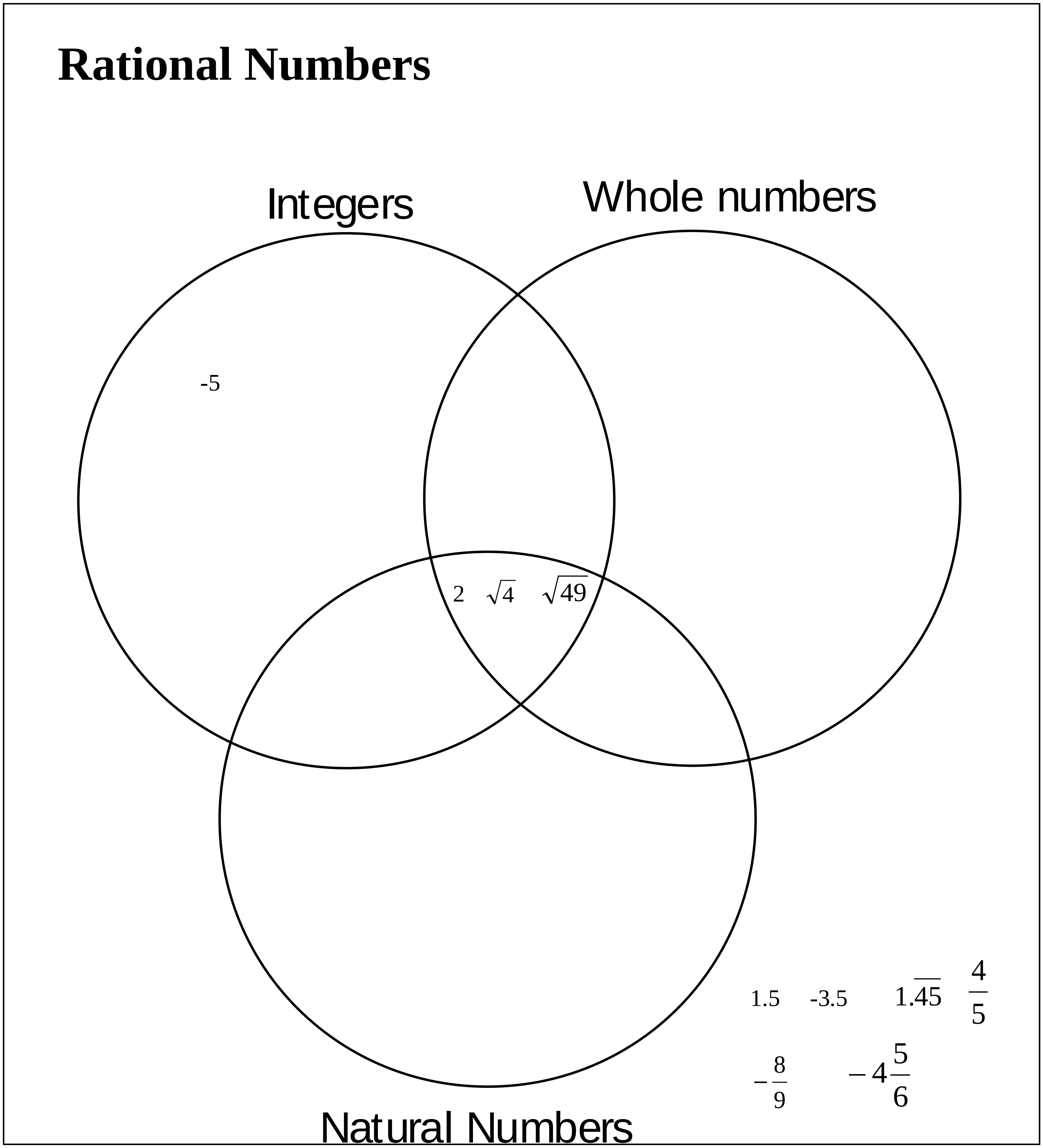
***Whole* numbers are natural numbers including zero. {0, 1, 2, 3, 4, 5, . . .}**

***Integers* are whole numbers and their opposites. {-2, -1, 0, 1, 2, . . .}**

All *rational* and *irrational* numbers form the set of *real numbers.*

Rational Numbers




Rational Numbers
Integers
Whole numbers
Natural Numbers
-5
2 $\sqrt{4}$ $\sqrt{49}$
1.5 -3.5 $1.\overline{45}$ $\frac{4}{5}$
$-\frac{8}{9}$ $-4\frac{5}{6}$

Unit 1, Activity 4, Word Grid

Name ____ **Date** ___________ **Section**______

Directions:

Complete the word grid below using "Y" for yes, if the number fits into the category of the type of number and "N" for no if the number does not meet the specifications of type of number.

Real Numbers

	$\sqrt{144}$	$\sqrt{2}$	$\frac{1}{3}$	2.3445444. . .	$4.\overline{66}$	$\sqrt{29}$	-54	$-\frac{8}{4}$	5.3
Irrational Number									
Rational Number									
Integer									
Whole Number									
Natural Number									

Unit 1, Activity 4 Word Grid with Answers

	$\sqrt{144}$	$\sqrt{2}$	$\frac{1}{3}$	2.3445444. . .	$4.\overline{66}$	$\sqrt{29}$	-54	$-\frac{8}{4}$	5.3
Irrational Number		√		√		√			
Rational Number	√		√		√		√	√	√
Integer	√						√	√	
Whole Number	√								
Natural Number	√								

$\sqrt{2}$	$\sqrt{15}$	$\sqrt[3]{8}$	$\sqrt{16}$
$\frac{12}{6}$	1^2	$\frac{10}{3}$	$\left(\frac{1}{2}\right)^2$
$\sqrt{3}$	$\sqrt[3]{27}$	$\frac{12}{7}$	$\sqrt{14}$
$\frac{5}{2}$	1.5^3	$\sqrt{11}$	$\sqrt{9}$

Unit 1, Activity 5, Number Line

$\frac{1}{2}^{2}$

1^{2}

$\sqrt{2}$

$\frac{12}{7}$

$\sqrt{3}$

$\sqrt[3]{8}, \frac{12}{6}$

$\frac{5}{2}$

$\sqrt{9}, \sqrt[3]{27}$

$\sqrt{10}$

$\sqrt{11}$

$\frac{10}{3}$

1.5^{3}

$\sqrt{14}$

$\sqrt{15}$

$\sqrt{16}$

Unit 1, Activity 7, Scientific Notation

Name _______________________________________ Date _____________ Hour _____

Complete each of the following scientific notation problems.

1. Write 34,000 in scientific notation.

2. Write 8.21×10^5 in standard form.

3. There are approximately 950,000,000 acres of farmland in the United States. Write the number in scientific notation.

4. A house fly is about 1.25×10^{-2} feet long. Write the number in standard form.

5. Sam said that 234,000 would be written as 23.4×10^4 in scientific notation. Explain why Sam is correct or incorrect.

6. What would the correct exponent be for each of the following scientific notation problems?

   a. $130 = 1.3 \times 10^n$ n = _______________ *(exponent)*

   b. $0.00087 = 8.7 \times 10^n$ n = _______________ *(exponent)*

   c. $87{,}300{,}000 = 8.73 \times 10^n$ n = _______________ *(exponent)*

   d. $0.65 = 6.5 \times 10^n$ n = _______________ *(exponent)*

Unit 1, Activity 7, Scientific Notation with Answers

Name ____ Date _____________ Hour _____

Complete each of the following scientific notation problems.

1. Write 34,000 in scientific notation.

   3.4×10^4

2. Write 8.21×10^5 in standard form.

   821,000

3. There are approximately 950,000,000 acres of farmland in the United States. Write the number in scientific notation.

   9.5×10^8

4. A house fly is about 1.25×10^{-2} feet long. Write the number in standard form.

   0.0125

5. Sam said that 234,000 would be written as 23.4×10^4 in scientific notation. Explain why Sam is correct or incorrect.

   Sam is incorrect because 23 is not between 0 and 9; it should be 2.34×10^5

6. What would the correct exponent be for each of the following scientific notation problems?

   a. $130 = 1.3 \times 10^n$ n = _____*2*__________ *(exponent)*

   b. $0.00087 = 8.7 \times 10^n$ n = _____*-4*__________ *(exponent)*

   c. $87{,}300{,}000 = 8.73 \times 10^n$ n = ______*7*_________ *(exponent)*

   d. $0.65 = 6.5 \times 10^n$ n = _____*-1*__________ *(exponent)*

Unit 1, Activity 8, Trip to Mars

Name______________________________________ Date _______ Hour_____

Complete the following problems using what you have learned about scientific notation.

1. A space craft may someday travel from Earth to Mars. The space researchers estimated the distance of travel from the Earth to Mars when the earth is farthest from the sun to be an estimated distance of 5.6×10^7 kilometers. Write the number in standard form.

2. They also determined that the return would be 6 months after the arrival and the estimated distance in June was 4.01×10^8 kilometers when the earth is closest to the sun. Write the number in standard form.

3. Find the distance of the round trip. Record your answer in scientific notation.

4. The space craft will be designed to have 8,000,000 cubic feet of cargo space. Express the number in scientific notation.

5. It has been estimated that meals for each person on the trip will occupy 0.00098 cubic feet of the available cargo space. The meals for everyone on the trip can only use no more than 5.0×10^{-3} cubic feet of the cargo space. Is this possible if there are 10 people on the trip?

6. The researchers estimate that the cost of the trip is about $500,000 per kilometer. Give the estimated cost of the trip to Mars. Record your answer in scientific notation.

7. Determine whether the SQPL question is true; use information from this page to justify the statement.

Unit 1, Activity 8, Trip to Mars with Answers

Name _______________________________________ Date _______ Hour_____

Complete the following problems using what you have learned about scientific notation.

1. A space craft may someday travel from Earth to Mars. The space researchers estimated the distance of travel from the Earth to Mars when the earth is farthest from the sun to be an estimated distance of 5.6×10^7 kilometers. Write the number in standard form.

   56,000,000 km

2. They also determined that the return would be 6 months after the arrival and the estimated distance in June was 4.01×10^8 kilometers when the earth is closest to the sun. Write the number in standard form.

   401,000,000 km

3. Find the distance of the round trip. Record your answer in scientific notation.

   456,000,000 = 4.56×10^8 km

4. The space craft will be designed to have 8,000,000 cubic feet of cargo space. Express the number in scientific notation.

   8.0×10^6 cubic feet

5. It has been estimated that meals for each person on the trip will occupy 0.00098 cubic feet of cargo space. The meals for everyone on the trip can only use no more than 5.0×10^{-2} cubic feet of the cargo space. Is this possible if there are 10 people on the trip?

   0.00098 x 10 = 0.0098 space for food for 10 people

   0.05 cubic feet is allowed, yes there is space.

6. The researchers estimate that the cost of the trip is about $500,000 per kilometer. Give the estimated cost of the trip to Mars. Record your answer in scientific notation.

   $500,000 x 401,000,000= $200,500,000,000 = 2.005×10^{14}
   Two hundred billion, five hundred million dollars

7. Determine whether the SQPL question is true; use information from this page to justify the statement.

   The distance from Earth to Mars changes every minute with the difference between the closest and farthest distance being more than 300,000,000 kilometers is a true statement because there is more than the 300,000,000 kilometers difference.

Unit 1, Activity 9, Powerful Numbers

Use a calculator to fill in the following chart with powers of 10.

10^4	10^3	10^2	10^1	10^0	10^{-1}	10^{-2}	10^{-3}	10^{-4}

From your observations of the chart, what can you conclude about negative exponents?

Use your calculator to find the value of 2^{-1}. Does your conclusion still hold true?

Review: Scientific Notation

Convert the following numbers to correct scientific notation.

23,000

1,345,900,000

56

23.459×10^4

Convert the following numbers in scientific notation to standard form.

2.3×10^5

3.56909×10^3

4.9×10

7.89×10^{11}

Look at the very small numbers below, and find a way to write these numbers in scientific notation. Use the chart you constructed above to help you decide the proper procedure to follow.

.000023

.0004598

.02

.00000000000000004

Convert the following numbers in scientific notation to standard form.

6.7×10^{-5}

3.4×10^{-8}

3.56×10^{-1}

9.08×10^{-6}

Unit 1, Activity 9, Powerful Numbers with Answers

Use a calculator to fill in the following chart with powers of 10.

10^4	10^3	10^2	10^1	10^0	10^{-1}	10^{-2}	10^{-3}	10^{-4}
10000	*1000*	*100*	*10*	*1*	*.1*	*.01*	*.001*	*.0001*

From your observations of the chart, what can you conclude about negative exponents? *Answers will vary. Ex: Negative exponents produce decimals/fractions*

Use your calculator to find the value of 2^{-1}. Does your conclusion still hold true?

$2^{-1} = \frac{1}{2}$ *yes*

Review: Scientific Notation

Convert the following numbers to correct scientific notation.

23,000 = 2.3×10^4

1,345,900,000 = 1.3456×10^9

56 = 5.6×10^1

23.459×10^4 = 2.3459×10^5

Convert the following numbers in scientific notation to standard form.

2.3×10^5= *230,000*

3.56909×10^3 = *3569.09*

4.9×10 = *49*

7.89×10^{11} = *789,000,000,000*

Look at the very small numbers below, and find a way to write these numbers in scientific notation. Use the chart you constructed above to help you decide the proper procedure to follow.

.000023 = 2.3×10^{-5}

.0004598 = 4.598×10^{-4}

.02 = 2×10^{-2}

.00000000000000004 = 4.0×10^{-17}

Convert the following numbers in scientific notation to standard form.

6.7×10^{-5} = *.000067*

3.4×10^{-8} = *.000000034*

3.56×10^{-1} = *.356*

9.08×10^{-6} = *.00000908*

Exponential Growth and Decay

In this activity, fold a piece of computer paper in half as many times as possible. After each fold, stop to fill in a row of the table. Continue folding and recording until the table is filled.

NUMBER OF FOLDS	NUMBER OF REGIONS	AREA OF SMALLEST REGION
0		
1		
2		
3		
4		
5		
6		
7		
N		

1. Explain how the number of regions increases with each fold of the paper.
2. Is the relationship of the number of folds and the number of regions linear? Explain.
3. How does the relationship of the number of folds and the area of the smallest region differ from the comparison in #2?
4. If you were to graph these comparisons, which would be the independent and dependent variable in each comparison? Explain.

Exponential Growth and Decay

In this activity, fold a piece of computer paper in half as many times as possible. After each fold, stop to fill in a row of the table. Continue folding and recording until the table is filled

NUMBER OF FOLDS	NUMBER OF REGIONS	AREA OF SMALLEST REGION
0	1	1
1	2	$\frac{1}{2}$ or 2^{-1}
2	4	$\frac{1}{4}$ or 2^{-2}
3	8	$\frac{1}{8}$ or 2^{-3}
4	16	$\frac{1}{16}$ or 2^{-4}
5	32	$\frac{1}{32}$ or 2^{-5}
6	64	$\frac{1}{64}$ or 2^{-6}
7	128	$\frac{1}{128}$ or 2^{-7}
N	2^n	$\frac{1}{2^n}$ or 2^{-n}

1. Explain how the number of regions increases with each fold of the paper.
   The number of regions doubles with each fold

2. Is the relationship of the number of folds and the number of regions linear? Explain.
   The relationship is not linear because the rate of change is not constant

3. How does the relationship of the number of folds and the area of the smallest region differ from the comparison in #2?
   The relationship between the two shows a decrease in the size of each small area after each fold becomes half the size of the previous.

4. If you were to graph these comparisons, which would be the independent and dependent variable in each comparison? Explain.
   Since the number of folds determines the number of regions or the area of the smallest region, the number of folds is independent and either the regions or area is dependent.

Unit 1, Activity 11, Vocabulary Awareness

Name ____ **Date** ___________ **Hour** ______

Word- Properties of Powers	**+**	**✓**	**-**	**Example**	**Definition**
Product of Powers					
Quotient of Powers					
Power of a Power					
Power of zero					
Product of a Power					
Power of a quotient					

Unit 1, Activity 11, Vocabulary Awareness with Answers

Word-Properties of Powers	+	✓	-	Example	Definition
Product of Powers				x^m x x^p $x^{(m+p)}$ 3^2 x 3^5 = $3^{(2+5)}$ (3 x 3)x (3 x 3 x 3 x 3 x 3) 3^7=2,187	*If numbers with exponents have the same base are multiplied, the exponents are added.*
Quotient of Powers				$n^m \div n^r$ $n^{(n-r)}$ $5^6 \div 5^5 = 5^{(6-5)}$ $\dfrac{\cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5} \times 5}{\cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5}}$ 5^1	*If numbers with exponents have the same base are divided, the exponents are subtracted.*
Power of a Power				$(n^r)^t$ n^{rt} $(4^2)^3 = 4^{(2 \times 3)}$ $(4 \times 4)^3$ $(16)^3$ 4,096	*If numbers are raised to a power and then this is raised to a power, the exponents are multiplied.*
Power of zero				$n^0=1$ if $n \neq 0$ $8^0 = 1$ $10^0 = 1$	*If a nonzero number is raised to the zero power, it equals 1.*
Product of a Power				$(ab)^r$ $a^r b^r$ $(4 \times 3)^2$ $4^2 \times 3^2 = 16 \times 9 = 144$	*If factors are raised to a power and the product is raised to a power, find the power of each factor and multiply.*
Power of a quotient				$\left(\dfrac{m}{n}\right)^x = \dfrac{m^x}{n^x}$ if $n \neq 0$ $\left(\dfrac{3}{2}\right)^3 = \dfrac{3^3}{2^3} = \dfrac{27}{8}$	*If a quotient of two numbers is raised to a power, raise both the numerator and the denominator to that power and simplify.*

Unit 1, Activity 11, Exponent

Name _________________________________ Date ________________ Hour__________

Use your understanding of exponents and their properties to complete these problems.

1. What is 37^0? _____________________ Which property did you use?
2. What is 2^3 x 2^4? ___________________ Which property did you use?
3. What is 5^3 x 5^{-3}? __________________ Which property did you use?
4. What is 6^2 x 6^{-3}? _________________ Show your work and describe the property used.
5. What is $\left(\frac{3}{6}\right)^3$? ___________________ Show your work and describe the property used.
6. What is $\left(\frac{34}{45}\right)^0$? __________________ Show your work and describe the property used.
7. What is $\left(\frac{5}{10}\right)^2$?__________________ Show your work and describe the property used.
8. Write a problem that illustrates the power of a power and explain how you would solve the problem.
9. This problem has a base of 3 and exponents of 3 and 4. The problem illustrates the product of powers. Write the problem.
10. Explain the difference in the product of powers property and the power of a product property.

Unit 1, Activity 11, Exponent with Answers

Use your understanding of exponents and their properties to complete these problems.

1. What is 37^0? _________1____________ Which property did you use? *Power of zero*

2. What is 2^3 x 2^4? ____$2^{3+4} = 2^7 =$ _128____________ Which property did you use? *Product of powers*

3. What is 5^3 x 5^{-3}? __$5^{(3+-3)}$ ___$= 5^0 =1$__ Which property did you use? *Product of powers and Power of zero*

4. What is $(6^2)^{-1}$? ___$6^{2(-1)} = 6^{-2} =$__$\frac{1}{6^2} = \frac{1}{36}$___________ Show your work and describe the property used. *Power of a product*

5. What is $\left(\frac{3}{6}\right)^3$? __$\frac{3^3}{6^3} = \frac{3x3x3}{6x6x6} = \frac{27}{216} = \frac{1}{8}$_________________ Show your work and describe

   or

   $\frac{3x3x3}{6x6x6} = \frac{1x1x1}{2x2x2} = \frac{1}{8}$

   the property used. *Power of a quotient*

6. What is $\left(\frac{34}{45}\right)^0$? ______1____________ Show your work and describe the property used.

   No work necessary; purpose of the problem is to reinforce the power of zero property

7. Write a problem that illustrates the power of a power and explain how you would solve the problem.

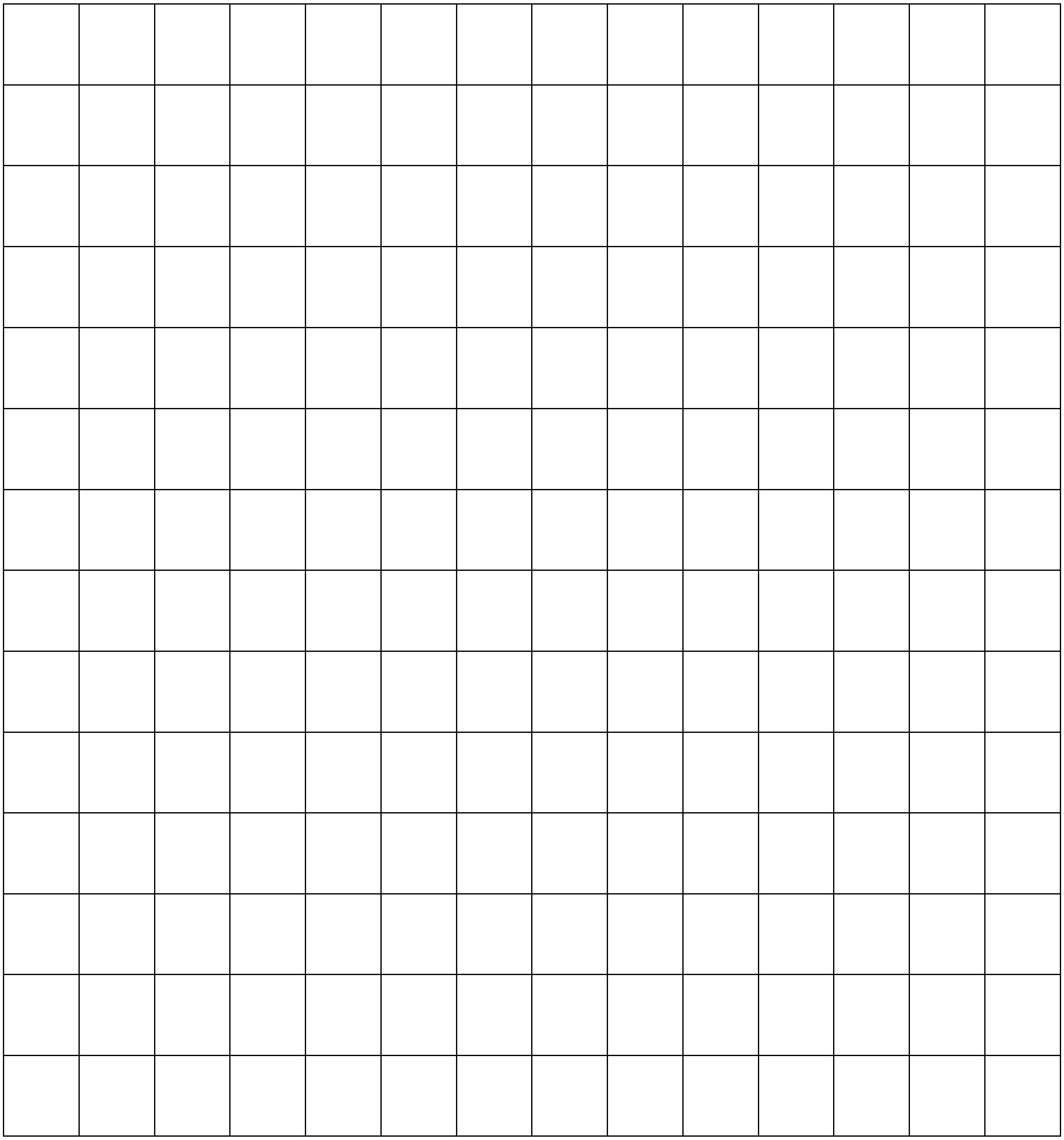
   Various answers possible

8. This problem has a base of 3 and exponents of 3 and 4. The problem illustrates the product of powers. Write the problem.

   3^3x 3^4 resulting in 3^7 product of powers
   or possibly $(3^3)^4$ resulting in 3^{12} power of a product

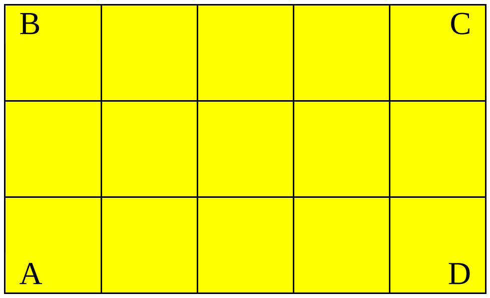
9. Explain the difference in the product of powers property and the power of a product property. *For the product of powers, the exponents are added and for the power of a product, the exponents are multiplied.*

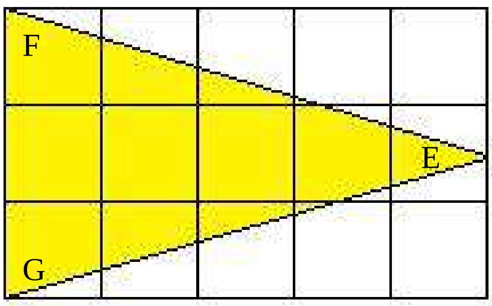
Unit 2, Activity 2, One-half Inch Grid

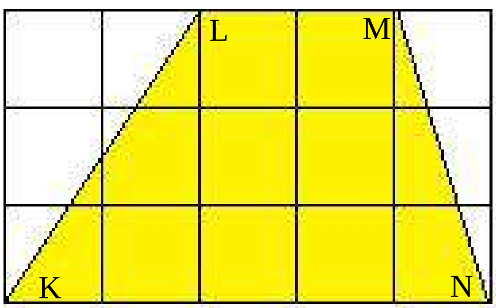


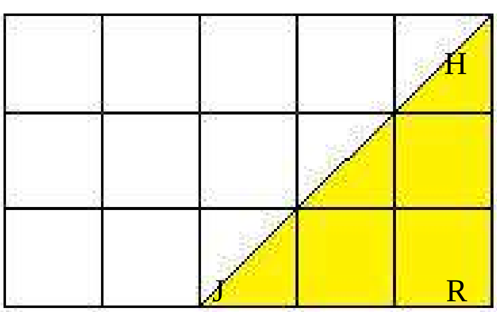
Unit 2, Activity 2, Shapes

Cut these yellow shapes out for each pair of students prior to class. The labels for each vertex are important to the activity.









Name ________________________________ Date _______________ Hour __________

Give the coordinates of the vertices of the figure in its original position, and then give the coordinates of the new vertices based on stated transformation. The rotation is 90°clockwise about the origin. The reflection is across the *y*-axis.

Shape	**Original Position**	**Translate**	**Rotate**	**Reflect across *y*-axis**
Rectangle	A (2 , 3) B (2 , 6) C (,) D (,)	A′ (,) B′ (2 ,-4) C′ (,) D′ (,)	A′ (,) B′ (,) C′ (,) D′ (,)	A′ (,) B′ (,) C′ (,) D′ (,)
Right Triangle	H (0 , 3) R (0 , 0) J (,)	H′ (,) R′ (2, -4) J′ (,)	H′ (,) R′ (,) J′ (,)	H′ (,) R′ (,) J′ (,)
Isosceles Triangle	E (4, -3.5) F (,) G (-1, -5)	E′ (,) F′ (,) G′ (-1, -3)	E′ (,) F′ (,) G′ (,)	E′ (,) F′ (,) G′ (,)
Trapezoid	K (,) L (3 , -1) M (5, -1) N (,)	K′ (,) L′ (,) M′ (,) N′ (-1 , -1)	K′ (,) L′ (,) M′ (,) N′ (,)	K′ (,) L′ (,) M′ (,) N′ (,)

	Change in length	Change in orientation	Change in angles measures
Reflection			
Translation			
Rotation			
Dilation			

Shape	**Original Position**	**Translate**	**Rotate**	**Reflect across *y*-axis**
Rectangle	*A (2 , 3)* *B (2 , 6)* *C (7, 6)* *D (7 , 3)*	*A′ (2 , -7)* *B′ (2 , -4)* *C′ (7 ,-4)* *D′ (7 , -7)*	*A′ (3 , -2)* *B′ (6 , -2)* *C′ (6, -7)* *D′ (3 , -7)*	*A′ (-2, 3)* *B′ (-2 , 6)* *C′ (-7, 6)* *D′ (-7 , 3)*
Right Triangle	*H (0 , 3)* *R (0 , 0)* *J (-3 , 0)*	*H′ (2 , -1)* *R′ (2 , -4)* *J′ (-1 ,-4)*	*H′ (3 , 0)* *R′ (0 , 0)* *J′ (0 , 3)*	*H′ (0, 3)* *R′ (0 , 0)* *J′ (3 , 0)*
Isosceles Triangle	*E (4, -3.5)* *F (-1, -2)* *G (-1, -5)*	*E′ (4 ,-1.5)* *F′ (-1 , 0)* *G′ (-1, -3)*	*E′ (-3.5 ,-4)* *F′ (-2 , 1)* *G′ (-5 , 1)*	*E′ (-4 , -3.5)* *F′ (1 , -2)* *G′ (1 ,-5)*
Trapezoid	*K (1 , -4)* *L (3 , -1)* *M (5, -1)* *N (6 , -4)*	*K′ (-6 , -1)* *L′ (-4 , 2)* *M′ (-2 , 2)* *N′ (-1, -1)*	*K′ (-4 ,-1)* *L′ (-1, -3)* *M′ (-1 ,-5)* *N′ (-4, -6)*	*K′ (-1 ,-4)* *L′ (-3, -1)* *M′ (-5, -1)* *N′ (-6, -4)*

Unit 2, Activity 2, Transformation Word Grid with Answers

	Change in length	Change in orientation	Change in angles measures
Reflection		✓	
Translation			
Rotation		✓	
Dilation	✓		

Unit 2, Activity 2, Transformations Review

Name ________________________________ Date ___________ Hour __________

Transformation Review

Fill in the *"bridge maps"* below to illustrate the resulting changes in the coordinates of polygons in the transformation explained.

Example

A polygon is reflected across y axis ______ the result is ______

1\. a polygon reflection across the x axis ______ the result is ______

2\. ______ the result is ______ (x, y) becomes ($-y$, x)

3\. with a translation down 2 and to the right 1 ______ the result is ______

4\. ______ the result is ______ a polygon in quadrant 4

A reflection across the x-axis of a triangle with point A located at (-1, 3) ______ the result is ______

Unit 2, Activity 2, Transformations Review with Answers

Fill in the *"bridge maps"* below to illustrate the resulting changes in the coordinates of polygons in the transformation explained.

Example:

A polygon is reflected across *y* axis	the result is	The opposite *x* value and the same *y* value

1.

a polygon reflection across the *x* axis	the result is	The same *x* value and the opposite *y* value.

2.

With a 90° clockwise rotation about the origin	the result is	(x, y) becomes (y, -x)

3.

with a translation down 2 and to the right 1	the result is	The *x* value increases by 1 The *y* value decreases by 2

4. *The answer below is only one possible solution. For example, a polygon in quadrant 1 might have been reflected across the x-axis and end up in quadrant 1.*

A polygon is rotated 180° about the origin from quadrant 2	the result is	a polygon in quadrant 4

5.

A reflection across the *x*-axis of a triangle with point A located at (-1, 3)	the result is	The new coordinates will be (-1, -3)

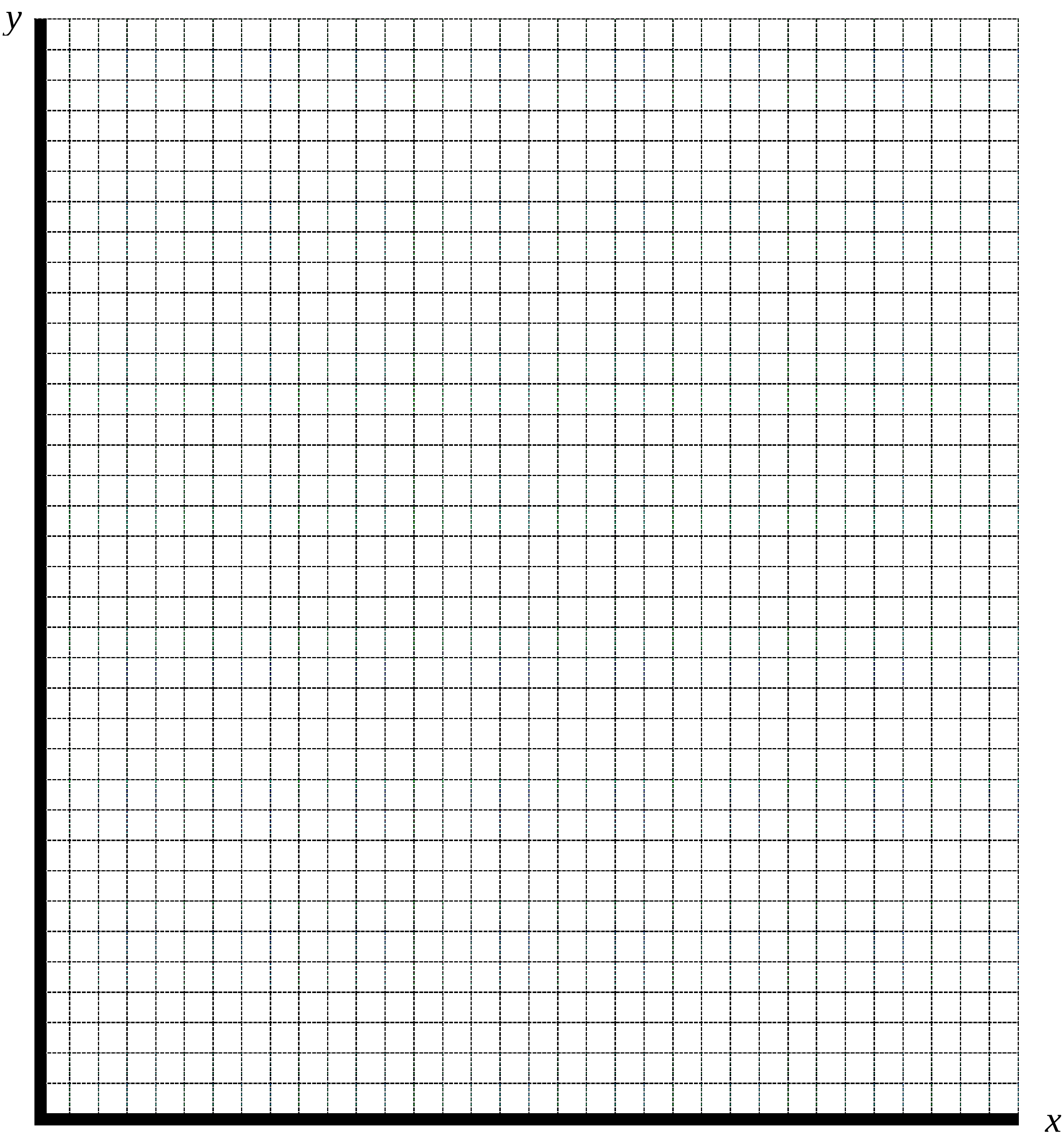
Unit 2, Activity 2, Transformations Dilations

Name ___________________________________ Date ___________________ Hour ______

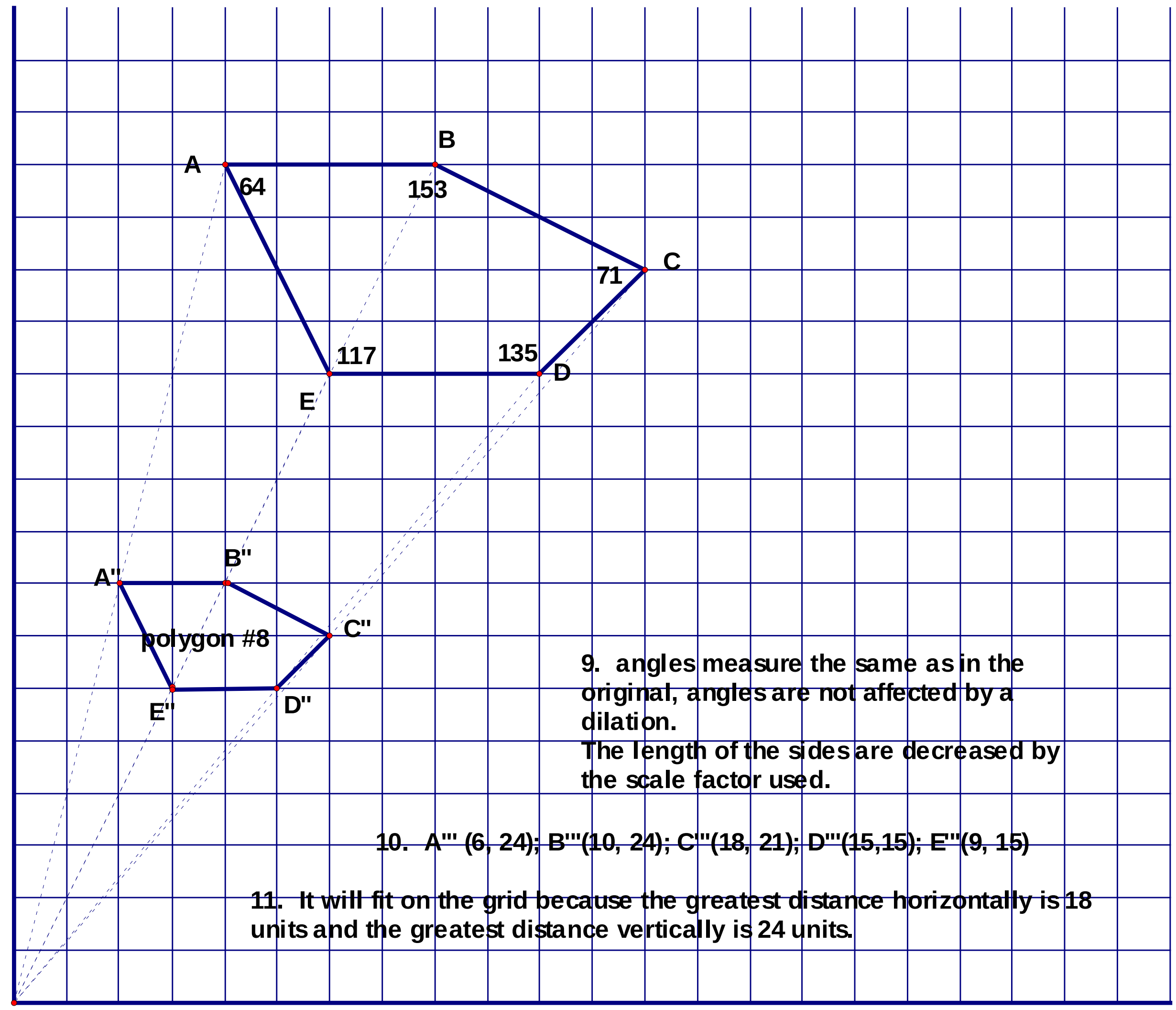
1. Plot the following points on the grid paper showing only **quadrant I**.
   A(4,16), B(8,16), C(12, 14), D(10,10) and E(6,10).
2. Find the measure of each of the angles.
   a) $m\angle$ A
   b) $m\angle$ B
   c) $m\angle$ C
   d) $m\angle$ D
   e) $m\angle$ E
3. Use a ruler and find the length of each side of the polygon.
   a) Length of $\overline{AB}$
   b) Length of $\overline{BC}$
   c) Length of $\overline{CD}$
   d) Length of $\overline{DE}$
   e) Length of $\overline{EA}$
4. Draw a dotted line from the origin through each of the five vertices of the polygon (i.e., you will have five dotted lines extending from the origin of the graph through the vertices of your polygon).
5. Plot a new polygon on your grid by doubling the length of each side of the original polygon. To do this, double the coordinates for *x and y* and plot the new point. How does the placement of the new point relate to the dotted lines you drew in step 4?
6. Connect the points to form your new polygon. Measure the angle lengths.
   a) $m\angle$ A'
   b) $m\angle$ B'
   c) $m\angle$ C'
   d) $m\angle$ D'
   e) $m\angle$ E'
7. Measure the side lengths of your dilation (enlargement).
   a) Length of $\overline{A'B'}$
   b) Length of $\overline{B'C'}$
   c) Length of $\overline{C'D'}$
   d) Length of $\overline{D'E'}$
   e) Length of $\overline{E'A'}$
8. Dilate the original polygon by a scale factor of ½. Name points A'', B'', C'', D'', E''
9. How are the angles of a figure affected by a dilation? What is the relationship between the scale used for the dilation and the length of corresponding sides of an original to the figure created by using dilation?
10. Using the lines and the conjectures that you have developed, determine the new coordinates of ABCDE if it were dilated by a scale factor of 1 ½ without graphing the points. Will it fit on the grid? Why or why not?

Unit 2, Activity 3, Quadrant 1 Grid

Name ________________________________ Date ______________ Hour ____________



Unit 2, Activity 3, Quadrant 1 grid with Answers



9. angles measure the same as in the original, angles are not affected by a dilation.
The length of the sides are decreased by the scale factor used.

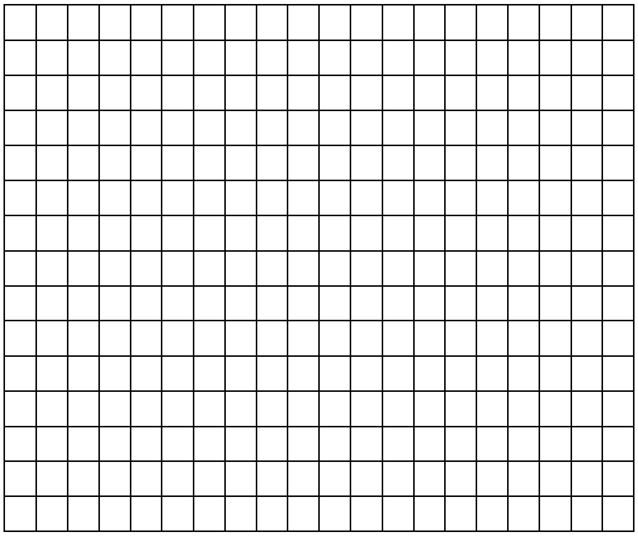
10. A''' (6, 24); B'''(10, 24); C'''(18, 21); D'''(15,15); E'''(9, 15)

11. It will fit on the grid because the greatest distance horizontally is 18 units and the greatest distance vertically is 24 units.

Unit 2, Activity 3, Similarity

Name ______________________________ Date _______________ Hour______

1. Draw an x and y axis on the grid below so that you can plot △ABC with vertices A(3, 3); B(3, -1); and C(1, -1). Translate the triangle 2 units left and 3 units up. Sketch the translation.



2. Justify which of the characteristics are true of the two figures.
   a. Similarity b. Congruency

3. Reflect the translated figure over the y axis. Justify similarity and/or congruence of the three figures.

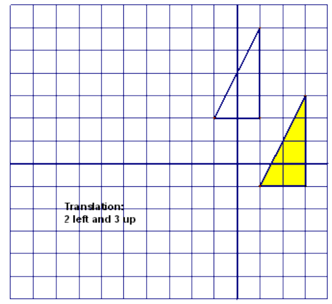
4. Suppose you rotate the reflected figure 90° around the origin, does the shape of the figure change? Does the size of the figure change? Do the measures of the angles change?

5. Dilate the rotation by a factor of 2. Does the size of the figure change? Do the measures of the angles change?

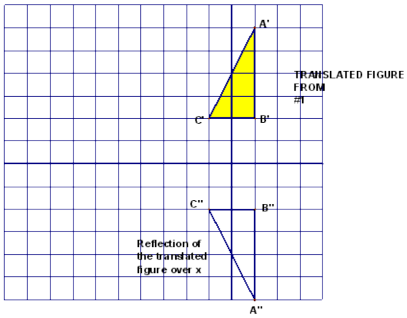
6. Using a new sheet of grid paper, draw a triangle and write the coordinates. Use a series of transformations (at least 4) to relocate the triangle on the grid. Write a conjecture explaining the effect of translations, reflections, dilations and rotations on the area and angle measurements of two-dimensional shapes.

1. The translation figure is congruent to the original.

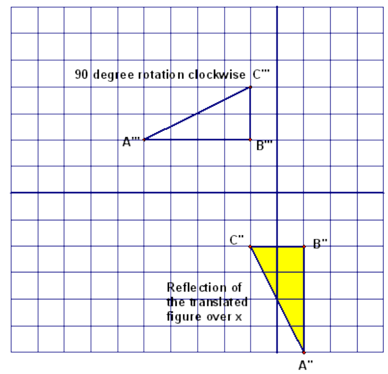
2. The original figure is the same size and shape as the other.



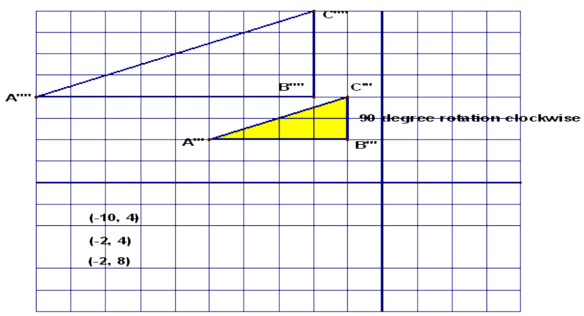
3. The reflection and the translation are also congruent. It can be seen that angle B is a right angle and side AC matches if the paper is folded on the x-axis. The angles are equal and will lay on top of each other if the paper if folded on the x-axis



4. The rotation is also congruent and similar. This can be proved by tracing the reflection and placing it on top of the rotation; angles and side lengths are congruent.



5. The dilation has equal angles because they can be compared by folding the paper or tracing the angles and placing the angle over the angle of the dilation. The dilation has an area larger than the original (4 times the area). Length is twice as long and height is twice as long. 2 x 2 gives an area 4 times the original.



6.Sketches vary

Unit 2, Activity 6, The Theorem

Name ____________________________ Date _______________ Hour ________

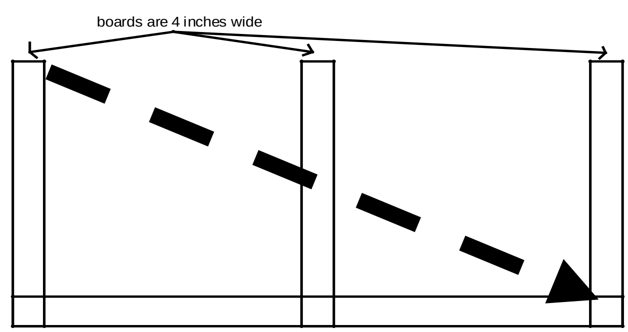
Work with your partner to complete these problems. Make scale drawings of the figures in problems 1 – 3, and label sides of the right triangle that are being used to solve the problem. Give the scale factor used for each. Problem 4 has a diagram already drawn for you.

1. James has a circular trampoline with a diameter of 16 feet. Will this trampoline fit through a doorway that is 10 feet high and 6 feet wide? Explain your answer.

2. A carpenter measured the length of a rectangular table top he was building to be 26 inches, the width to be 12 inches, and the diagonal to be 30 inches. Explain whether the carpenter can use this information to determine if the corners of the tabletop are right angles.

3. For safety reasons, the base of a ladder that is 24 feet tall should be at least 8 feet from the wall. What is the highest distance that the 24 foot ladder can safely rest on the wall? Explain your thinking.

4. The wall of a closet in a new house is braced with a corner brace. The height of the wall is 8 feet. The wall of the closet has three boards placed 16 inches apart, and this corner brace becomes the diagonal of the rectangle formed. How long will the brace need to be for the frame at the right?



Unit 2, Activity 6, The Theorem with Answers

Name ___________________________________ Date _______________ Hour ________

Work with your partner to complete these problems. Make scale drawings of the figures in problems 1 – 3, and label sides of the right triangle that are being used to solve the problem. Problem 4 has a diagram already drawn for you.

1. James has a circular trampoline with a diameter of 16 feet. Will this trampoline fit through a doorway that is 10 feet high and 6 feet wide? Explain your answer.

Since the trampoline is larger than the height of the doorway, it would have to be held at a diagonal. The trampoline will not fit into the doorway because the diagonal of the doorway is approximately 11.7 ft.

2. A carpenter measured the length of a rectangular table top he was building to be 26 inches, the width to be 12 inches, and the diagonal to be 30 inches. Explain whether the carpenter can use this information to determine if the corners of the tabletop are right angles.

If the angles are right angles, 30 inches should be the diagonal when the Pythagorean Theorem is applied to the sides.

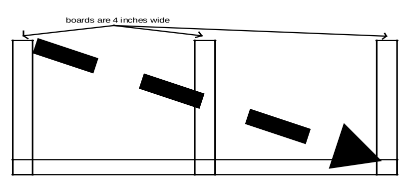
$$12^2 + 26^2 = c^2$$
$$820 = c^2$$
$$c \approx 28.6$$

The sides of the table do not form right angles.

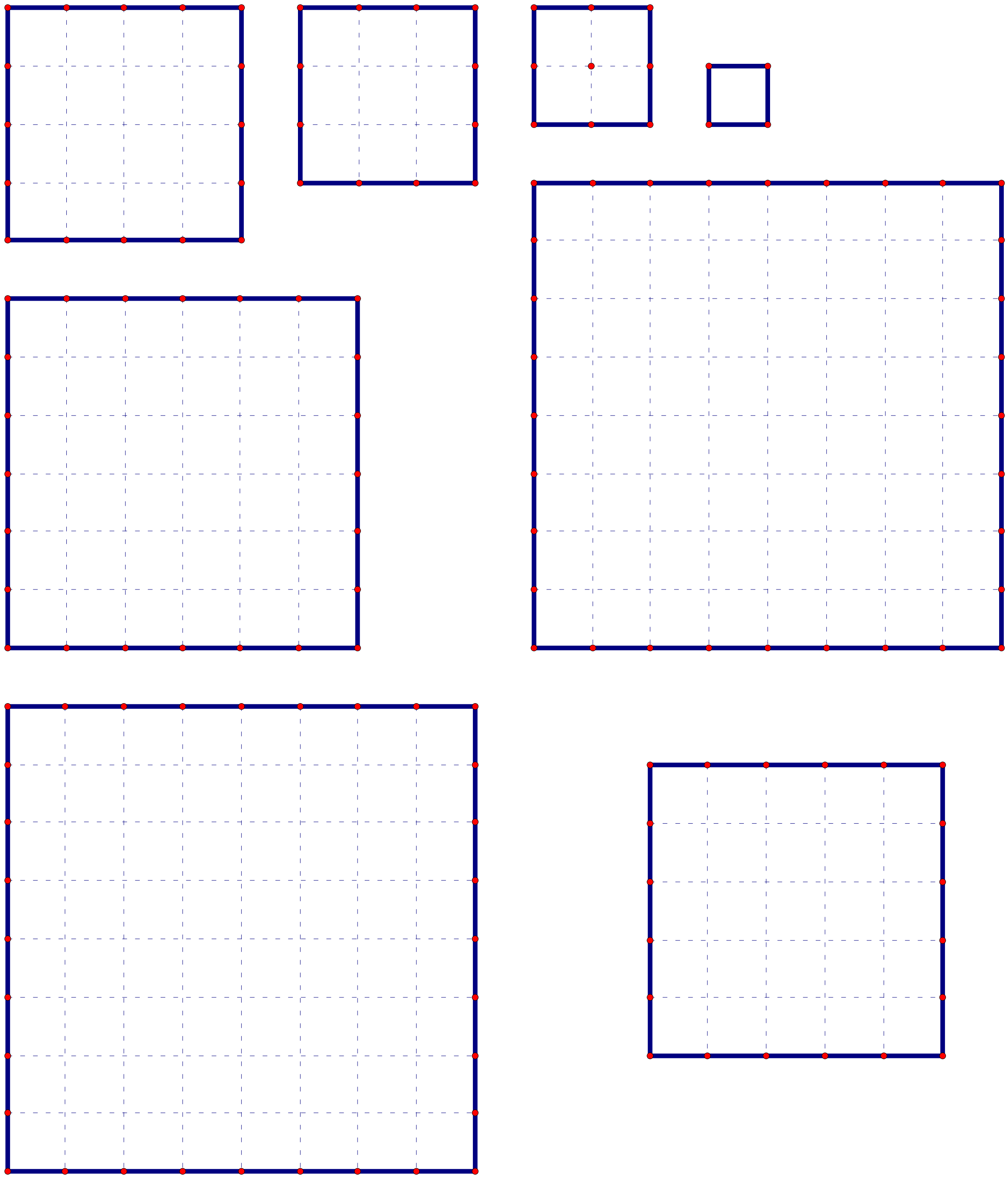
3. For safety reasons, the base of a ladder that is 24 feet tall should be at least 8 feet from the wall. What is the highest distance that the 24 foot ladder can safely rest on the wall? Explain your thinking.

The ladder would be the hypotenuse in a right triangle formed by the ladder, the wall, and the ground. The ladder can reach approximately 22.6 feet up the wall if the end of the ladder hits the ground 8 feet from the wall.

4. The wall of a closet in a new house is braced with a corner brace. The height of the wall is 8 feet. The wall of the closet has three boards placed 16 inches apart, and this corner brace becomes the diagonal of the rectangle formed. How long will the brace need to be for the frame at the right?



The widths of the two end boards should not be used when bracing. Therefore, the horizontal distance is 36 inches, and the brace would be about 102.5 inches or 8.5 feet.



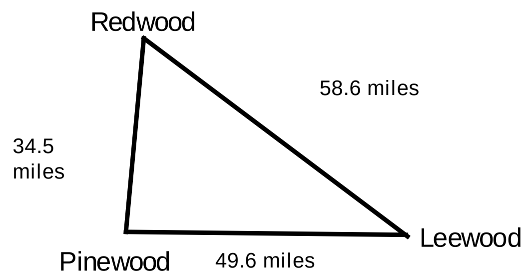
Unit 2, Activity 7, Converse of Pythagorean Theorem

Name ____ Date ______________ Hour ____

Use the converse of the Pythagorean Theorem to answer each of the following.

1. Which of the following could be the lengths of the sides of a right triangle? Explain your answer.
   a. 2 cm, 4 cm, 7 cm
   b. 6 cm, 8 cm, 10 cm
   c. 4 cm, 9 cm, 12 cm
   d. 5 cm, 10 cm, 15 cm

2. Planning a trip from Leewood to Pinewood and then to Redwood, my dad wondered if the three towns were located in a triangle that would form a right triangle. The map showed the distances of the cities from each other. Determine whether the town locations form a right angle, and write an explanation to justify this to your dad.



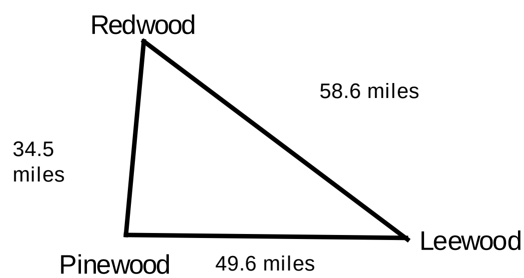
3. Which of the following could NOT be the lengths of the sides of a right triangle? Justify your answers.
   a. $\frac{3}{4}$, 1, $1\frac{1}{4}$
   b. $\frac{1}{3}$, $\frac{2}{3}$, 1
   c. $\frac{3}{7}$, $\frac{8}{14}$, $\frac{10}{14}$

Unit 2, Activity 7, Converse of Pythagorean Theorem with Answers

Use the converse of the Pythagorean Theorem to answer each of the following.

1. Which of the following could be the lengths of the sides of a right triangle? Explain your answer.
   a. 2 cm, 4 cm, 7 cm *$4 + 16 \neq 49$ not right triangle*
   b. 6 cm, 8 cm, 10 cm *$36 + 64 = 100$ this is a right triangle*
   c. 4 cm, 9 cm, 12 cm *$16 + 91 \neq 144$ this is not a right triangle*
   d. 5 cm, 10 cm, 15 cm *$25 + 100 \neq 225$ this is not a right triangle*

2. Planning a trip from Leewood to Pinewood and then to Redwood, my dad wondered if the three towns were located in a triangle that would form a right triangle. The map showed the distances of the cities from each other. Determine whether the town locations form a right angle, and write an explanation to justify this to your dad.



(34.5)(34.5) + (49.6)(49.6)_____ (58.6)(58.6)

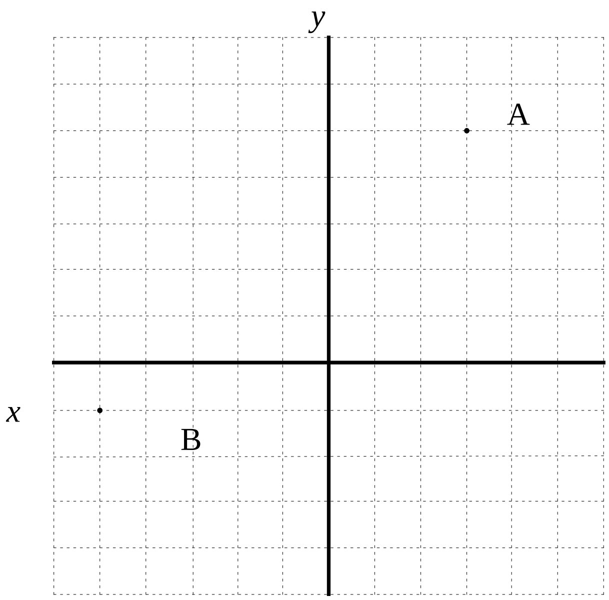
1190.25 + 2460.16 3433.96

$3650.41 \neq 3433.96$ No, they do not form a right angle.

3. Which of the following could NOT be the lengths of the sides of a right triangle? Justify your answers.
   a. $\frac{3}{4}, 1, 1\frac{1}{4}$ *9/16 + 1= 25/15 which is 1 9/16 Yes, this could be a right triangle.*
   b. $\frac{1}{3}, \frac{2}{3}, 1$ *$1/9 + 4/9 \neq 1$ This cannot be a right triangle.*
   c. $\frac{3}{7}, \frac{8}{14}, \frac{10}{14}$ *9/49 +16/49 = 25/49 This can be a right triangle.*

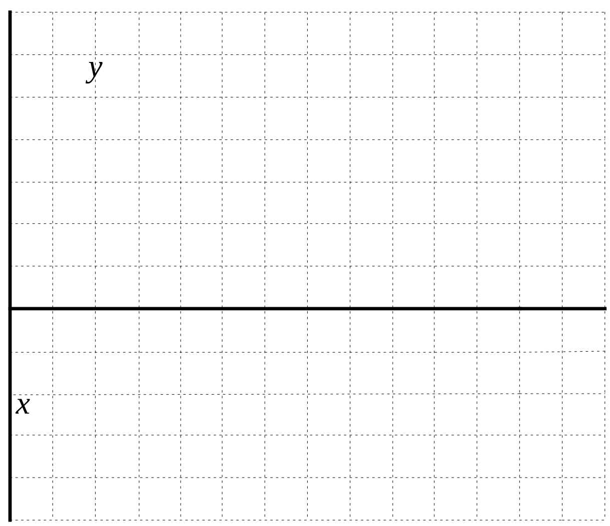
Unit 2, Activity 9, Distance

Name ____________________________ Date ________________ Hour ______



1. Use what you have learned about the Pythagorean Theorem to find the distance between points A and B on the graph at the left.

2. On the grid below, plot the points (-3, 8) and (-8, -4). Find the distance between the two points.

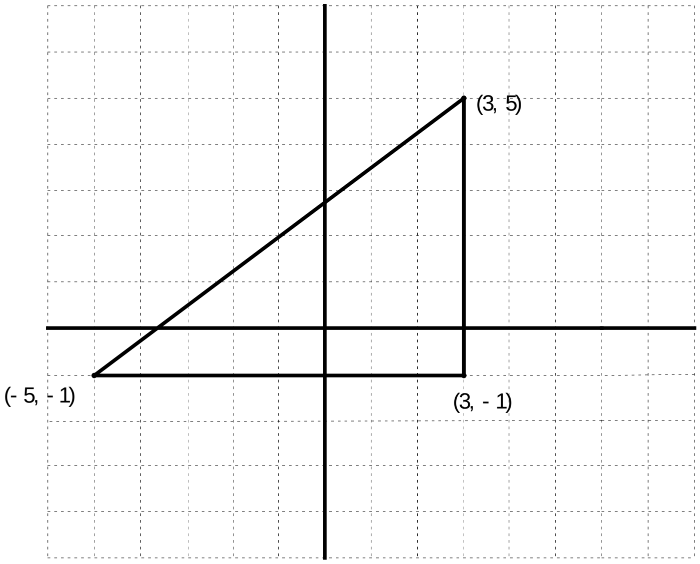


3. If you subtract the distance of the x coordinates and the y coordinates of the given points in #1 and 2, do you get the same lengths as you do when you form the right triangle? Why does this happen?

4. Find the distance between the points (-2, 5) and (- ½ , 3).

Unit 2, Activity 9, Distance with Answers

1. $a = 3 - (-5)$



$a = 8$ units

$b = 5 - (-1)$
$b = 6$ units

$d^2 = a^2 + b^2$
$d^2 = 8^2 + 6^2$
$d^2 = 64 + 36$
$d^2 = 100$
$d = \sqrt{100}$
$d = 10$

2)

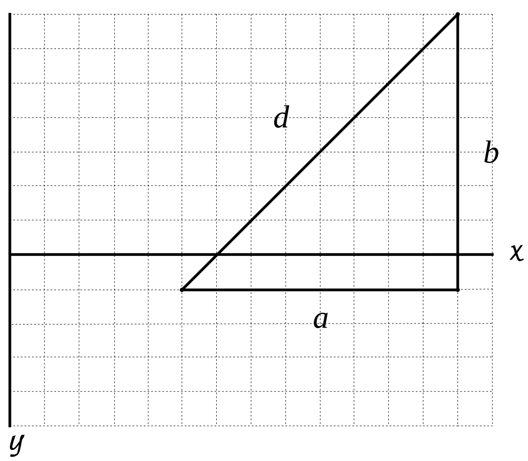
$a = -3 - (-8)$
$a = 5$ units

$b = 8 - (-4)$
$b = 12$ units

$d^2 = a^2 + b^2$

$d^2 = 25 + 144$
$d^2 = 169$
$d = \sqrt{169}$

$d =$ 13 units



3) Yes, this happens because when forming the right triangle; the x value stays on the horizontal line of the y value, and the y value stays on the vertical line of the x value to show where they will cross.

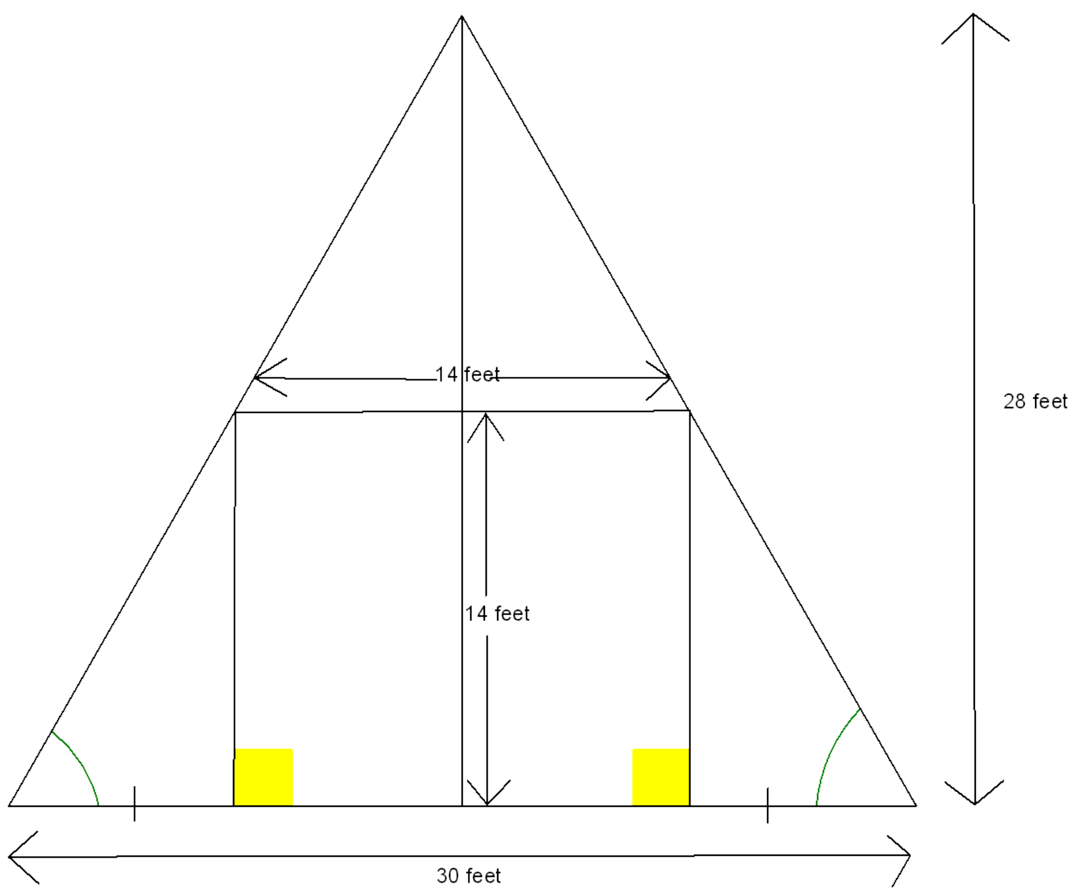
4) $a = -- ½ - (-2)$
$a = 3/2$

$b = 3 - 5$
$b = -2$

$d^2 = a^2 + b^2$
$d^2 = 9/4 + 4$
$d^2 = 9/4 + 16/4$
$d^2 = \sqrt{\frac{25}{4}} = 5/2$

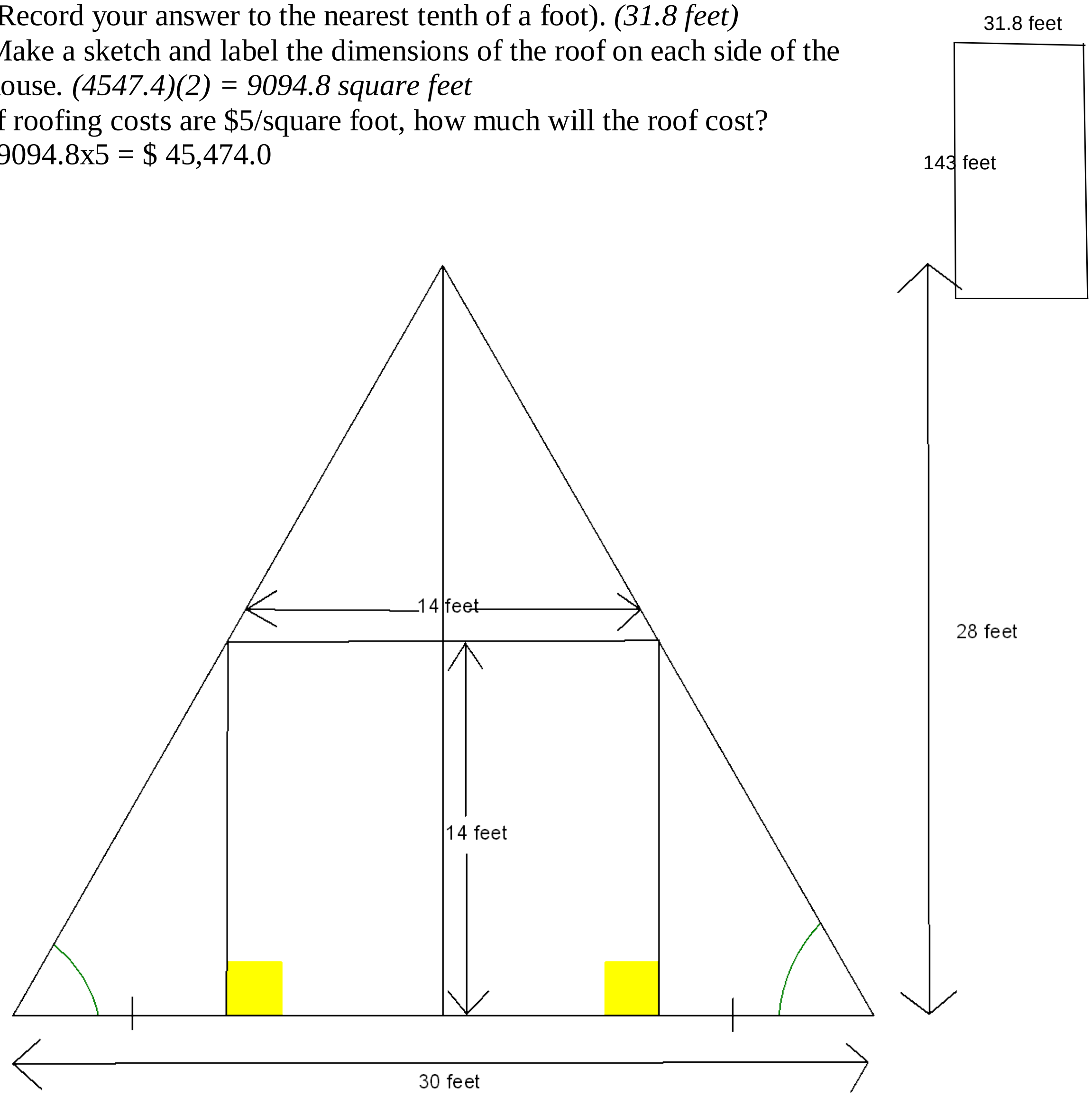
In Louisiana, one builder has decided to prevent dangerous hurricane winds from damaging homes. He predicts that it would be best to build homes that have a triangular shape as shown below. The inside walls should be 14 feet high but the overall design must be built with the extreme angle of the roof approximately 60° from the ground as the base.

a) The home buyer wants at least 2000 square feet of living area. Determine the length of the house to the nearest foot.
b) Determine the length of the roof from the top of the house to the ground. Record your answer to the nearest tenth of a foot.
c) Make a sketch and label the dimensions of the roof on each side of the house.
d) If roofing costs are $5/square foot, how much will the roof cost?



In Louisiana, one builder has decided that to prevent dangerous hurricane winds from damaging homes. He predicts that it would be best to build homes that have a triangular shape as shown below. The inside walls should be 14 feet high but the overall design must be built with the extreme angle of the roof approximately 60° from the ground as the base.

a) The home buyer wants at least 2000 square feet of living area. Determine the length of the house to the nearest foot. (*to the nearest whole foot, 143 feet)*
b) Determine the length of the roof from the top of the house to the ground. (Record your answer to the nearest tenth of a foot). *(31.8 feet)*
c) Make a sketch and label the dimensions of the roof on each side of the house. *(4547.4)(2) = 9094.8 square feet*
d) If roofing costs are $5/square foot, how much will the roof cost? (9094.8x5 = $ 45,474.0



Unit 3, Activity 1, Vocabulary Self-Awareness Chart

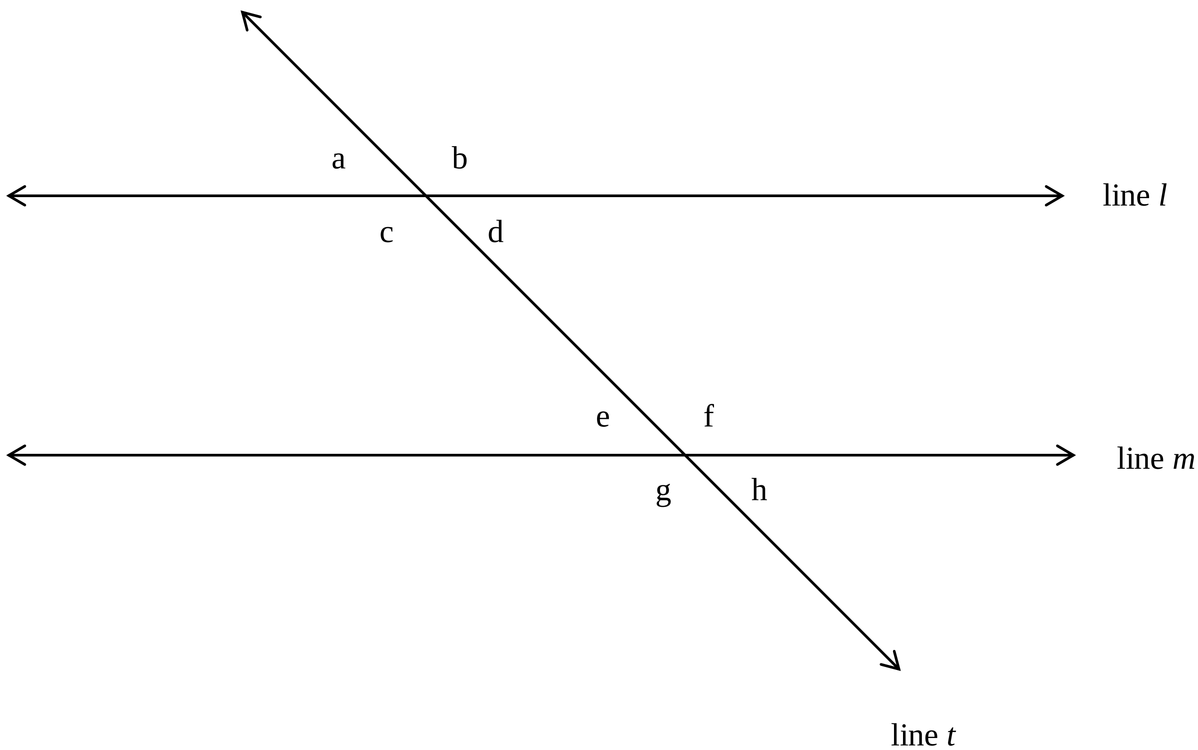
Name ________________________________ Date ____________ Hour __________

Put a (+) in the blank for each word that you are comfortable with the definition.
Put a (✓) in the blank for each word that you are not quite certain of the definition.
Put a (-) in the blank for each word that is brand new to you and you have no understanding of the vocabulary word.

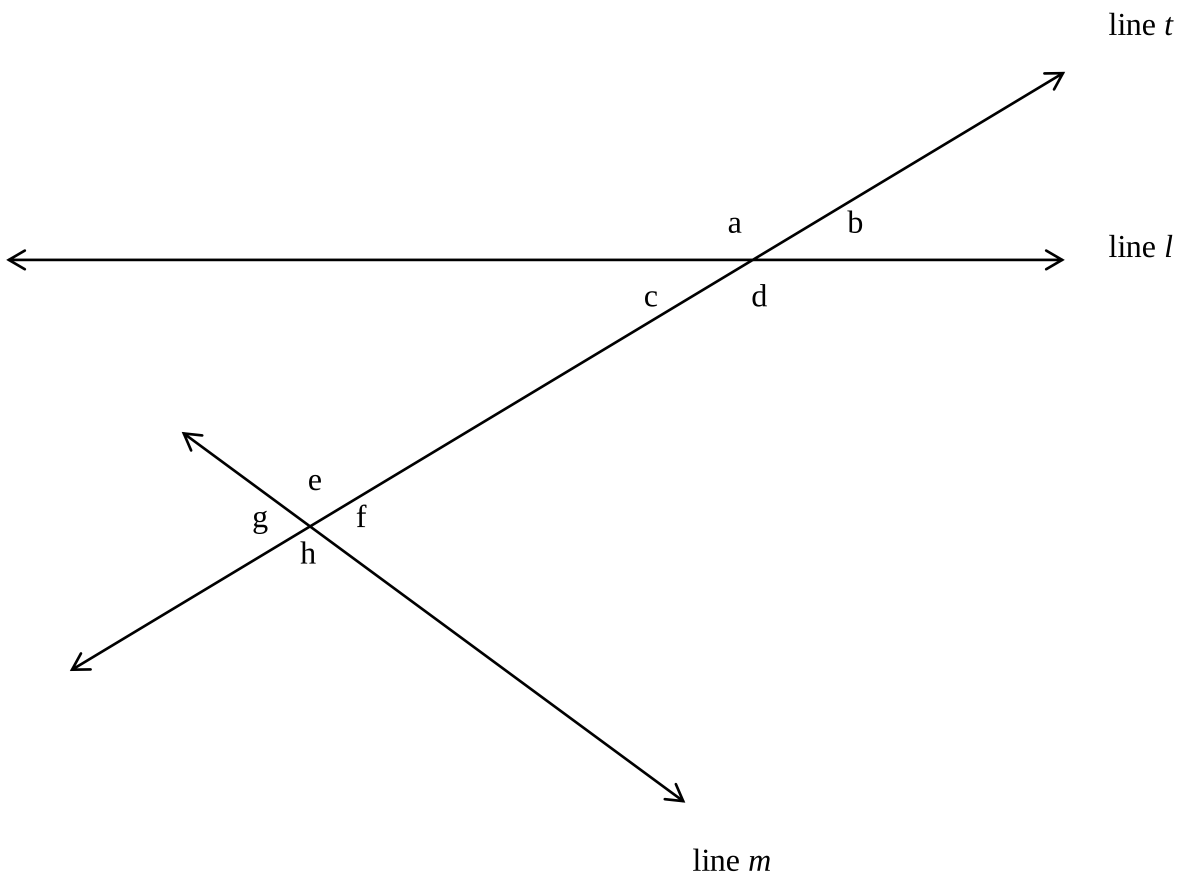
Write a definition and give an example of each of the words. If you are not sure of the word's definition, make a guess and during the unit, you will have time to update your definitions as the terms are developed throughout the unit.

Word	+	✓	-	**Example**	**Definition**
cube root					
transversal					
congruent					
corresponding angles					
adjacent angles					
opposite angles					
interior angles					
exterior angles					
volume					
surface area					
sphere					

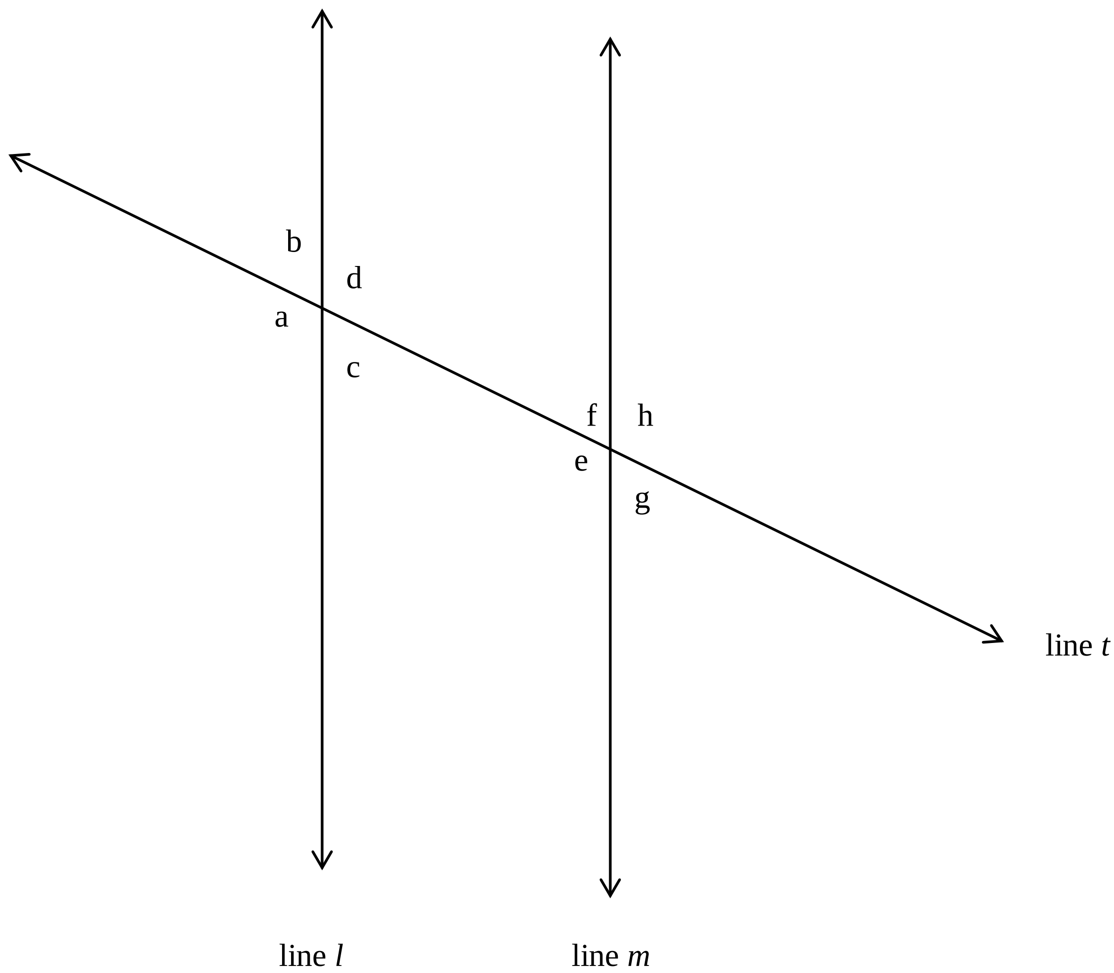
Unit 3, Activity 1, Drawing A



Unit 3, Activity 1, Drawing B



Unit 3, Activity 1, Drawing C



Group names ____

Your name __________________________

1. Trace the angles on your drawing on a piece of tracing paper or patty paper. Label the angles on the tracing.
2. Use the tracings to find pairs of angles that are congruent.
3. Check with your table group. All people at your table have the same drawing.
4. Write the pairs of congruent angles in the chart at the bottom of this page. This chart will be used throughout the activity.

Pairs of congruent angles

__________________ __________________

__________________ __________________

__________________ __________________

__________________ __________________

__________________ __________________

__________________ __________________

__________________ __________________

Group names ____

Your name ___________________________

5. Some groups found other angles congruent.

angles a and e	angles b and f
angles c and g	angles d and h

6. On one of the 4 drawings at your table, color each pair of angles listed above in a different color.

7. These pairs of angles are called **corresponding angles**. What do you notice about the positions of these pairs of angles?

8. Why are these angles congruent on Drawings A and C, but not on Drawing B?

angles a and e	angles b and f
angles c and g	angles d and h

9. Write a conjecture about congruent corresponding angles formed by intersecting lines.

Group names ____

Your name ________________________

10. Some groups found some other angles congruent.

    angles c and f   angles e and d

11. On one of the 4 drawings at your table, color the first pair of angles in a different color from the colors you have used so far. Color the second pair of angles a different color.

12. What do you notice about the two sets of pairs of angles?

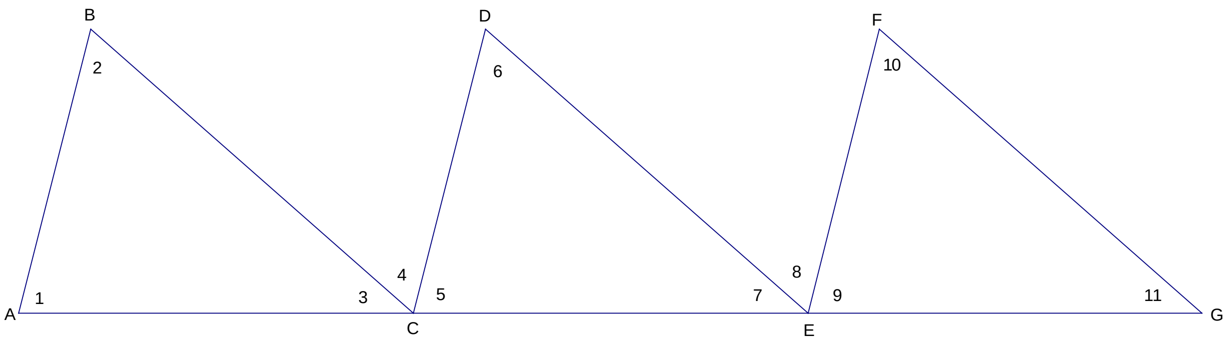
13. Alternate exterior angles are angles that are on the opposite sides of the transversal and on the outside of the lines it intersects.

14. Which angles are alternate exterior angles?

15. What can you say about alternate exterior angles if the two lines are *parallel*?

Name ________________________________ Date _____________ Hour ____________

The diagram below shows three triangles that are congruent and form a line forming the segment ACEG. Answer the questions below by referring to the diagram.



1. $\angle 3 + \angle 4 + \angle 5 =$ _________ degrees

2. $\angle 7 = \angle$___________ and $\angle$__________

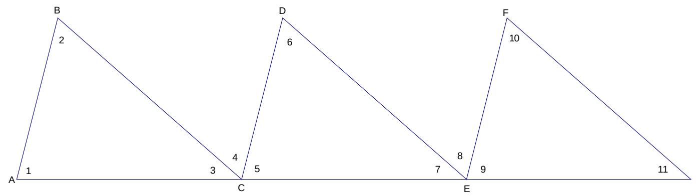
3. $\angle$A BC = 62° and $\angle$DEF = 42° Find the measures of each of the numbered angles listed. Justify how you determined each angle measure.
   $\angle 1$= ______________ because _______________________________________
   $\angle 2$= ______________ because _______________________________________
   $\angle 3$= ______________ because _______________________________________
   $\angle 6$= ______________ because _______________________________________
   $\angle 7$= ______________ because _______________________________________
   $\angle 9$= ______________ because _______________________________________
   $\angle 11$=______________ because _______________________________________

4. If you were to form an angle from points CDB, what would the measure of the angle be? Why?
5. Would an angle formed by EFD be congruent to angle CDB? Justify your answer.

Unit 3, Activity 2, Triangles and Transversals with Answers

The diagram below shows three triangles that are congruent and form a line forming the segment ACEG. Answer the questions below by referring to the diagram.

1. $\angle 3 + \angle 4 + \angle 5$ = __*180*_______ degrees



2. $\angle 7 = \angle$_____*3*______ and $\angle$____*11*______

3. $\angle$A BC = 62° and $\angle$DEC = 42°
   Find the measures of each of the numbered angles listed. Justify how you determined each angle measure.
   a) $\angle 1$= ____*76°*__________ *because* ______*62 +42 = 104 and 180 – 104 = 76*_____

   b) $\angle 2$= _____*62°*_________ *because* ____*$\angle$ABC is the same angle as $\angle$2*________

   $\angle$4= _____*62°*_________ *because* _____*$\angle$4 +$\angle$3 + +$\angle$5 = 180° and $\angle$5=$\angle$1 because they are corresponding angles so $\angle$5 = 76° and $\angle$3 is 42° because 76 +62 = 138 and 180 – 138 = 42*_______

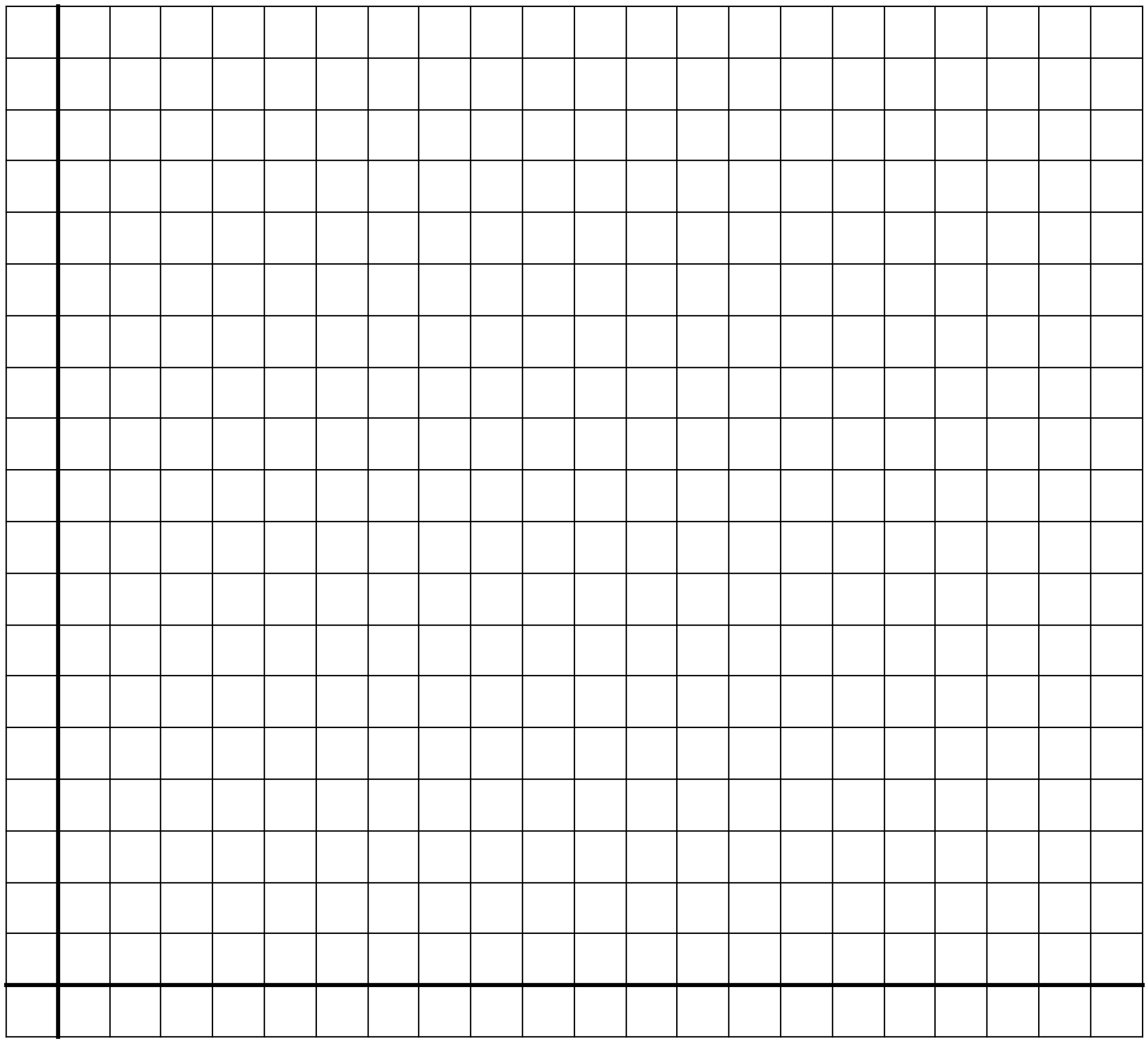
   c) $\angle 6$= ___*62°*___________ *because* _____________*alternate angle to $\angle$4*________

   d) $\angle 7$= ___*42°*___________ *because* _____________*corresponding to $\angle$3*________

4. If you were to form an angle from points CDB, what would the measure of the angle be? Why? *The measure would be 76° because it is an alternate interior angle with CD forming a transversal between two parallel lines because all three triangles are congruent, therefore the line connecting the points would be parallel to the line formed at the base.*

5. What would an angle formed by EDF be congruent to angle CBD measure? Justify your answer. *They would measure 42 degrees. These would be congruent because they are corresponding angles.*

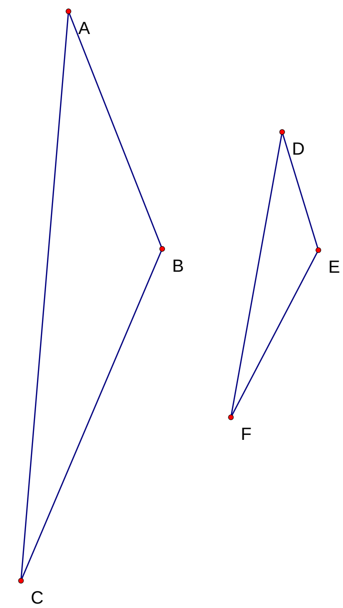
Unit 3, Activity 3, Grid Paper



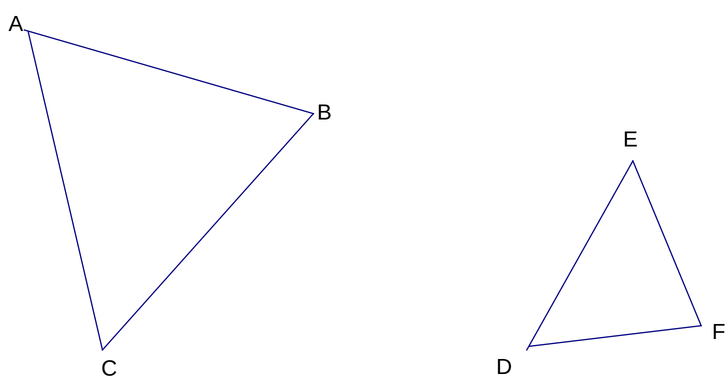
Unit 3, Activity 3, Angle Similarity

Name ________________________ Date ________________ Hour ____________

1. The triangles at the right are similar. Angle E measures 135° and angle A measures 27°. Find the measures of all of the angles in each triangle.

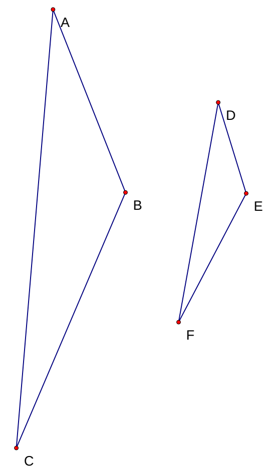


2. Use the angle-angle similarity rule to determine if the triangles are similar. Prove your answer.
   $\angle$ A = 62°
   $\angle$B = 70°
   $\angle$F = 70°
   $\angle$D = 58°



Unit 3, Activity 3, Angle Similarity with Answers

1. The triangles at the right are similar. Angle E measures 135° and angle A measures 27°. Find the measures of all of the angles in each triangle.



$\angle A = 27^\circ$

$\angle B = 135^\circ$

$\angle C = 18^\circ$

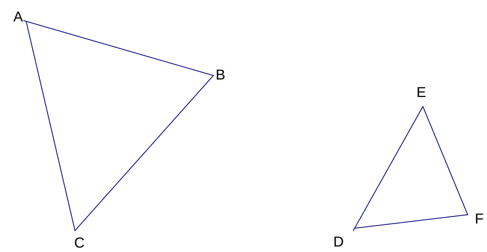
$\angle D = 27^\circ$

$\angle E = 135^\circ$

$\angle F = 18^\circ$

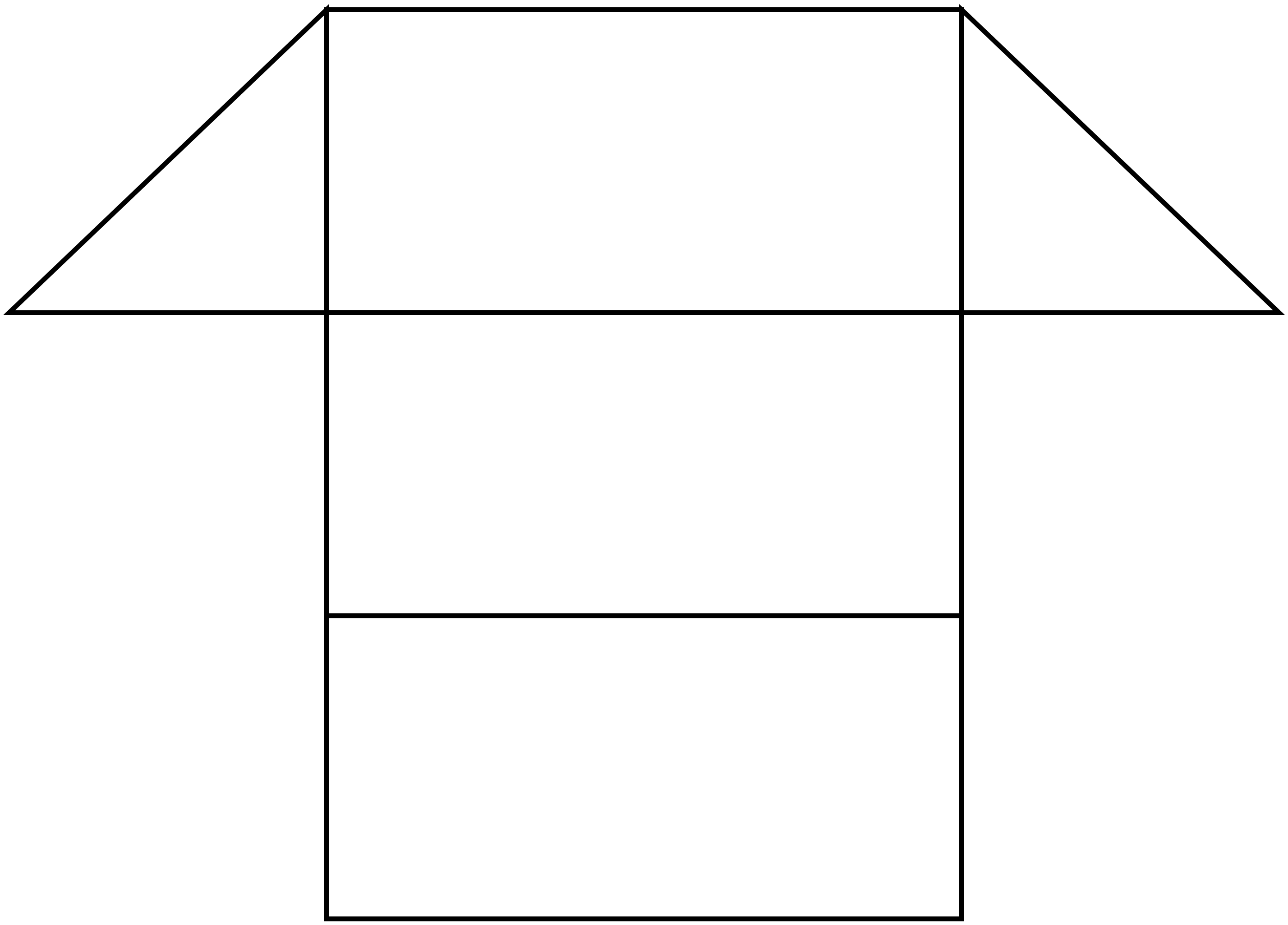
2. Use the angle-angle similarity rule to determine if the triangles are similar. Prove your answer.

$\angle$ A = 62°
$\angle$B = 70°
$\angle$F = 70°
$\angle$D = 58°

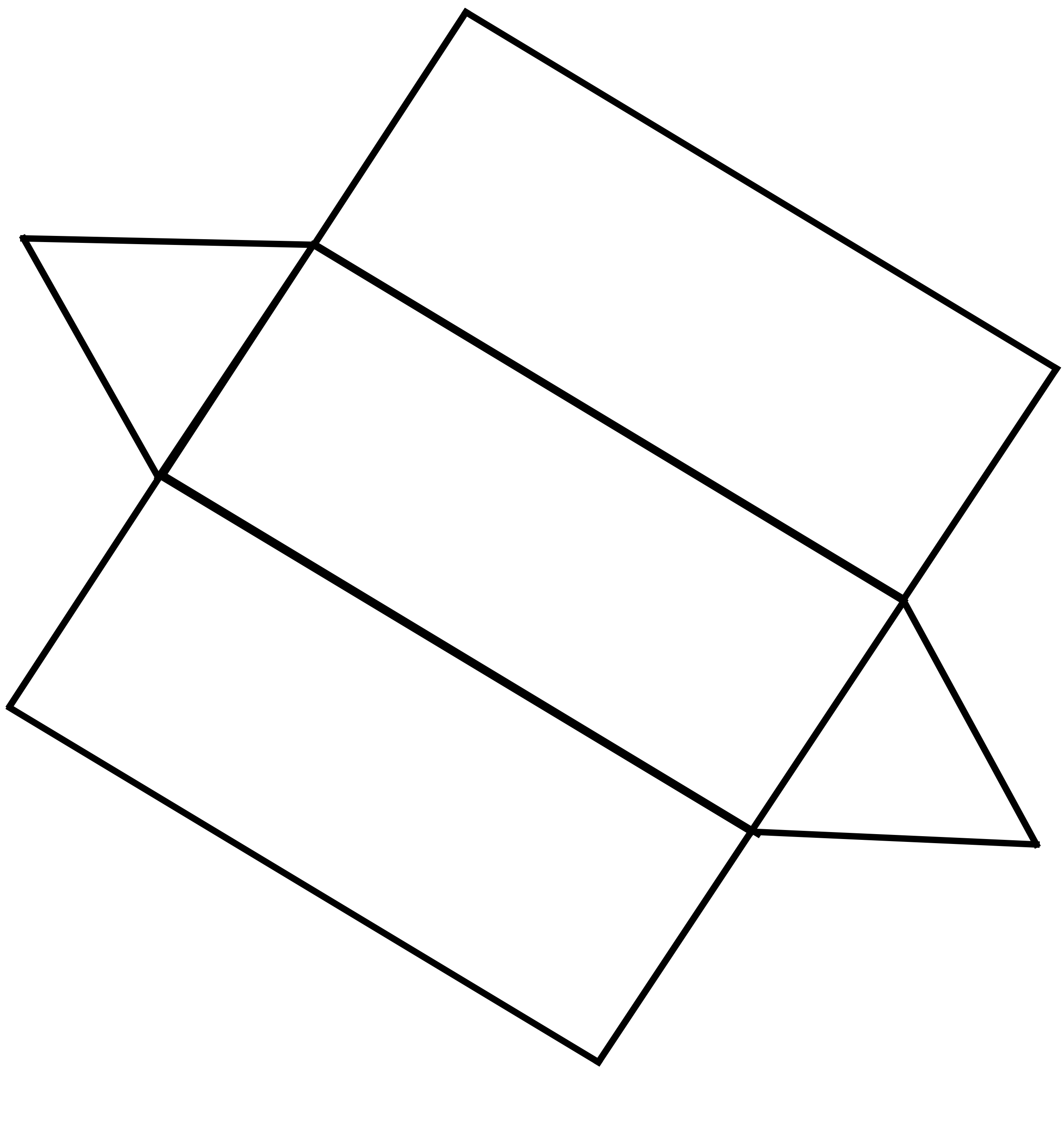


$\angle A + \angle B + \angle C = 180^\circ$ *because it is a triangle.*
$\angle A + \angle B = 132$
$180 – 132 = 48$
$\angle C = 48^\circ$

$\angle D + \angle E + \angle F = 180^\circ$ *because it is a triangle.*
$\angle D + \angle F = 128$
$180 – 128 = 58$
$\angle E = 58^\circ$
No the triangles are not similar because there are not two angles that are congruent in the triangles.



Unit 3, Activity 4, Triangular prism



Name ________________________________ Date __________________ Hour ____________

# cubes used for model	Length of rectangular prism built (linear units)	Width of rectangular prism built (linear units)	Height of rectangular prism built (linear units)	Volume of rectangular prism built (cubic units)	Surface Area of rectangular prism built (square units)
16					

Exploring Volume and Surface Area

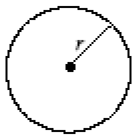
# cubes used for model	*Length of rectangular prism built (linear units)*	*Width of rectangular prism built (linear units)*	*Height of rectangular prism built (linear units)*	*Volume of rectangular prism built (cubic units)*	*Surface Area of rectangular prism built (square units)*
16	*16 units*	*1 unit*	*1 unit*	*16* u^3	*66*u^2
16	*8 units*	*2 units*	*1 unit*	*16* u^3	*52*u^2
16	*4 units*	*4 units*	*4 units*	*16* u^3	*24*u^2
The number of cubes will vary as students build other rectangular solids.					

LEAP

MATHEMATICS REFERENCE SHEET - GRADE 8

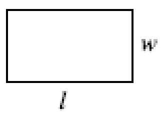
Use the information below to answer questions on the Mathematics test.

Circle



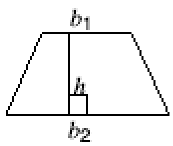
$\pi \approx 3.14$
Area $= \pi \cdot r^2$
Circumference $= 2\pi \cdot r$

Rectangle



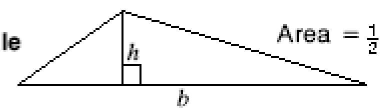
Area $= l \cdot w$
Perimeter $= 2(l + w)$

Trapezoid



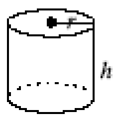
Area $= \frac{1}{2}h(b_1 + b_2)$

Triangle



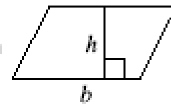
Area $= \frac{1}{2}b \cdot h$

Cylinder



Volume $= \pi \cdot r^2 \cdot h$
Surface Area $= 2\pi \cdot r^2 + 2\pi \cdot r \cdot h$

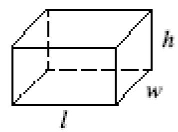
Parallelogram



Area $= b \cdot h$

Pythagorean Theorem: $a^2 + b^2 = c^2$

Rectangular Solid



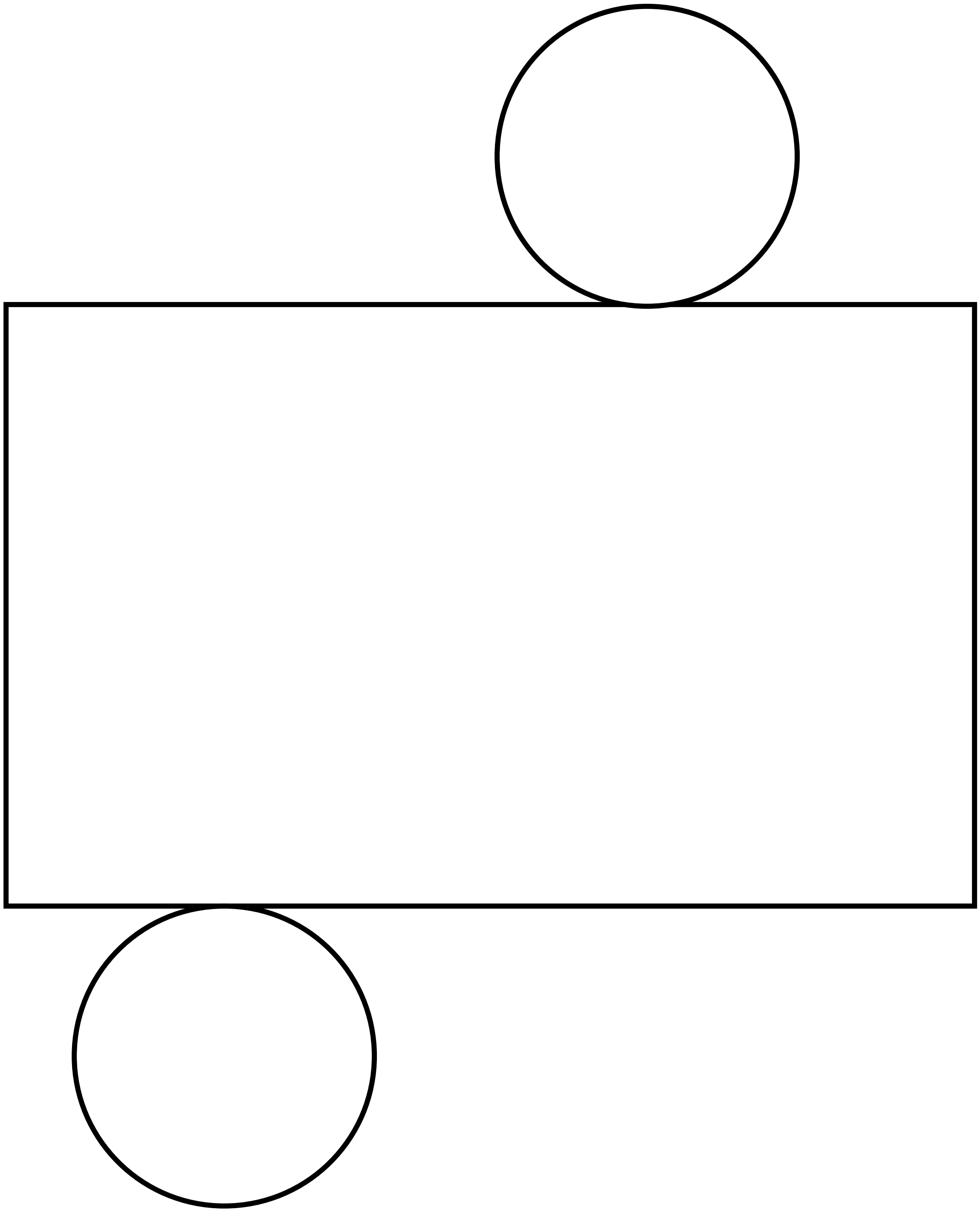
Volume $= l \cdot w \cdot h$
Surface Area $= 2wl + 2lh + 2wh$

Distance Formula: distance = rate • time

Mean:	In a collection of data, the sum of all the data divided by the number of data
Median:	The middle number or average of the two middle numbers in a collection of data when the data are arranged in order
Mode:	The number or numbers that occur most often in a collection of data
Range:	The difference between the greatest and the least numbers in a collection of data

Metric Units of Length
1 kilometer = 1,000 meters
1 centimeter = 0.01 meter
1 millimeter = 0.001 meter

U.S. Unit Conversions
8 fluid ounces = 1 cup
2 cups = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon
16 ounces = 1 pound
5,280 feet = 1 mile



This cone was drawn so that it will fit inside of the cylinder for comparison. Popcorn kernels can be used to fill the cone and then poured into the cylinder to show the one-third relationship of the volume. Not for mastery at the eighth grade level.

Unit 3, Activity 8, Cones

Name ______________________________ Date ________________ Hour _____________

Cut out the Model for Cone BLM and make a slit for the radius.

Form a cone by sliding point “L” so that it touches point “A”.
Measure the approximate diameter of the cone formed.
Measure the approximate height of the cone formed.
Record this information on the chart.

Complete the table below by sliding point “L” of the circle so that it lies on top of the points listed in the table. Use your centimeter ruler to measure the approximate diameter of the cone formed and the approximate height. (As you begin to make the cones from L to F and smaller diameters, it is easier to form the cone if a section is cut off the circle by cutting from point D to the center. This reduces the amount of the paper inside the cone.)

Point of intersection	**Approximate diameter of cone formed**	**Approximate height of cone formed**	**Approximate volume of the cone** $V=\frac{1}{3}\pi r^2 h$
L to A			
L to B			
L to C			
L to D			
L to E			
L to F			
L to G			
L to H			
L to I			

Use the data you collected in your chart to make the following observations:

1. How does the change affect the volume of the cone?

2. How do the changes in the diameter and height affect the surface area of the cone?

3. Is there a maximum height of a cone formed from a circle? Explain.

Unit 3, Activity 8, Cones with Answers

Cut out the circle on the Model for Cone BLM and make a slit for the radius.
Form a cone by sliding point “L” so that it touches point “A”.
Measure the approximate diameter of the cone formed.
Measure the approximate height of the cone formed.
Record this information on the chart.

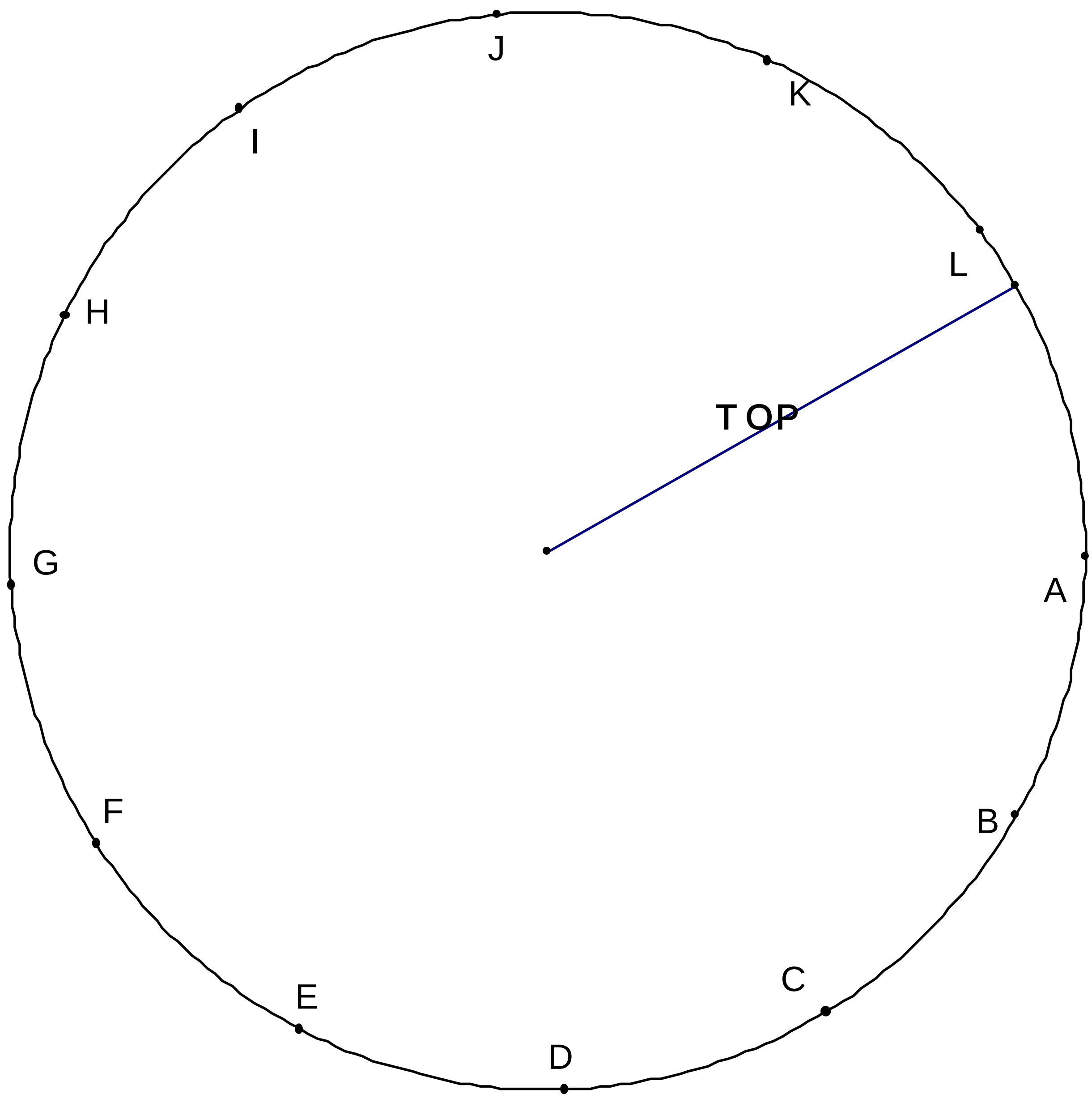
Complete the table below by sliding point “L” of the circle so that it lies on top of the points listed in the table. Use your centimeter ruler to measure the approximate diameter of the cone formed and the approximate height.

Point of intersection	**Approximate diameter of cone formed**	**Approximate height of cone formed**	**Approximate volume of the cone**
L to A	*≈15 cm*	*≈3cm*	*≈177cm*^{3}
L to B	*≈ 13cm*	*≈4.5cm*	*≈199cm*^{3}
L to C	*≈12cm*	*≈5.5cm*	*≈207 cm*^{3}
L to D	*≈11*	*≈6*	*≈190 cm*^{3}
L to E	*≈9*	*≈6.5*	*≈138 cm*^{3}
L to F	*≈8*	*≈7*	*≈117cm*^{3}
L to G	*≈7*	*≈7.25*	*≈93cm*^{3}
L to H	*≈5.5*	*≈7.5*	*≈ 59cm*^{3}
L to I	*≈4*	*≈8*	*≈34cm*^{3}

Use the data you collected in your chart to make the following observations:

1. How does the change affect the volume of the cone?
   As the diameter decreases, the height increases and the volume decreases.
2. How do the changes in diameter of the cone and height affect the surface area of the cone?
   The surface area decreases as the diameter decreases.
3. Is there a maximum height of a cone formed from a circle? Explain

The height of a cone formed from a circle must be less than the radius of the circle. A cone cannot be formed with a height equal to the radius.


J
K
I
L
H
TOP
G
A
F
B
C
E
D

Name ______________________________________ Date ___________________ Hour _____

1. What measurements do you think you will need from a sphere (ball) to find the volume?

2. Predict the volume of the ball your group has been given. ___________________

3. Substitute the value(s) you need into the formula $V = \frac{4}{3}\pi r^3$ to find the volume of the sphere.

4. Use the formula for finding the volume of a sphere to find the volume of the spheres in a – d.

a) 

diameter 2 inches

b)  diameter of marble: 1.2 cm

c)  diameter of red rubber ball: 12.6 inches

d) 

diameter of basketball: 24.26 inches

Unit 4, Activity 1, Vocabulary Self-Awareness

Name ____________________________________ Date _____________ Hour __________

Put a (+) in the blank for each word that you are comfortable with the definition.
Put a (✓) in the blank for each word that you are not quite certain of the definition.
Put a (-) in the blank for each word that is brand new to you and you have no understanding of the vocabulary word.

Write a definition and give an example of each of the words. If you are not sure of the word's definition, make a guess and during the unit you will have time to update your definitions as the terms are developed.

Word	+	✓	**-**	**Example**	**Definition**
input					
output					
coefficient					
slope					
linear equations					
proportional relationship					
unit rate					
equivalent ratio					
equivalent fraction					

One potato chip costs $0.15

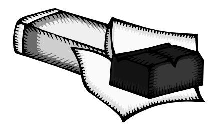
Unit 4, Activity 1, Choose the Better Buy

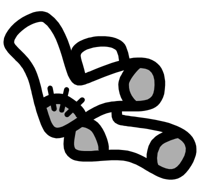
Name ______________________________________ Date _____________ Hour __________

Choose the better buy

1. Soda at Store A sells for $3.59 for six, and at Store B the soda sells 12 for $7.15. Which is the better buy? Show your thinking.

2. Candy bars are selling at Store A 10 for $5.50. At Store B the same candy bars are 5 for $2.30. Which is the better buy? Show your thinking.





3. Store A decides to sell socks in a package of 12 for $17.25. Store B puts the same socks on sale for $1.40/pair. Which is the better buy? Show your thinking.

4. Justin found a CD player at Store A for $79.98 and he gets a 30% discount off the price. At Store B, the CD player is marked $55.00. Which is the better buy? Why?

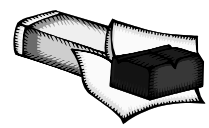
Unit 4, Activity 1, Choose the Better Buy with Answers

Choose the better buy

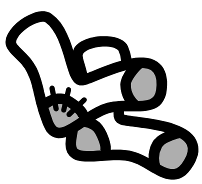
1. Soda at Store A sells for $3.59 for six, and at Store B the soda sells 12 for $7.15. Which is the better buy? Show your thinking.

   At store A the unit price for one soda is $.60 (.595833) and store B the price would also be $.60 (.5983333). Because the money is always rounded to the hundredths, there would be no better buy.

2. Candy bars are selling at Store A 10 for $5.50. At Store B the same candy bars are 5 for $2.30. Which is the better buy? Show your thinking.



   Store B has a unit price of $.46 per candy bars and Store A has a unit price of $.55. Store B has the better buy.



3. Store A decides to sell socks in a package of 12 for $17.25. Store B puts the same socks on sale for $1.40/pair. Which is the better buy? Show your thinking.

   Store B has the better buy because the unit price for socks at store A is $1.44/pair.

4. Justin found a CD player at Store A for $79.98, and he gets a 30% discount off the price. At Store B, the CD player is marked $55.00. Which is the better buy? Why?

   With the 30% discount off $79.98, the sale price would be $55.99, so Store B is the better buy at $55.00.

Unit 4, Activity 2, Refreshing Dance

Name_________________________________ Date __________ Hour ________

Use the data in the chart below to determine the total cost of getting the concession stand ready for the Friday night dance if there are 200 students predicted to attend.

Item	Cost per unit	Amount needed per student	Price per student	Amount needed	Total cost of item (200 students)
Soda	$1.19/2-liter soda	50 mL			
Candy bars	$8.99/box of 36 bars	1 bar			
Popcorn	$1.19/bag which pops about 5 gallons of popcorn	1 quart			
Pizza	$5.00/pizza divided into 8 equal slices	1 slice			

1. If 250 students attend the dance and every student in attendance orders a slice of pizza, how many extra pizzas must be ordered?

2. If there are only 150 students who want to purchase a box of popcorn, how much profit would be made if every box sells for $0.75?

Unit 4, Activity 2, Refreshing Dance with Answers

Use the data in the chart below to determine the total cost of getting the concession stand ready for the Friday night dance if there are 200 students predicted to attend.

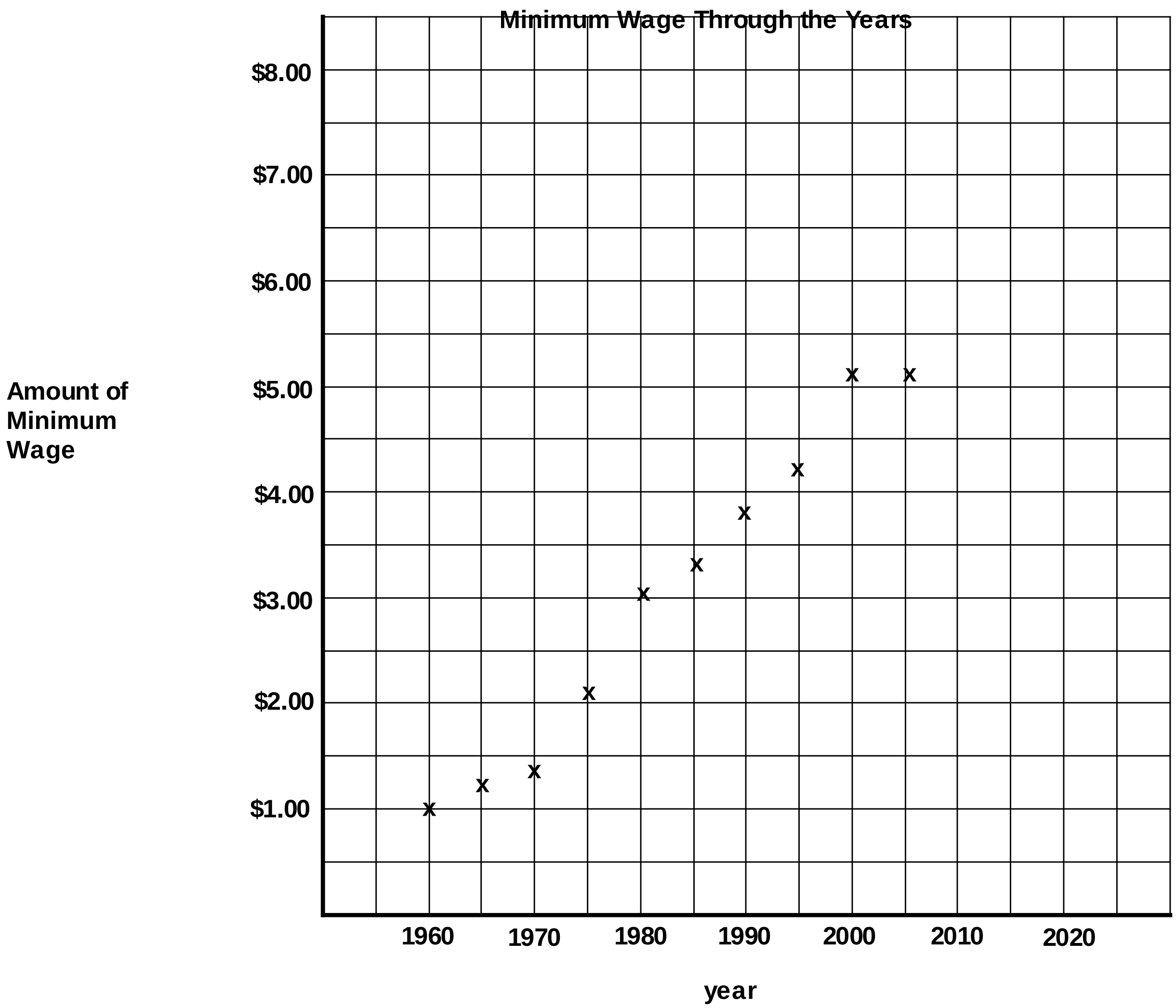
Item	Cost per unit	Amount needed per student	Price per student	Amount needed	Total cost of item (200 students)
Soda	*$1.19/2 liter soda*	*50 mL*	*$.03/student*	*10 2L bottles*	*$5.95*
Candy bars	*$8.99/box of 36 bars*	*1 bar*	*$.25/student*	*must buy the 6th box to get 200 bars*	*$53.94*
Popcorn	*$1.19/bag which pops about 5 gallons of popcorn*	*1 quart*	*$.06/student*	*Need 10 bags*	*$11.90*
Pizza	*$5.00/pizza divided into 8 equal slices*	*1 slice*	*$.63/student*	*Need 25 pizzas*	*$125*

1. If 250 students attend the dance and every student in attendance orders a slice of pizza, how many extra pizzas must be ordered?
   Must order 7 more pizzas because 8 is not a factor of 50.

2. If there are only 150 students who want to purchase a box of popcorn, how much profit would be made if every box sells for $0.75?
   150 x $.06 = $9.00 to purchase the popcorn and if this sells for $.75/box, 150 x .75 = $112.50; therefore, 112.50 – 9.00 = $103.50 profit

Wages and Benefits: Value of the Minimum Wage (1960-Current)

Effective Date	*1938 Act* [1]	*1961 Amendments* [2]	*1966 and Subsequent Amendments*[3]	
			Nonfarm	*Farm*
Oct 24, 1938	$0.25			
Oct 24, 1939	$0.30			
Oct 24, 1945	$0.40			
Jan 25, 1950	$0.75			
Mar 1, 1956	$1.00			
Sep 3, 1961	$1.15	$1.00		
Sep 3, 1963	$1.25			
Sep 3, 1964		$1.15		
Sep 3, 1965		$1.25		
Feb 1, 1967	$1.40	$1.40	$1.00	$1.00
Feb 1, 1968	$1.60	$1.60	$1.15	$1.15
Feb 1, 1969			$1.30	$1.30
Feb 1, 1970			$1.45	
Feb 1, 1971			$1.60	
May 1, 1974	$2.00	$2.00	$1.90	$1.60
Jan. 1, 1975	$2.10	$2.10	$2.00	$1.80
Jan 1, 1976	$2.30	$2.30	$2.20	$2.00
Jan 1, 1977			$2.30	$2.20
Jan 1, 1978	$2.65 for all covered, nonexempt workers			
Jan 1, 1979	$2.90 for all covered, nonexempt workers			
Jan 1, 1980	$3.10 for all covered, nonexempt workers			
Jan 1, 1981	$3.35 for all covered, nonexempt workers			
Apr 1, 1990[4]	$3.80 for all covered, nonexempt workers			
Apr 1, 1991	$4.25 for all covered, nonexempt workers			
Oct 1, 1996	$4.75 for all covered, nonexempt workers			
Sep 1, 1997[5]	$5.15 for all covered, nonexempt workers			
Jul 24, 2007	$5.85 for all covered, nonexempt workers			
Jul 24, 2008	$6.55 for all covered, nonexempt workers			
Jul 24, 2009	$7.25 for all covered, nonexempt workers			


Minimum Wage Through the Years
Amount of Minimum Wage
$8.00
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
1960
1970
1980
1990
2000
2010
2020
year

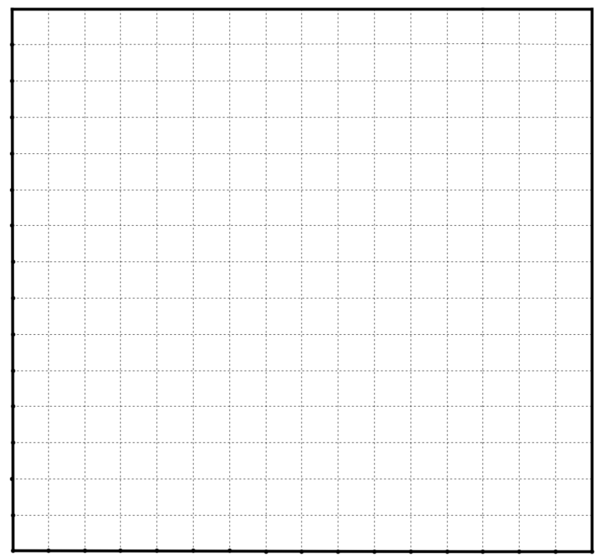
Unit 4, Activity 3, Grid

Name ________________________________ Date ___________ Hour _______

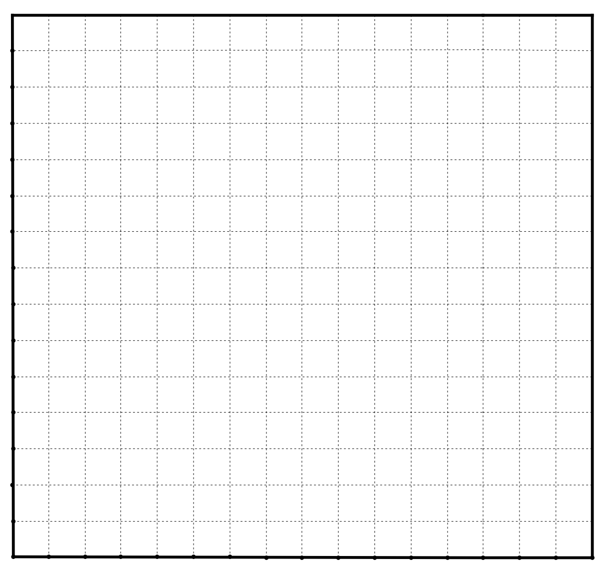
Rates and Proportions

For each of the following problems, draw a graph of the relationship between the quantities and describe how the unit rate is illustrated by the slope of the graph in the relationship. Write at least 2 proportions from each situation using ordered pairs from the graph.

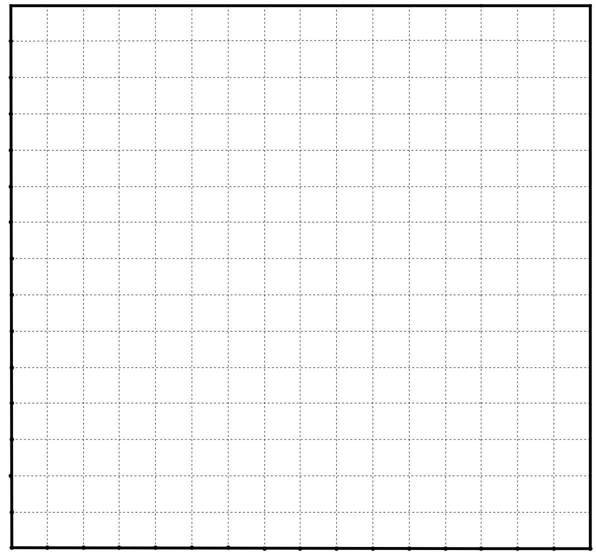
1. Lunches in the cafeteria are $1.75 each.



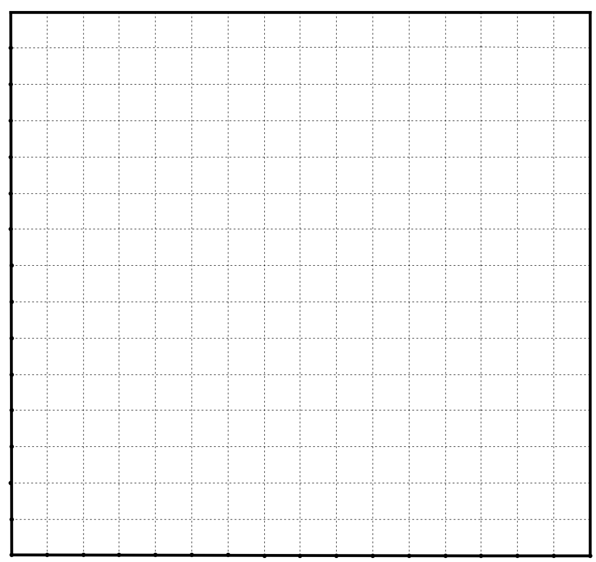
2. Ms Williams gives three quizzes every two weeks.



3. Every week, grandmother receives 3 letters.



4. Baily adds $25 to his savings account each month.



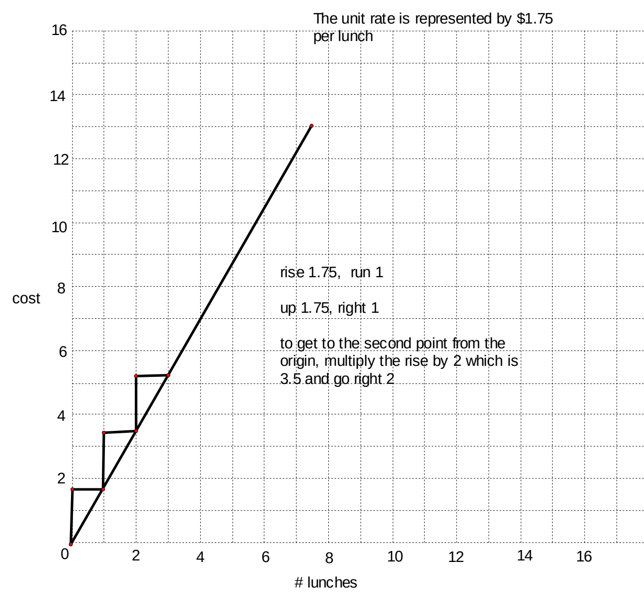
Rates and Proportions

For each of the following problems, draw a graph of the relationship between the quantities and describe how the unit rate is illustrated by the slope of the graph in the relationship. Write at least 2 proportions from each situation using ordered pairs from the graph

1. Lunches in the cafeteria are \$1.75 each.

$$\frac{y}{x}=\frac{1.75}{1}=\frac{3.5}{2}=\frac{5.25}{3}$$

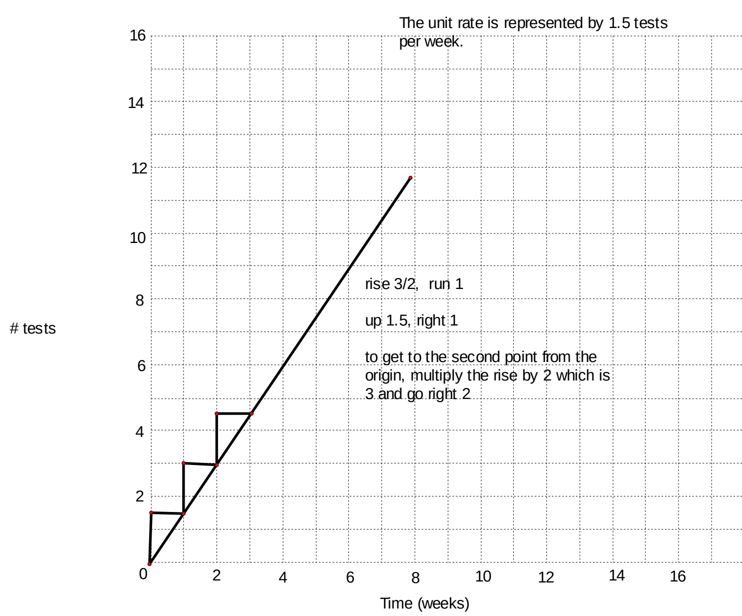
The value of y will always be the number of lunches times 1.75, so the rise over the run will be the unit rate and the proportional values.



2. Ms. Williams gives three quizzes every two weeks.

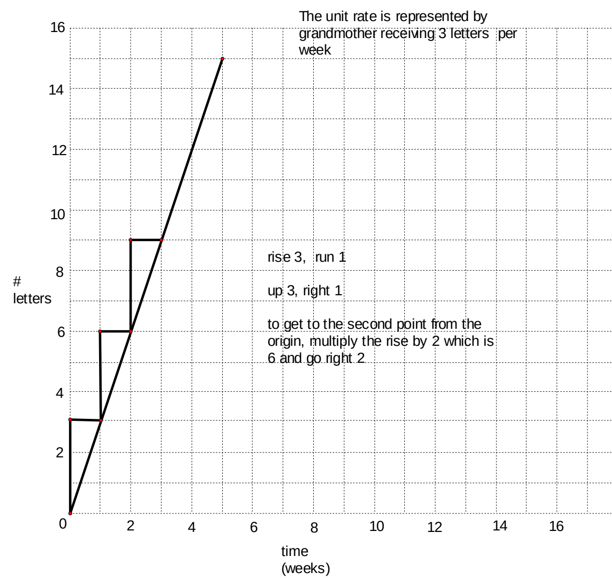
$$\frac{y}{x}=\frac{3}{2}=\frac{6}{4}=\frac{9}{6}$$

The number of quizzes will always be 1.5 times the number of weeks, so the rise over the run will be the unit rate and the proportional values.



3. Every week, grandmother receives 3 letters. $\frac{3}{1}=\frac{6}{2}=\frac{9}{3}$

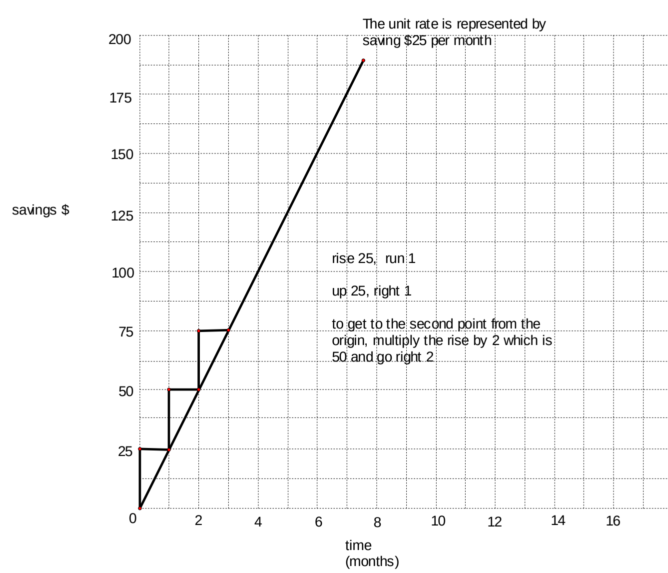
The total number of letters that grandmother receives is 3 times the number of weeks, so the rise over the run will be the unit rate and the proportional values.



4. Baily adds $25 to his savings account each month.

$$\frac{25}{1}=\frac{50}{2}=\frac{75}{3}$$

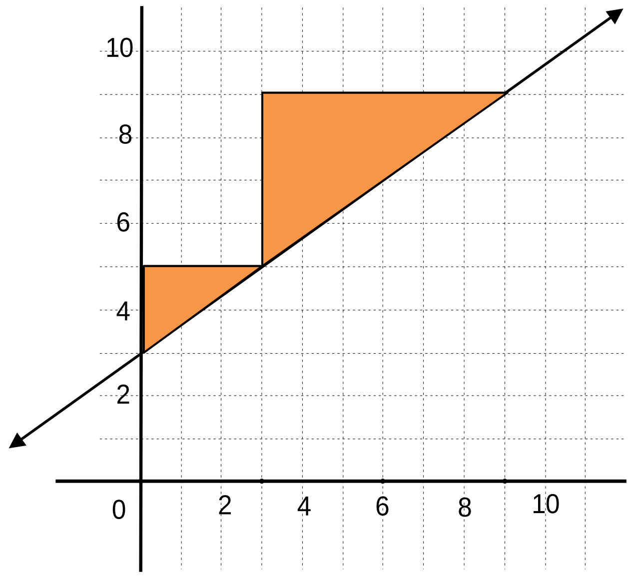
The amount of money in Bailey's savings account is $25 times the number of months, so the rise over the run will be the unit rate and the proportional values.



Name ________________________________ Date ______________ Hour __________

1) The diagonal line at the right is not vertical. Label the vertices of the two triangles that are drawn along the diagonal with the ordered pair that represents each vertex.

2) The diagonal line on the coordinate grid provides the third side of two similar triangles. Prove that these two triangles are similar using ratios of the lengths of their corresponding sides. Compare the vertical side length to the horizontal side length.



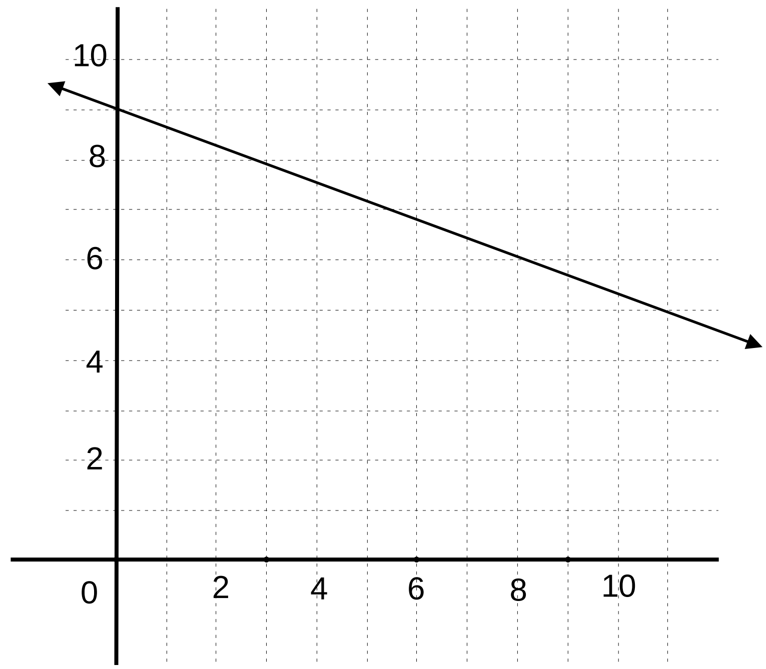
3) Find the slope of each of the triangles using the ratio of $\frac{rise}{run}$ or the slope formula $m = \frac{y_1 - y_2}{x_1 - x_2}$.

4) Compare the ratio in #2 to the slope in #3. What is true of the ratios?

5) Work with your shoulder partner and form a conjecture from the information you have gathered. Extend your proof to include one more triangle along the line.

6) What is the *y*-intercept of this line? Write the equation for the line.

On the grid at the right, prove whether the conjecture from #5 holds true for the line that is not vertical.



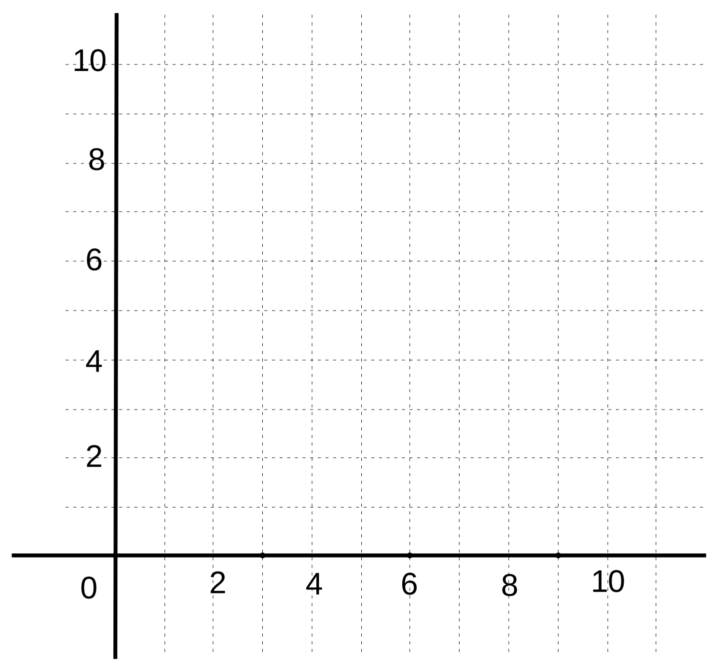
7) Show the ratios of two similar triangles along the line.

8) What is the slope of the line.

How do the ratio and slope compare?

9) Write the equation for the line.

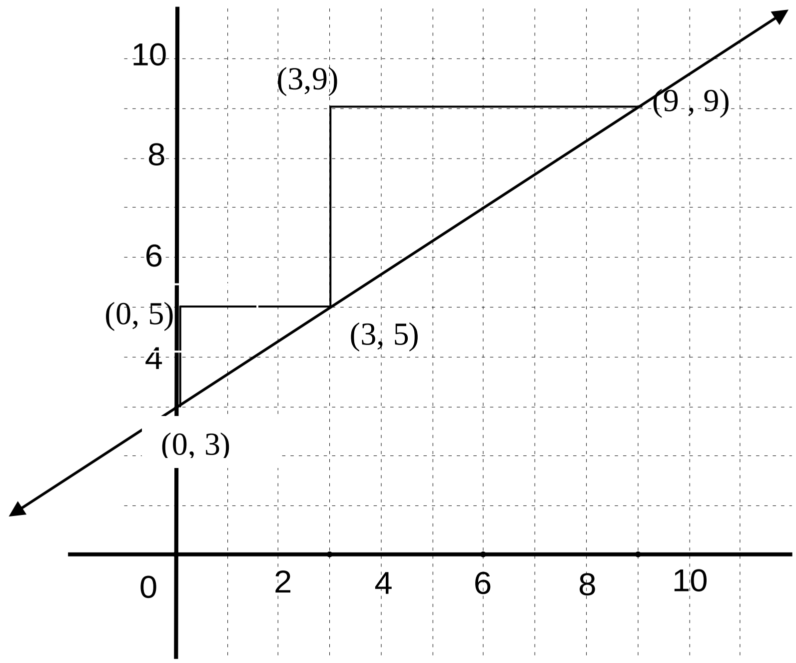
10) Draw a line on the grid below that intersects the origin and point (2, 2).



11) Write the ratios for two triangles along the line. Show your triangles.

12) Explain how the equation for this line is different from the equation for the lines in #6 and #9.

13) Does your conjecture still prove to be true?



1) The diagonal line at the right is not vertical. Label the vertices of the two triangles that are drawn along the diagonal with the ordered pair that represents each vertex.

2) The diagonal line on the coordinate grid provides the third side of two similar triangles. Prove that these two triangles are similar using ratios of the lengths of their corresponding sides. Compare the vertical side length to the horizontal side length.

Small triangle $\dfrac{vertical_1}{horizontal_1} = \dfrac{2}{3}$

Large triangle $\dfrac{vertical_2}{horizontal_2} = \dfrac{4}{6}$

$\dfrac{2}{3} = \dfrac{4}{6}$ *yes, they are similar*

3) Find the slope of each of the triangles using the ratio of $\dfrac{rise}{run}$ or the slope formula $m = \dfrac{y_1 - y_2}{x_1 - x_2}$.

Small Triangle slope: $\dfrac{rise}{run} = \dfrac{2}{3}$ $\quad \dfrac{5-3}{3-0} = \dfrac{2}{3}$

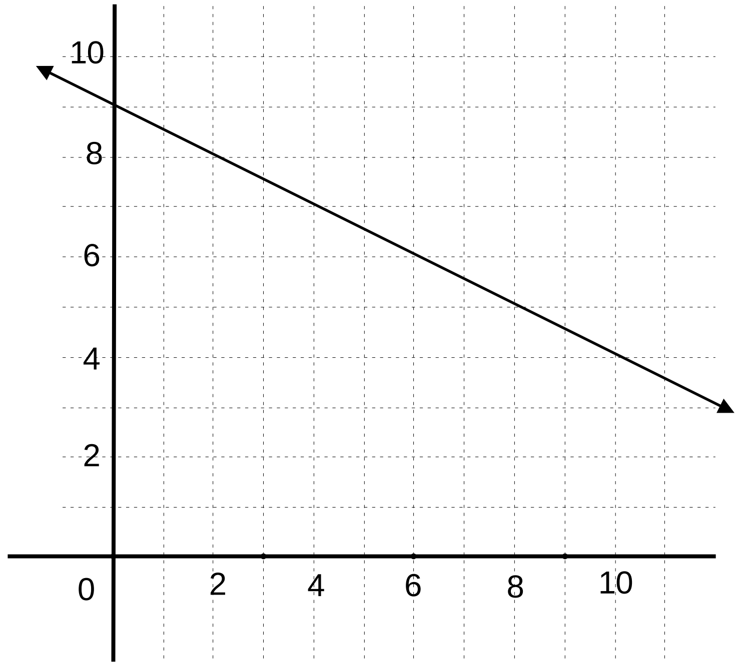
Large Triangle Slope: $\dfrac{rise}{run} = \dfrac{4}{6}$ $\quad \dfrac{9-5}{9-3} = \dfrac{4}{6}$

4) Compare the ratio in #2 to the slope in #3. What is true of the ratios?
The ratios and the slopes are equivalent.

5) Work with your shoulder partner and form a conjecture from the information you have gathered. Extend your proof to include one more triangle along the line.

6) What is the y-intercept of this line? Write the equation for the line.
3 is the y intercept and the equation is $y = \frac{2}{3}x + 3$

On the grid at the right, prove whether the conjecture from #5 holds true for the line that is not vertical.



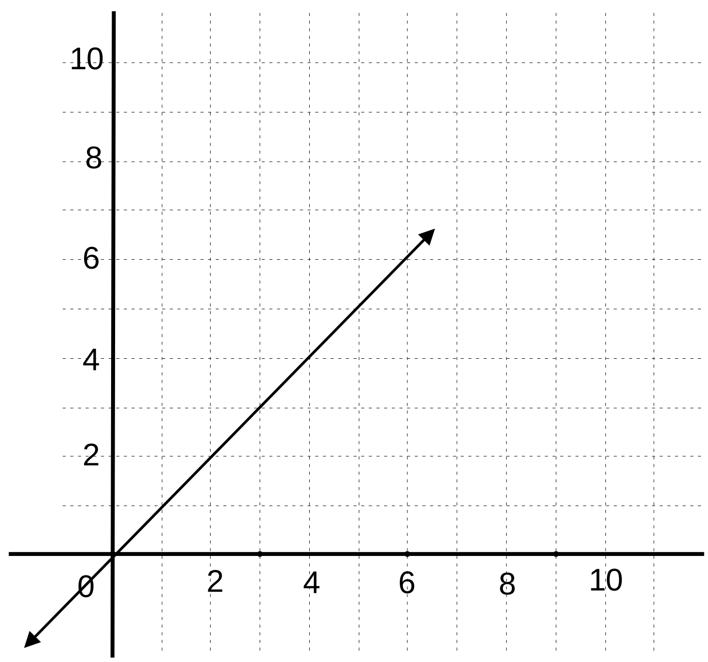
7) Show the ratios of two similar triangles along the line, comparing corresponding sides.
These will vary but possible are: $\frac{3}{6}, \frac{5}{10}$

8) What is the slope of the line.
$\frac{1}{2}$

How do the ratio and slope compare?

9) Write the equation for the line.
$y = -\frac{1}{2}x + 9$

10) Draw a line on the grid below that intersects the origin and point (2, 2).



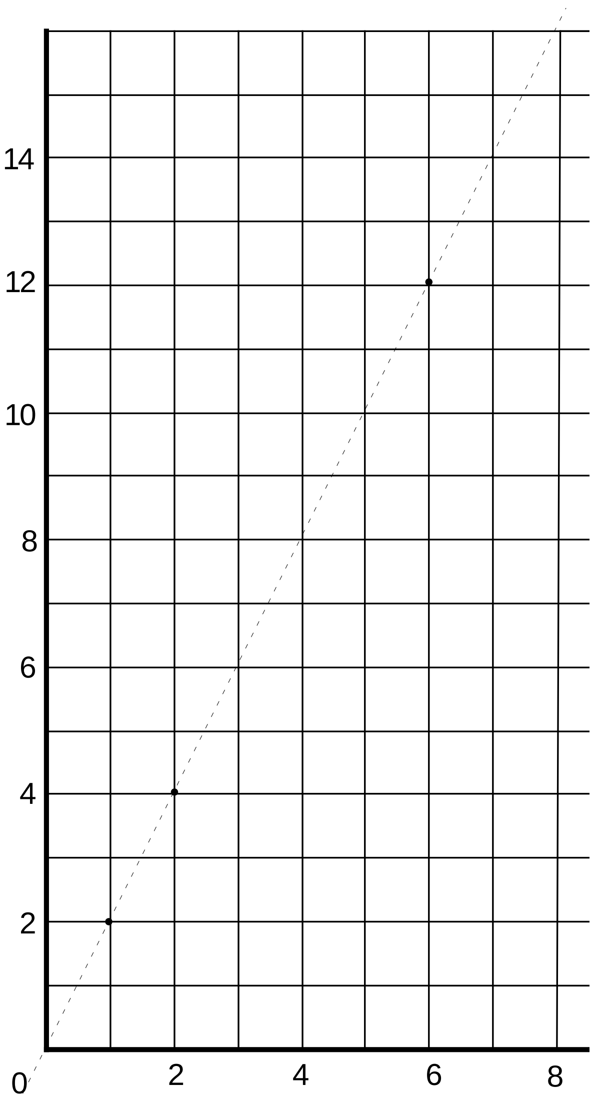
11) Write the ratios for two triangles along the line. Show your triangles.
Many different possible answers, possible vertical side/horizontal side is $\frac{1}{1}, \frac{4}{4}$

12) Write the equation for this line and explain how the equation for this line is the different from the equation for the lines in #6 and #9.
y = x; the slope of this line is one and the y intercept is 0. In #6 there was a y intercept of 3 and #9 a y intercept of 9

13) Does your conjecture still prove to be true? *Yes, the slope of the similar triangles is equal.*

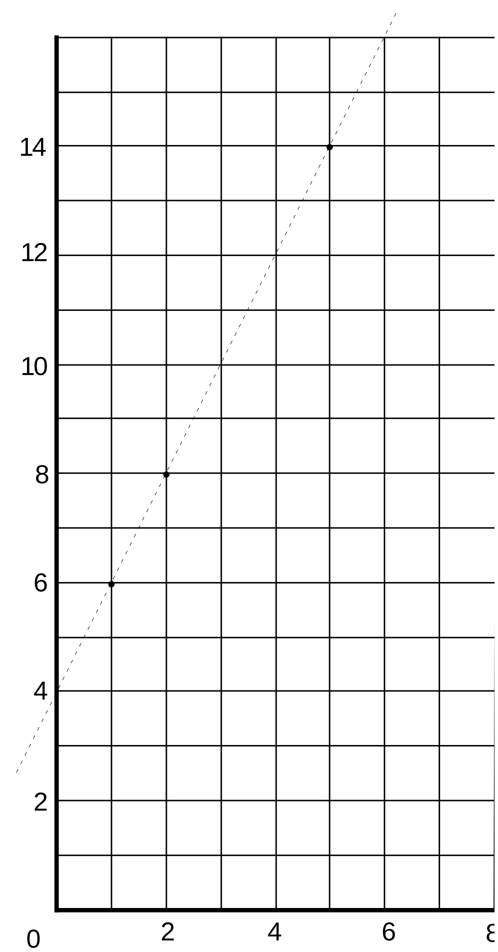
Unit 4, Activity 6, Developing Slope Formula

Name ______________________________________ Date _____________ Hour __________

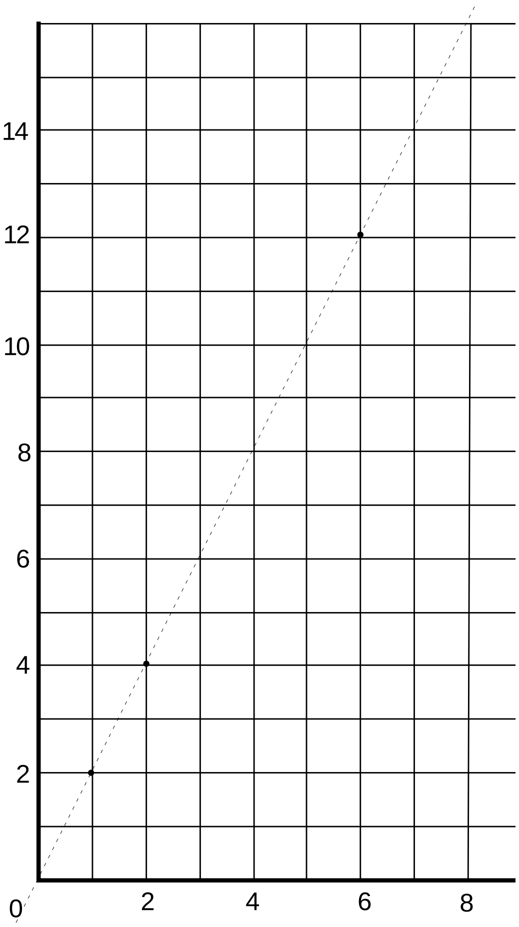


1) On the graph at the left, use the points shown to form a conjecture that any points along a linear graph that cross at the origin are proportional.

2) On the graph below at the right, prove whether the conjecture stated in #1 will stand true for the graph in #2. Explain.



3) Write at least two observations about the graphs in #1 and #2.



1) On the graph at the left, use the points shown to prove that any two points along a linear graph that cross at the origin are proportional.

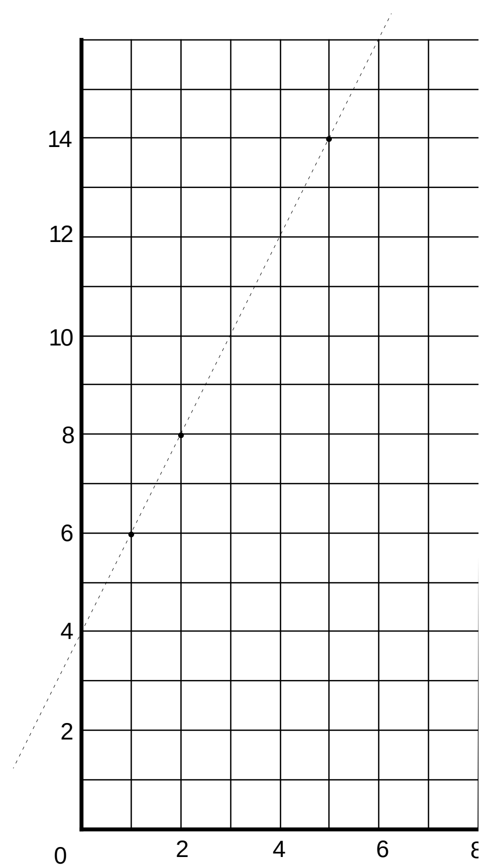
Using points (1,2) and (6,12) $\frac{1}{2}=\frac{6}{12}$ *and using points (2,4) and (6,12)* $\frac{2}{4}=\frac{6}{12}$. *This can be done as* $\frac{x}{y}$ *or* $\frac{y}{x}$

2) On the graph at the right, prove whether the conjecture stated in #1 will stand true for the graph in #2. Explain.

Using point (1,6) and (2,8) $\frac{1}{6}\neq\frac{2}{8}$ *so they are not proportional*

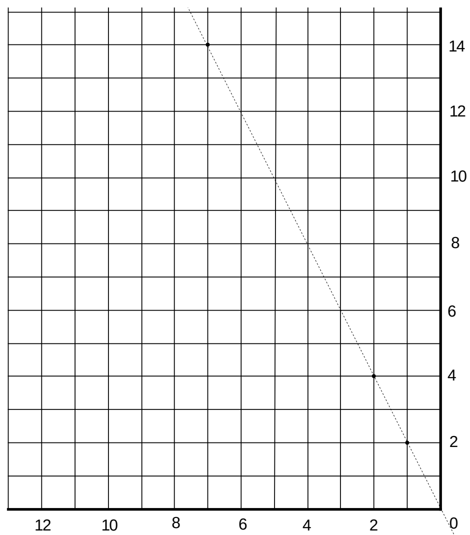
3) Write at least two observations about the graphs in #1 and #2.

Answers will vary, students might see that the two lines are parallel and that one crosses at the origin and the other crosses "y" at (0,4).



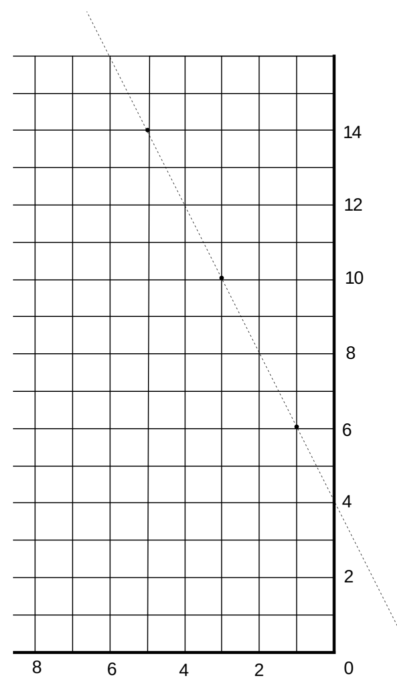
Unit 4, Activity 6, More Exploration with the Slope – y-intercept Form of an Equation

Name ___________________________________ Date ___________________ Hour ________



1) The graph to the left has a negative slope and crosses the *y*- axis at the origin. Determine if the relationship of the ordered pair (-1, 2), (-2, 4) and (-7, 14) are proportional. Justify your answer.

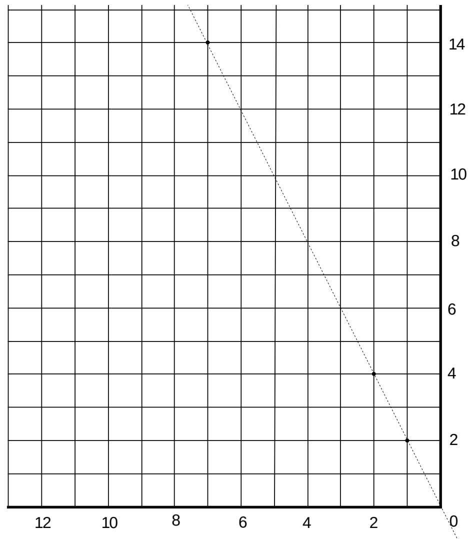
2) The graph to the right also has a negative slope. Using what was learned about the *y*-intercept with the graph having a positive slope, determine if the same rules hold true for graphs with a negative slope and do not cross the origin.



3) Write the equation for this line using the *slope-intercept* form of an equation.

Unit 4, Activity 6, More Exploration with the Slope -intercept Form of an Equation with Answers

Name ________________________________ Date __________________ Hour ________



1) The graph below has a negative slope and crosses the "*y*" axis at the origin. Determine if the relationships of the ordered pair (-1, 2), (-2, 4) and (-7, 14) are proportional. Justify your answer.

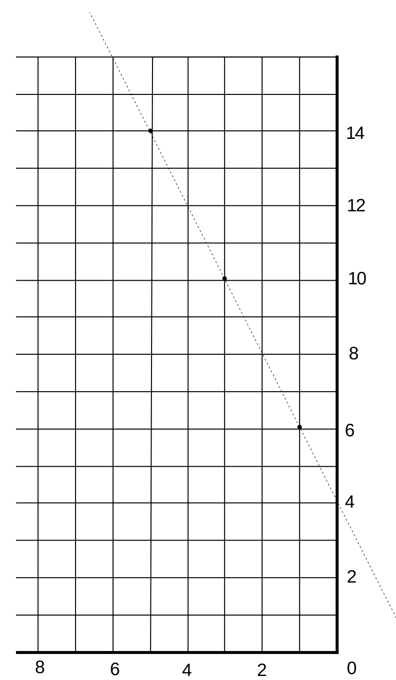
The points (-1, 2) and (-2, 4) are proportional shown by $\frac{y}{x} = \frac{2}{-1} = \frac{4}{-2}$ *so the slope of the line is -2*

$-2 = -2$

Points (-2, 4) and (-7, 14) are proportional.

$\frac{y}{x} = \frac{4}{-2} = \frac{14}{-7}$ *both of which we look at as* $\frac{y}{x} = \frac{m}{1}$, *the slope will be a -2 in both cases.*

2) The graph to the right also has a negative slope. Using what was learned about the *y*-intercept with the graph having a positive slope, determine if the same rules hold true for graphs with a negative slope, and do not cross the origin.



If the y-intercept, which is (0,4)' is subtracted from the y values of the ordered pair, the lines are the same just as with the positive slope. If you add the y intercept (4), you can use the same formula.

$\frac{y}{x} = \frac{6-4}{-1} = \frac{2}{-1} = -\left(\frac{2}{1}\right)$ *y = mx + b where "b" represents the "y-intercept"*

3) Write the equation for this line using the *slope-intercept* form of an equation.

With the same slope of -2, you can write

and with the y intercept not at the origin, $y = mx$

$y = mx + 4$

You can substitute the slope value and write y = -2x + 4 for the second graph's equation.

Unit 4, Activity 7, Grid

Unit 4, Activity 7, Camping Sounds

Name ______________________________ Date ____________ Hour ________

1. Raccoons ate 117 marshmallows total from three bags. The raccoons ate 47 from Sue's bag and 31 from Sam's bag. How many were eaten from Melissa's bag? Write your equation and solve.

2. Melissa ate some marshmallows on Saturday and 3 less on Sunday. She ate four times as many on Friday as she did on Saturday. If Melissa ate a total of 33 marshmallows, how many marshmallows did Melissa eat on Saturday? Write your equation and solve.

3. Jack wanted to go canoeing. He has carried the canoe for 14 minutes. The trip should take 21 minutes for him to get to the lake. How much more time, *t*, does he have to walk?

   Write your equation. Make a graph of Jack's walk to the lake if he walks $\frac{1}{4}$ mile every 3 minutes.

4. Sam is hiking on a trail that is 280 feet long. He has hiked 20 feet less than half the distance. How far, *d*, has he walked? Write your equation and solve. If Sam walks 10 feet per second and completes the trail, make a graph of his hike along the trail.

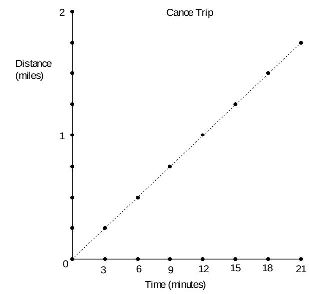
5. A bag of marshmallows has about 150 small marshmallows in each bag. Campers took marshmallows on a camping trip. A group of raccoons came to the campsite and ate about 20 marshmallows each hour. Make a table of values to find the length of time it took for the raccoons to eat the bag of marshmallows. Graph your values on the Grid for Questions 5 and 6 BLM. Do not forget to label your graph.

6. Jack wants to canoe down river. The guide told him that the average speed down river is 20 mph. Jack will leave the campsite to canoe at 10:20 a.m. Make a table of values to find how far Jack will have gone by 5:00 p.m. Graph your values on the Grid for Questions 5 and 6 BLM. Do not forget to label your graph.

Unit 4, Activity 7, Camping Sounds with Answers

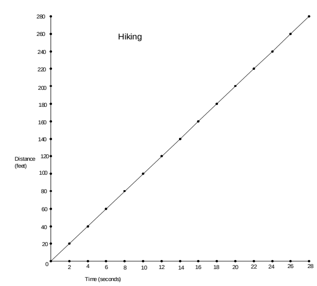
1. Raccoons ate 117 marshmallows total from three bags. The raccoons ate 47 from Sue's bag and 31 from Sam's bag. How many were eaten from Melissa's bag? Write your equation and solve. *Solution:* $117 = 31 + 47 + n; n = 39$

2. Melissa ate some marshmallows on Saturday and 3 less on Sunday. She ate four times as many on Friday as she did on Saturday. If Melissa ate a total of 33 marshmallows, how many marshmallows did Melissa eat on Saturday? Write your equation and solve. *Solution* $33 = 4(x) + x + (x - 3);\ \ x = 6$



3. Jack wanted to go canoeing. He has carried the canoe for 14 minutes. The trip should take 21 minutes for him to get to the lake. How much more time, *t*, does he have to walk? Write your equation. *Solution: 21 – 14 = t ;* Make a graph of Jack's walk to the lake if he walks $\frac{1}{4}$ mile every 3 minutes.

4. Sam is hiking on a trail that is 280 feet long. He has hiked 20 feet less than half the distance. How far, *d*, has he walked? Write your equation and solve. *Solution:* $\frac{280}{2} - 20 = d; d = 120\ \text{feet}$ If Sam walks 10 feet per second and completes the trail, make a graph of his hike along the trail.



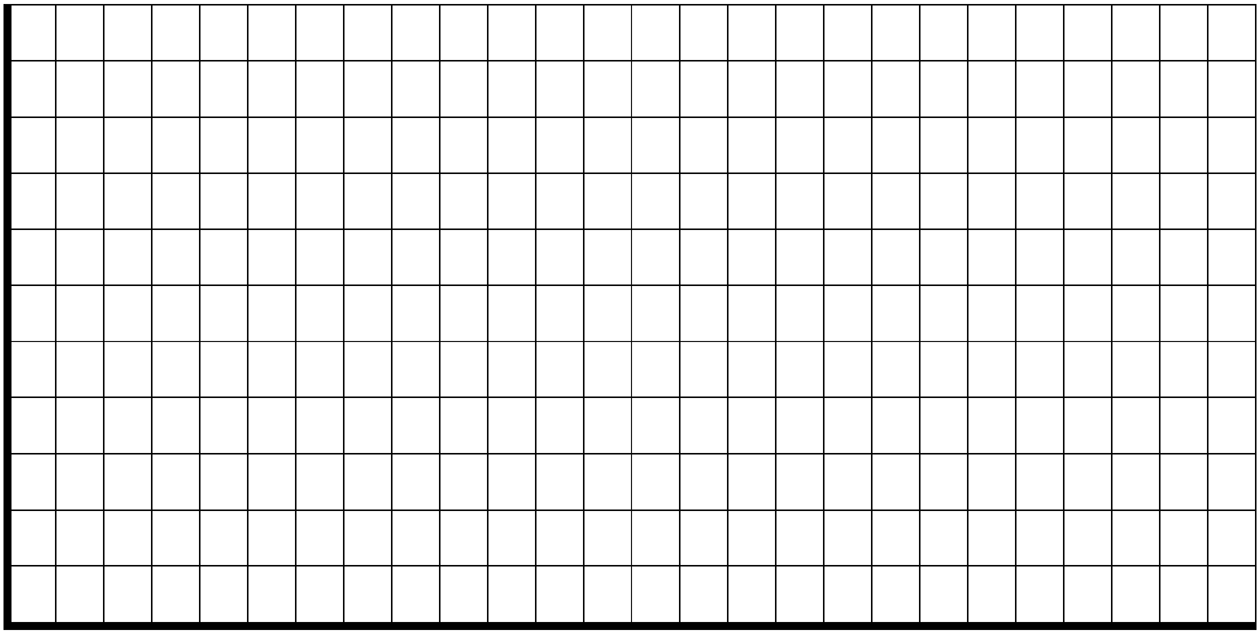
5. A bag of marshmallows has about 150 small marshmallows in each bag. Campers took marshmallows on a camping trip. A group of raccoons came to the campsite and ate about 20 marshmallows each hour. Make a table of values to find the length of time it took for the raccoons to eat the bag of marshmallows. Graph your values on the Grid for Questions 5 and 6 BLM.

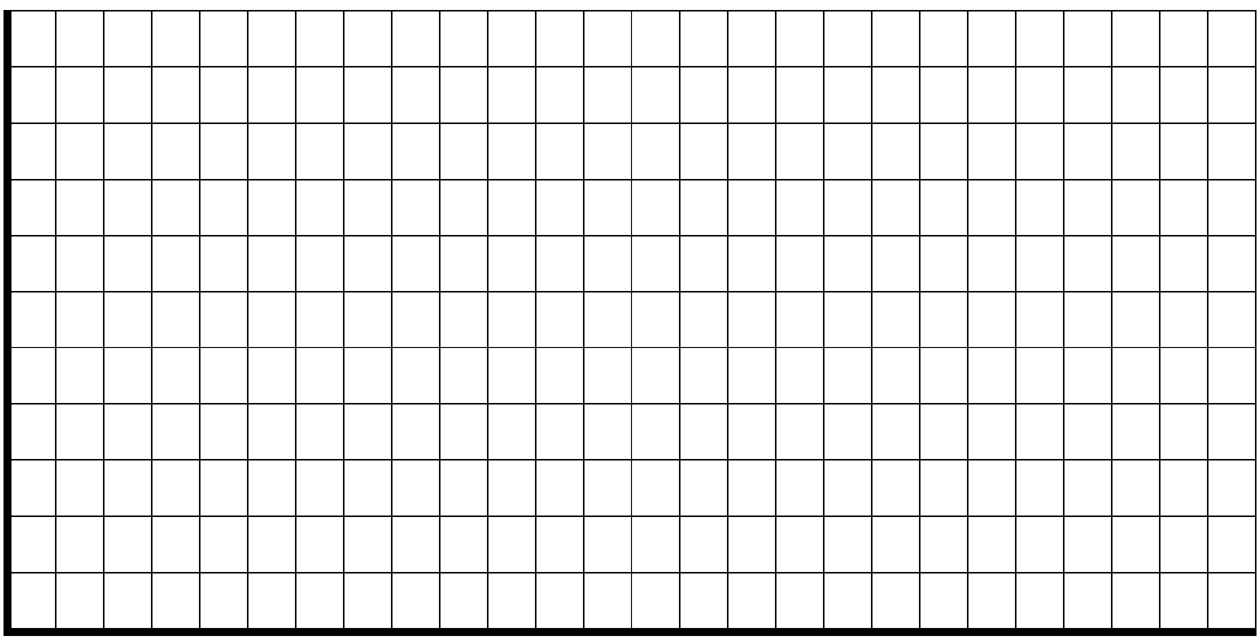
Hours	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Marshmallows left in bag	*150*	*130*	*110*	*90*	*70*	*50*	*30*	*10*	*Finished bag in about ½ hour*

6. Jack wants to canoe down river. The guide told him that the average speed down river is 20 mph. Jack will leave the campsite to canoe at 10:20 a.m. Make a table of values to find how far Jack will have gone by 5:00 p.m. Graph your values on the Grid for Questions 5 and 6 BLM.

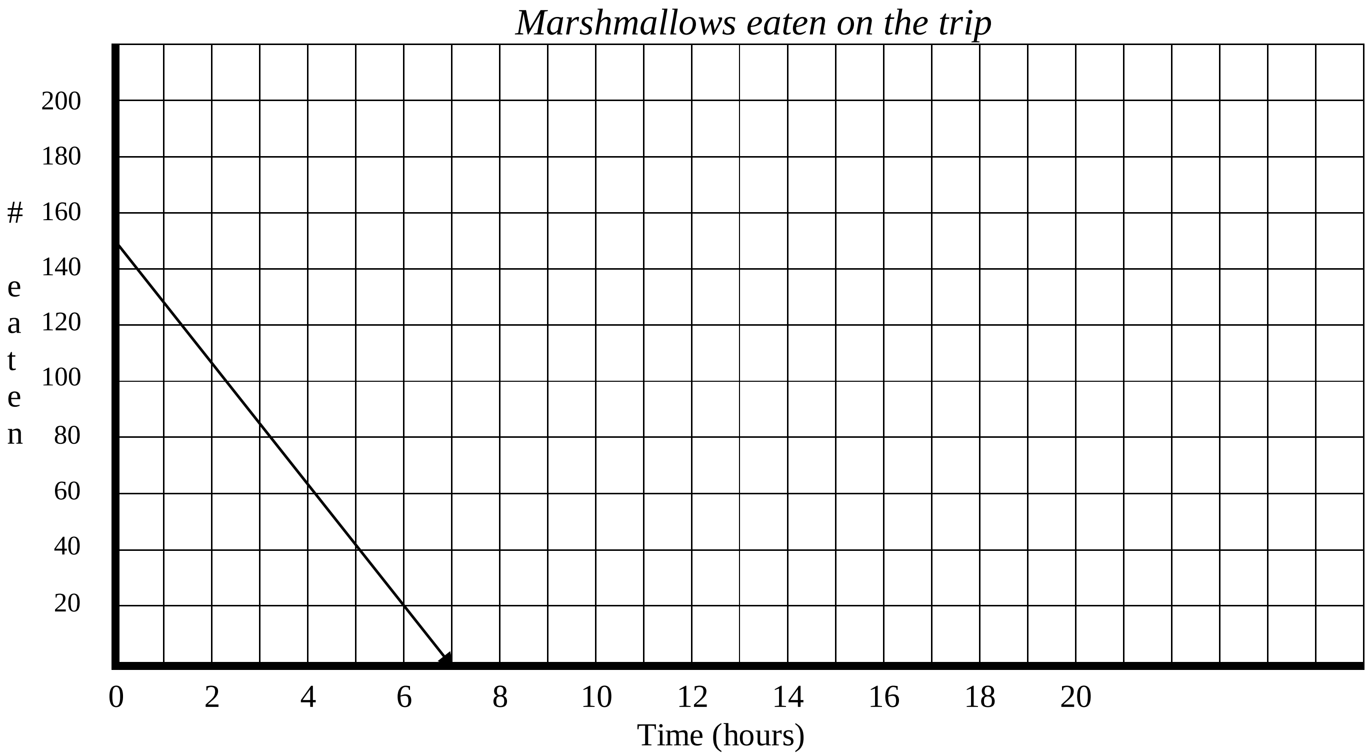
Time	*10:20 a.m.*	*11:20 a.m.*	*12:20 a.m.*	*1:20 p.m.*	*2:20 p.m.*	*3:20 p.m.*	*4:20 p.m.*	*5:00 p.m.*
Distance (miles)	*0*	*20*	*40*	*60*	*80*	*100*	*120*	$133\frac{1}{3}$ *miles*

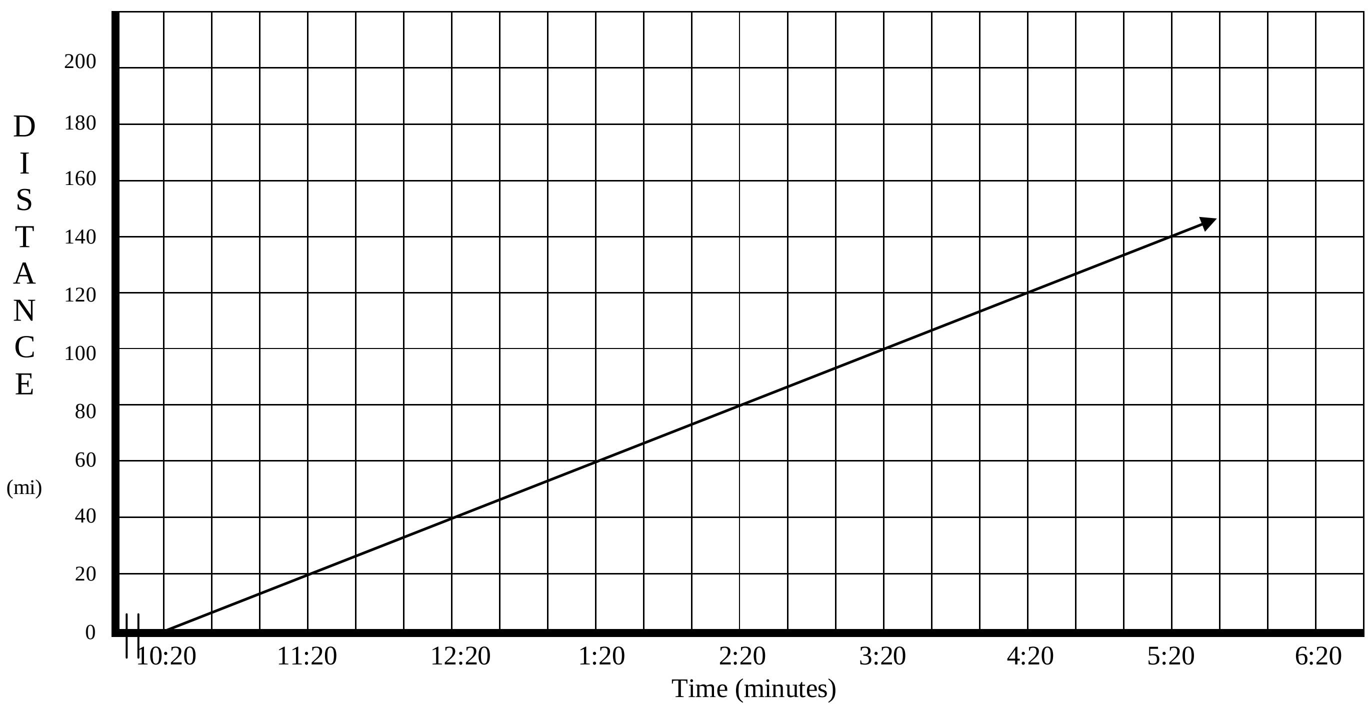
Unit 4, Activity 7, Grid for Questions 5 & 6





Unit 4, Activity 7, Grid for Question for 5 & 6 with Answers



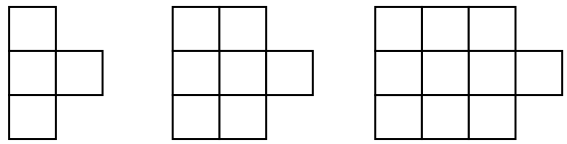


Unit 4, Activity 8, Grid

Unit 4, Activity 8, Patterns and Graphing

Name ______________________________ Date _____________ Hour _________

Pattern 1



Arrangement 1 Arrangement 2 Arrangement 3

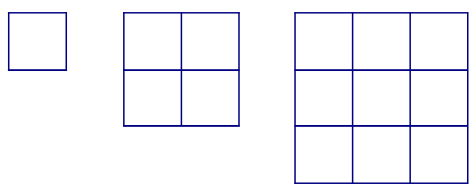
a) Sketch the 4th and 5th arrangement in the pattern.
b) Make a table that shows the arrangement number and the total number of tiles in the pattern.

c) Describe a ‘rule’ for determining the number of tiles in the 25th pattern, 100th pattern.

d) Is the rate of change in this pattern linear? Explain why or why not.

Pattern 2

Arr #1 Arr #2 Arr #3



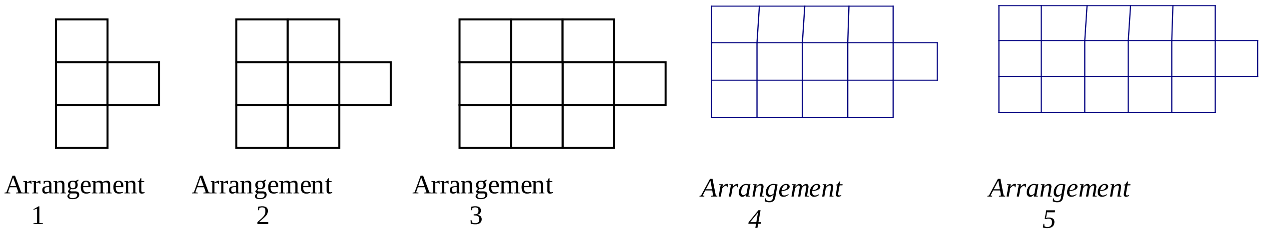
a) Sketch the 4th and 5th arrangement in the pattern.
b) Make a table that shows the arrangement number and the total number of tiles in the pattern.

c) Describe a “rule” for determining the number of tiles in the 25th pattern, 100th pattern.

d) Is the rate of change in this pattern linear? Explain why or why not.

Unit 4, Activity 8, Patterns and Graphing with Answers

Pattern



a) Sketch the 4^{th} and 5^{th} arrangement in the pattern.

b) Make a table that shows the arrangement number and the total number of tiles in the pattern.

Arrangment #	***Total tiles***
1	***4***
2	***7***
3	***10***
4	***13***
5	***16***

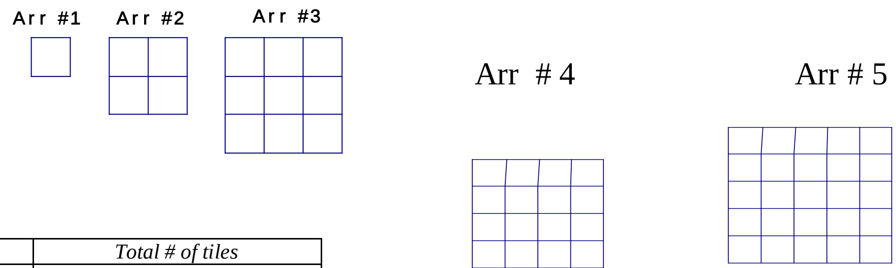
c) Describe a "rule" for determining the number of tiles in the 25^{th} pattern, 100^{th} pattern.

3 times the arrangement number plus 1

$3x + 1$

d) Is the rate of change in this pattern linear? Explain why or why not? *Linear, no exponents.*

Pattern 2



Arrangement #	*Total # of tiles*
1	*1*
2	*4*
3	*9*
4	*16*
5	*25*

c) the arrangement number times itself or the arrangement number squared.

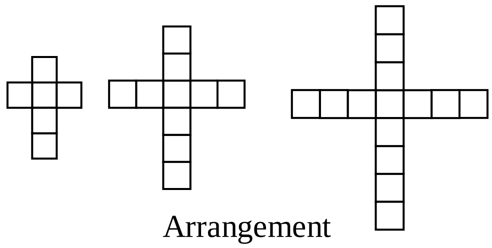
d) no, the total number of tiles does not change at a constant rate.

Unit 4, Activity 8, More Practice with Patterns

Name ____________________________Date ___________________ Hour _____________

Sketch the 4th and 5th arrangements in each of the patterns below. Answer the questions that follow.

1.



Arrangement
#1 #2 #3

a) How many tiles will be in the 10th arrangement?

b) One arrangement in this pattern has 86 tiles. Explain how you will determine the arrangement number that this number of tiles represents. Which arrangement is it?

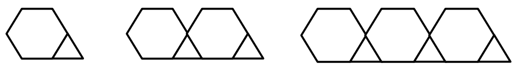
c) There are two consecutive arrangements of this pattern that contain a total of 128 tiles. What are the two consecutive arrangements?

d) Explain which consecutive arrangements contain exactly this number of tiles.

e) Write an equation to represent this pattern.

Make a table and graph this equation on a coordinate grid.

Name ________________________________
.
2. Sketch the 4th and 5th arrangements in each of the patterns below. Answer the questions that follow.



Arrangement Number
#1 #2 #3

a) Make a table of values with the *x* value representing the arrangement number and the *y* value representing the perimeter of the figures 1 - 5 (the sides of the equilateral triangle represent 1 unit).

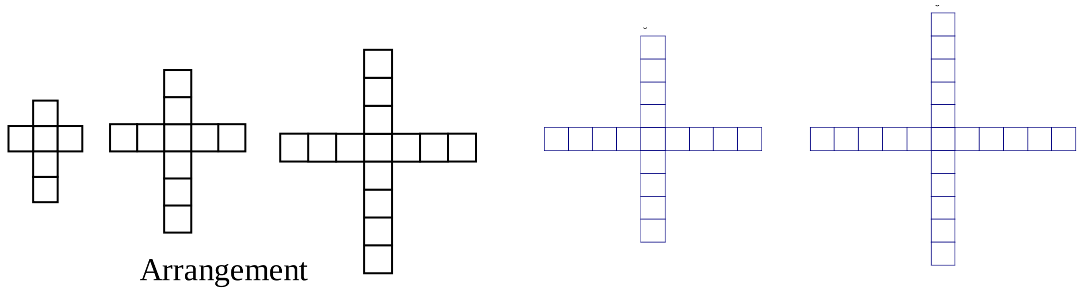
b) Plot the coordinates of the pattern on grid paper. Use the grid paper to determine which arrangement will have a perimeter of 57 units. Explain how you determined this.

c) Write an equation to represent the growth represented in this pattern. Explain how you determined this.

Unit 4, Activity 8, More Practice with Patterns with Answers

Sketch the 4th and 5th arrangements in each of the patterns below. Answer the questions that follow.

1.

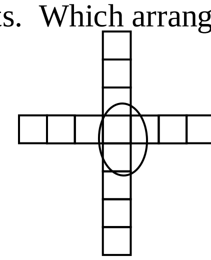


Arrangement
#1 #2 #3

a. How many tiles will be in the 10th arrangement? *42 tiles*

b. One arrangement in this pattern has 86 tiles. Explain how you will determine the arrangement number that this number of tiles represents. Which arrangement is it?
(86 – 2) ÷ 4 = 21 21 is the arrangement number

There is a constant of 2 squares in the center---and each leg is the arrangement number.



c. There are two consecutive arrangements in this pattern that contain a total of 128 tiles. What are the two consecutive arrangements?

Arrangements 15 and 16

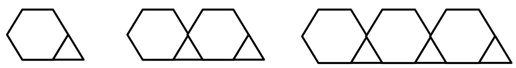
d. Explain which consecutive arrangements contain exactly this number of tiles.
One possible explanation: Arrangement 15 will contain 4(15) + 2 and arrangement 16 will contain 4(16) + 2 tiles. These two arrangements would give the exact 128 tile. 15 tile in 3 of the four legs of the 15th and 16 tile in 3 of the 4 legs of the 16th and the 2 extra center tiles.

e. Write an equation to represent this pattern.
Total = 4 times the arrangement number plus 2, $T = 4n + 2$

f. *Make a table and graph this equation on a coordinate grid.*

Arrangement # x	*total tile y*
1	*6*
2	*10*
3	*14*
4	*18*
5	*22*

2. *Sketch the 4^{th} and 5^{th} arrangement in each of the patterns below. Answer the questions that follow.*



Arrangement Number
#1 #2 #3

4^{TH} arrangement has 4 hexagons and 4 equilateral triangles.

5^{th} arrangement has 5 hexagons and 5 equilateral triangles

a. *Make a table of values with the 'x' value represent the arrangement number and the 'y' value represent the perimeter of the figures 1 - 5 (the sides of the equilateral triangle represent 1 unit).*

arrangement number x	*Perimeter y*
1	*7*
2	*12*
3	*17*
4	*22*
5	*27*

b. *Plot the coordinates of the pattern on grid paper. Use the grid paper to determine which arrangement will have a perimeter of 57 units. Explain how you determined this.*

   (57 – 2)÷ 2 = 11, the 11^{th} arrangement has 57 units.
   Continued the line on the graph and found the coordinates of the line on the grid.

c. *Write an equation to represent the growth shown in this pattern. Explain how you determined this.*

Perimeter = arrangement number times 5 plus 2, $y = 5x + 2$

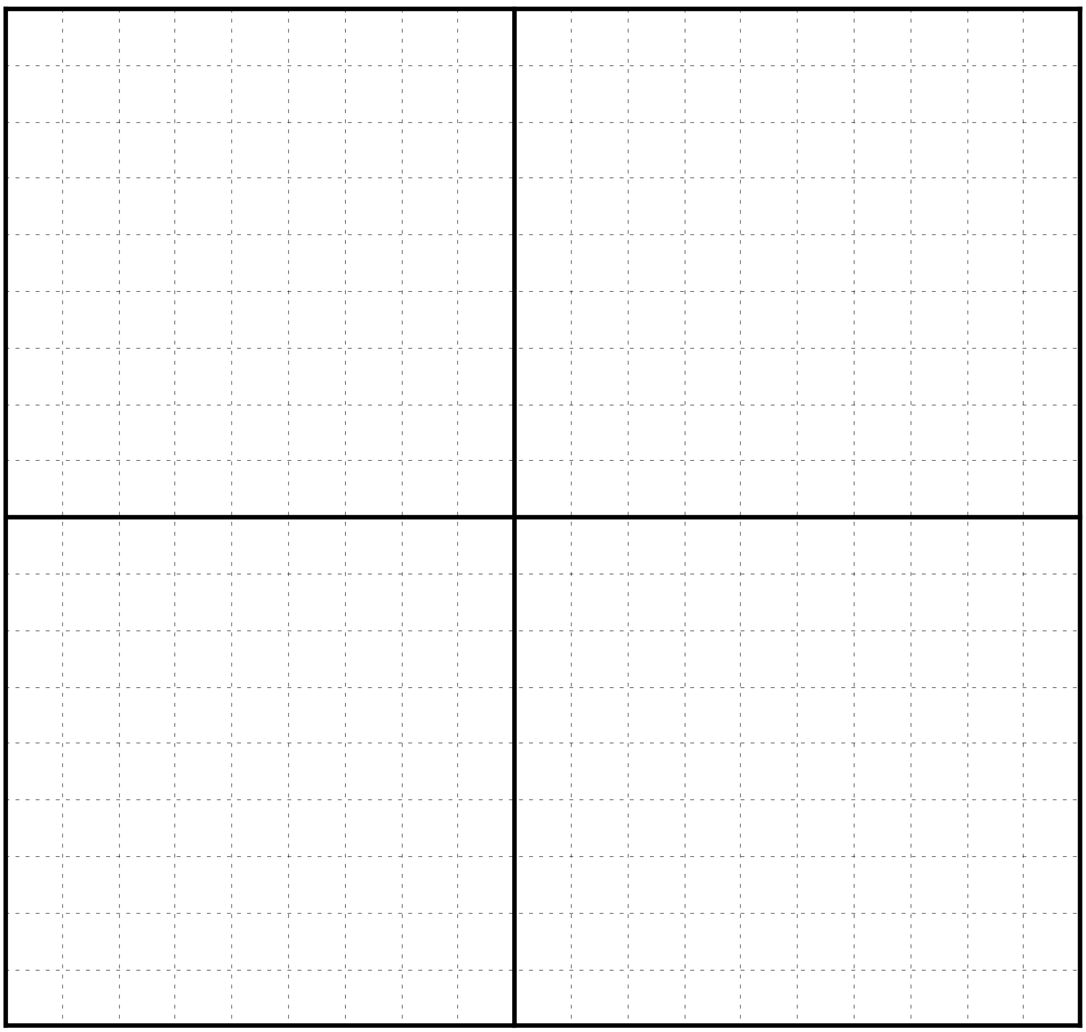
Unit 4, Activity 11, Rate of Change Grid 1

x	$y = \frac{1}{2}x$

x	$y = 2x$

x	$y = 3x$

x	$y = x^2$



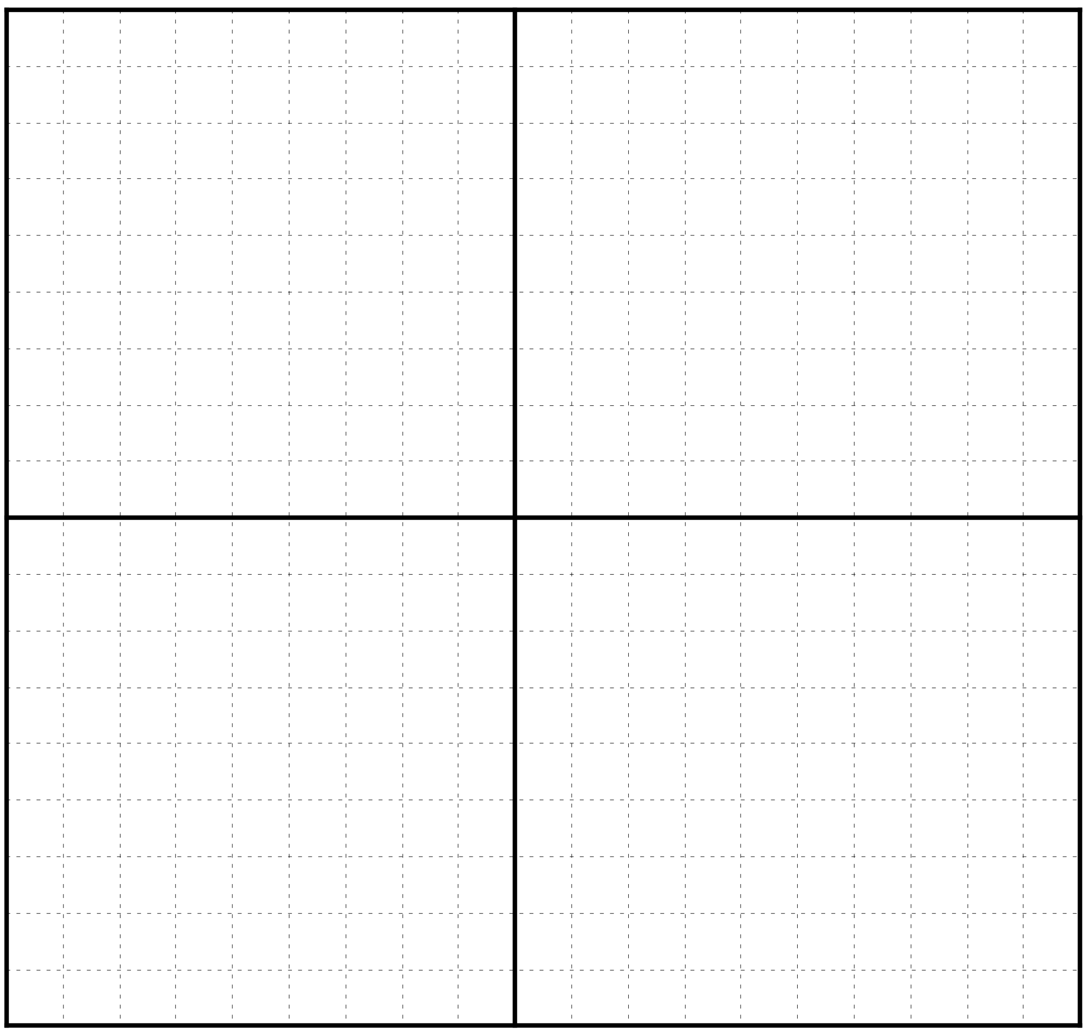
Unit 4, Activity 11, Rate of Change Grid 2

x	*y* =*x*+2

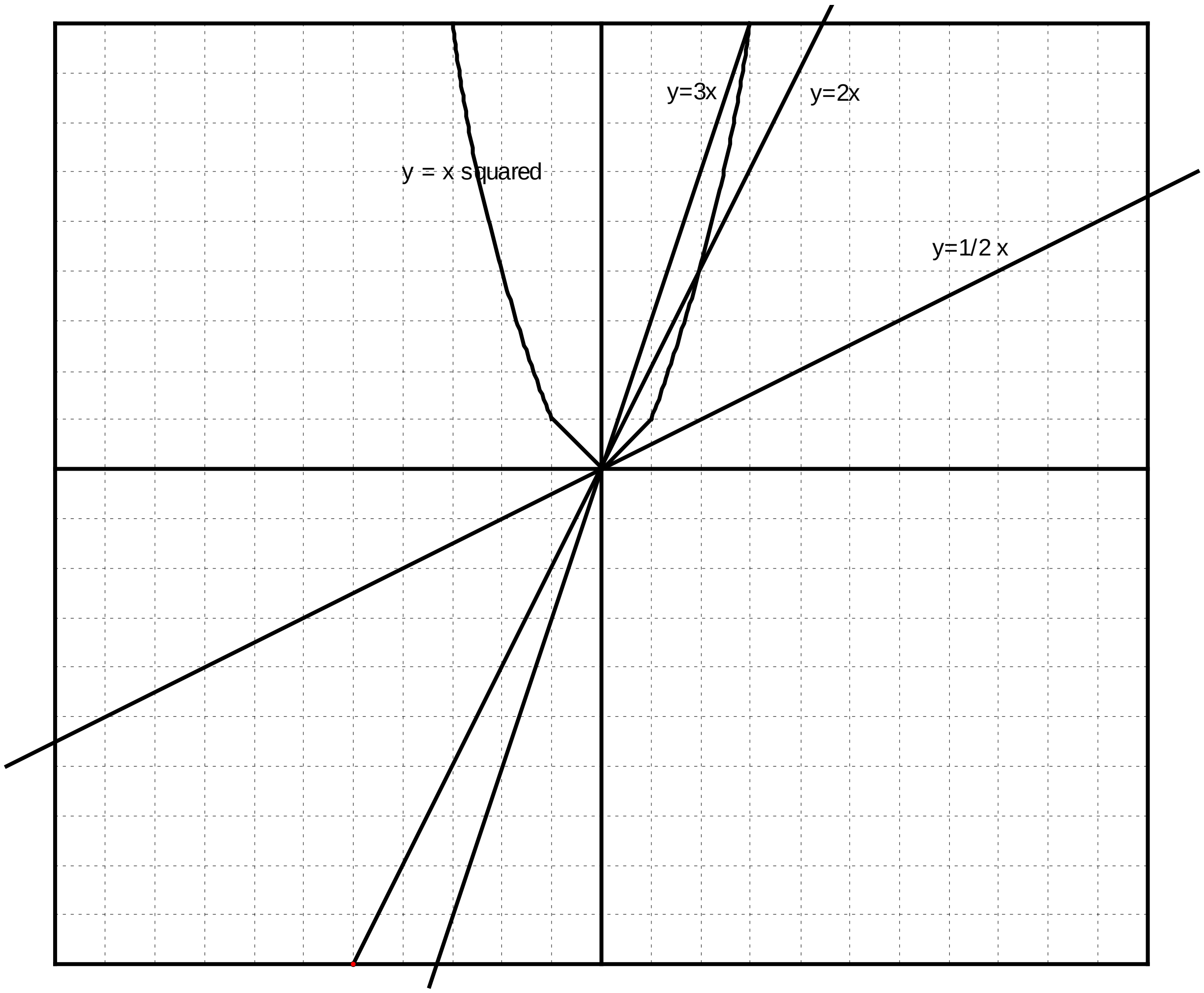
x	*y*=*x*-2

x	*y*=(-*x*)+2

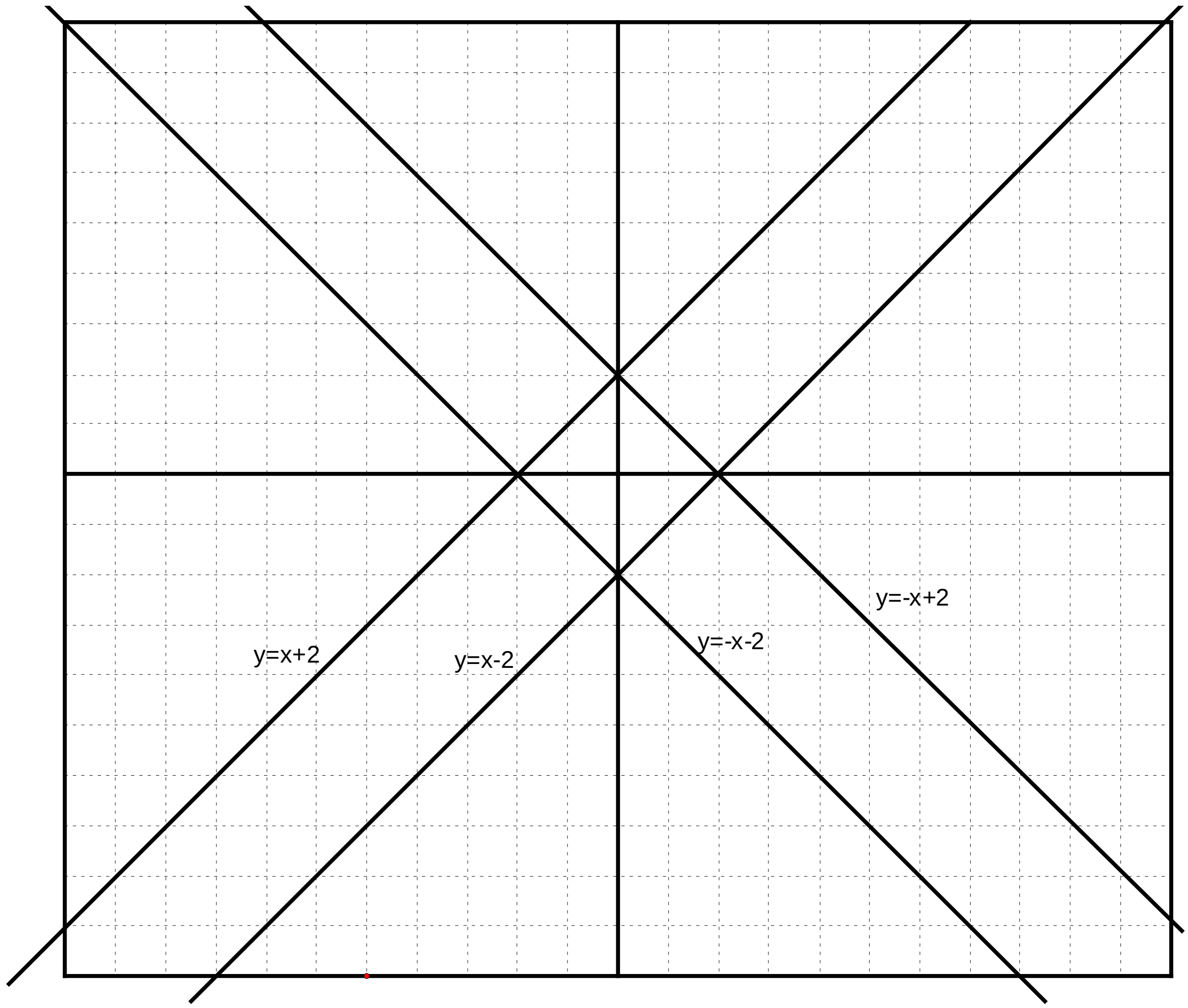
x	*y*=(-*x*)-2



Unit 4, Activity 11, Rate of Change Grid 1 with Answers



Unit 4, Activity 11, More Exploration with the Slope – y-intercept Form of an Equation with Answers



Grade 8
Mathematics
Unit 5: Functions, Growth and Patterns, Part 1

Time Frame: Approximately four weeks

Unit Description

This unit examines the nature of changes to the input variables in function settings through the use of tables and sequences. There is emphasis on recognizing and differentiating between linear and exponential change and developing the expression for the *n*th term for a given arithmetic or geometric sequence.

Student Understandings

Students recognize the nature of linear growth and exponential growth in terms of constant or multiplicative rates of change and can use this to test their generalizations. They understand that a table, a graph, an algebraic expression, or a verbal description can be used as different representations of the same sequence of numbers.

Guiding Questions

1. Can students differentiate between function relationships and those relations that are not functions using coordinates, tables and graphs?
2. Can students understand and apply the definition of a function in evaluating expressions (output rules) as to whether they are functions?
3. Can students differentiate between linear and non linear growth patterns and discuss each verbally, numerically, graphically, and symbolically?

Unit 5 Grade-Level Expectations (GLEs) and Common Core State Standards (CCSS)

Grade-Level Expectations	
GLE #	**GLE Text and Benchmarks**
13.	Switch between functions represented as tables, equations, graphs, and verbal representations, with and without technology (A-3-M) (P-2-M) (A-4-M)
14.	Construct a table of *x*- and *y*-values satisfying a linear equation and construct a graph of the line on the coordinate plane (A-3-M) (A-2-M)
46.	Distinguish between and explain when real-life numerical patterns are linear/arithmetic (i.e., grows by addition) or exponential/geometric (i.e., grows by multiplication) (P-1-M)

CCSS#	CCSS Text
8.F.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
8.F.3	Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function* $A = s^2$ *giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not a straight line.*
8.F.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation models, and in terms of its graph or table of values.
8.F.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

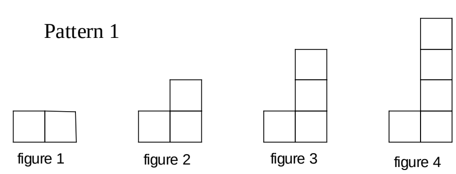
Sample Activities

Activity 1: To Function or Not to Function! (GLE: 14; CCSS: 8.F.1)

Materials: Vocabulary Self-Awareness Chart BLM, Function or not BLM, pencil, paper

Begin the activity by distributing the Vocabulary Self-Awareness Chart BLM. Students will begin with the *vocabulary self-awareness* (view literacy strategy descriptions). Since this is the first time they have done a Vocabulary Self-Awareness in math, the words have been written in the chart. Later, you might want to provide the chart and have the students write the words in from a list on the board. Students should rate their understanding of each of the vocabulary words by placing a plus sign (+) if they are very comfortable with the word, a check mark (✓) if they are uncertain of the exact meaning and a minus sign if the word is completely new (-) to them. Through this unit, students should develop an understanding of the vocabulary in the chart. Throughout the unit, students should be encouraged to pull out the chart and edit their chart as the vocabulary meanings are more understandable. The repeated use of the vocabulary chart will give the students multiple opportunities to practice and extend their growing understandings of the vocabulary.

This lesson was written to develop the idea of a function. Draw the following tile pattern on the board. Instruct the students to make an "Input/Output" table for the tile pattern. The input should be the figure number. The output should be the number of tiles.

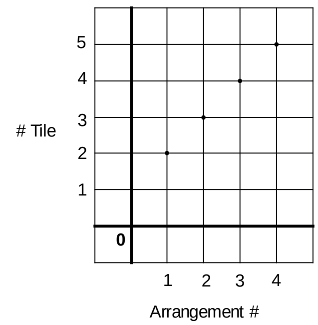


Students should have a table like **Table 1** which represents a function.A function is a rule that assigns to each input exactly one output.

Table 1

Input Figure #	1	2	3	4
Output Number of tile	2	3	4	5

In **Table 1**, each input value (1) corresponds to one and only one output value (2).
Have the students write the set of ordered pairs as shown in the table. (1,2), (2,3), (3,4), (4,5). Note that in this set of ordered pairs, each output is used exactly one time. Therefore, it fulfills the definition of a function. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. The input values are placed on the horizontal axis, and the output values are placed on the vertical axis. Make sure to relate the pattern, graph and table, ensuring that all students understand how they are related.



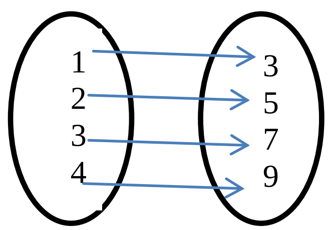
Have students look at the following tables and determine if the ordered pairs represent a function.

Practice #1

Input Figure #	1	2	3	4
Output Number of tiles	3	5	7	9

In Practice #1 the output increases by 2 with each additional figure; the input is doubled and then one is added.

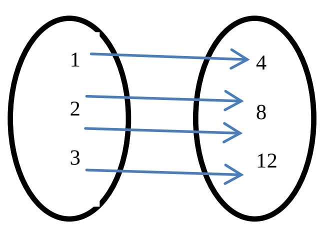
A mapping of this input/output table has been drawn at the right. The mapping has one oval drawn that contains the input values and a second that contains the output values. The arrows illustrate the input that is connected to the output, and each output value is associated with one input value.



Practice #2

Input Figure #	1	2	3	4
Output Number of tiles	4	8	12	16

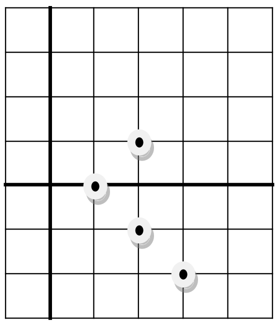
In Practice # 2, output increases by 4 each time. The mapping is shown to the right of the table for Practice #2.

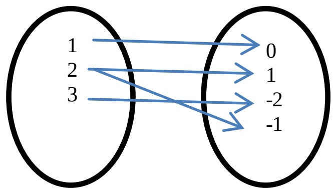


Next, copy **Table 2** on the board. Have the students write the ordered pairs, graph them, and determine if the table of values represents a function.

Table 2

Input	1	2	3	2
Output	0	1	-2	-1





Since the input 2 is matched to two different outputs, it does not represent a function. By definition, a function is a rule that assigns to each input exactly one output. This table has two outputs for 2, (2, 1) and (2, -1). The graph and the mapping of this is a good illustration of the input value "2" having more than one output value (1 and -1).

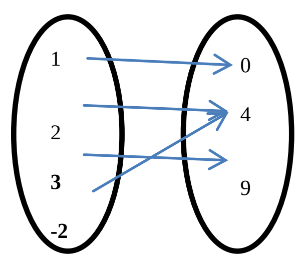
Draw another table, without inputs or outputs, on the board and have students work in pairs to determine a set of values that will not be a function. Ask students to justify why the table does not represent a function. Have the students share with another pair of students and discuss as a class any misunderstandings that might occur during these discussions.

Copy **Table 3** on the board. Ask students to determine if this is a function.

Table 3

Input	1	2	3	-2
Output	0	4	9	4

This should bring out some discussion because of the two 4 values in the outputs. Some students may say that it is not a function. Have the students restate the definition of a function. The table shows that there is one y-value (output) for each of the input values. The mapping shows that each input corresponds to one output, although one of the output values corresponds to two distinct input values. This does represent a function.



Distribute Function or Not BLM, and have the students work in pairs or groups of four to determine whether each relationship represents a function. Discuss results after students have completed the BLM.

As a closure activity, ask students to explain any terms from their Vocabulary Self-Awareness chart that have become clearer throughout the activity.

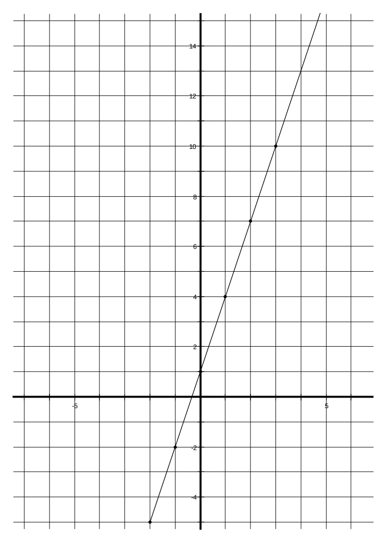
Activity 2: What's a Function? (CCSS: 8.F.1)

Materials List: paper, pencil, Vocabulary Self-Awareness Chart BLM, What is a Function? BLM, calculator (optional)

Have students complete the Vocabulary Self-Awareness Chart BLM for this unit. *Vocabulary self-awareness* (view literacy strategy descriptions) is valuable because it highlights students' understanding of what they know, as well as what they still need to learn in order to fully comprehend the concept. Students indicate their understanding of a term/concept, but then adjust or change the marking to reflect their change in understanding. The objective is to have all terms marked with a + at the end. A sample chart is included in the blackline masters. Be sure to allow students to revisit their self-awareness charts often to monitor their developing knowledge about important concepts.

Have students use the What is a Function? BLM to complete this activity.

Instruct the students to work through **Part 1** of the BLM and discuss as a class after this part is completed. The BLM first provides examples of relations of which some are functions and some are not functions (that are labeled as such) including real-life examples, input/output tables, mapping diagrams, and equations. Pose the question: "What is a function?" and then have students use a Think-Pair-Share process to help them determine what is significant in the tables. After giving students time to complete page 1, review the definition of a function (for every input there is exactly one output) and have students write the definition in the blank at the top on **Part II.**



Write the equation $y = 3x + 1$ on the board. Have students make a table of values and determine whether this equation represents a function. Have the students graph this equation on a grid. Next, explain to the students that the **vertical line test** can also be used to determine if the graph of an equation is a function. Tell students that to do this test they place their pencil vertically on the grid and move the vertical pencil horizontally to ensure that no more than one point on the graph is crossed at any time. Have them practice by moving their pencils across the graph of $y = 3x + 1$.

Tell the students that they will practice recognizing functions in **Part II** by comparing different representations. Give additional practice as needed.

Ask students to form a conjecture as to why the **vertical line test** works to determine if a graph is a function. Explain to the students that this test is a test to perform when the graph is given, or they have plotted points and want to determine if the relationship represents a function. According to the test, if each vertical line drawn through any point on the graph of a relation intersects the graph at no more than one point, then that relation is a function. It is easily performed by placing the pencil or a ruler vertical to the *x*-axis on the graph and moving it horizontally to determine that it crosses only one point on the graph at any time.

Once the students have completed **Parts I and II** of the BLM, instruct them that the final part of this activity provides them with a graph of $y = 3x + 1$ and ask them if this would be a function (at right). Ask the students to determine if the set of ordered pairs in the input/output tables generated using $y = 3x + 1$ with x values of *-2, -1 and 0* will satisfy the definition of a function (i.e., for each input value (x), there is exactly one output value (y)). Now, have students draw several vertical lines through the input values to illustrate the idea that for a function, a vertical line intersects the graph of a function at exactly one point. This is called the *vertical line test.*

Explain that this means that if they assign "*x*" the value of (-2) then they have to substitute the -2 into the equation, "$y = 2x+3$," making the value of the equation "$y=2(-2) + 3$" *or* $y = -1$.

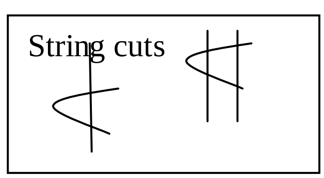
Part III of the BLM provides practice for students making connections between ordered pairs, equations, tables and graphs. Be sure to ask questions that will help the students make these connections. Questions such as: *What part of the equation helps me locate a starting point for my graph without the ordered pairs? (y-intercept) How can you tell from the input/output table, what the rate of change of the graph will be? (difference in y-values divided by the difference in x-values). Where is the rate of change found in the equation? (The number before the x is called the coefficient. If there is no number before the x, the slope is 1 because 1(x) = x as it is understood to be the rate of change). How can the rate of change be found on a linear graph without an equation or input/output table? (Identify two points along the line that intersect with the intersections of the grid and count vertically then horizontally to see rise/run).* Give students additional input-output rules for more practice as needed.

Provide closure to the activity by summarizing and reviewing the major concepts presented in the activity. *Students will describe how to recognize a function and understand that there can be no more than one value for each x value on a graph. They will also explain how to use the vertical line test to determine if a graph represents a function.*

Activity 3: Stringy Situation! (CCSS: 8.F.4)

Materials List: string, scissors, pencil, paper, Stringy Situation BLM, Grid paper

Begin this activity by distributing string and scissors to each pair of students. Tell the students to cut 4 pieces of string, each about 2 feet long. Instruct the students to take one of the pieces of string and make 1 cut as shown in the picture below. Ask, how many pieces of string do they have as a result of one cut? (*If one cut is made, there are three pieces of string; if two cuts are made, there are 5 pieces.)*



Distribute Stringy Situation BLM and have the students begin filling data into the chart as requested.

Once the students have completed the top part of the BLM, distribute additional pieces of string and have students complete the table and the remainder of the BLM.

Distribute grid paper and have the students graph both of the equations that have been written on the same graph. *This is a good time for the students to compare the different slopes and how the larger the rate of change, the steeper the graph of the equation.*

Discuss the BLM and graphs, ensuring student understanding. As closure, have the students respond in the math *learning log* (view literacy strategy descriptions) to the statement: If the string is folded into fourths, and cuts are made as in class today, explain in your own words how many pieces there would be with one, two or three cuts. Write the new equation.

Activity 4: Find that Rule (CCSS: 8.F.1)

Materials List: Find that Rule BLM, More Patterns and Rules BLM, pencil, paper, math learning log, poster paper, markers

This activity was not changed because it already incorporates the CCSS.

Write the following questions on the board or overhead and have the students copy them in the left column of a sheet of paper which has been formatted for *split-page notetaking* (view literacy strategy descriptions). Notetaking is an essential skill students must develop in order to be effective learners in mathematics. The volume of information, vocabulary, and concepts will be processed easier if they develop a notetaking system that helps them organize their thinking and make necessary connections in the mathematics class. Students will complete the *split-page note taking* as they complete the Find that Rule Activity. The questions in the left column are important concepts for students to observe. It is important for students to look for these things as the lesson progresses. Complete this column for the students to enable them to understand what is important to look for as they complete the BLM.

Arithmetic and Geometric Number Patterns	
1) What do you notice about the difference in the *y*-values in consecutive patterns in A – E on Find the Rule BLM?	
2) Define: arithmetic sequence	
3a) What do you notice about the differences in *y* values of the More Patterns and Rules BLM when the *x*-values are consecutive values?	
3b) Divide each *y*-value by the preceding y value and determine if there is a pattern.	
4) Define: Geometric Sequence	

Divide the students into groups of four. Distribute Find that Rule BLM and give the students time to find the perimeters and then the areas of the arrangements, recording each in the appropriate tables. Students should find the "rule" for finding the perimeters and areas in the summary chart on the second page of the BLM. Lead the classes in a discussion about the rules, having students explain how their rule would help them determine the perimeter or area of the 100^{th} or 150^{th} arrangement.

Define arithmetic sequences as sequences in which the difference between two consecutive terms is the same and geometric sequence as sequences in which the quotient between two consecutive terms is the same. Discuss whether the rules illustrate an arithmetic or geometric sequence. Make sure the students understand that all of the perimeter patterns show a linear relationship. The area relationships A-C show linear patterns. Pattern E is an area relationship. It is not a linear or geometric; it is a quadratic (power of 2).

Once the students have completed the Find that Rule BLM, instruct them to answer question 1 on their *split-page notetaking* sheet and define what is meant by an arithmetic sequence.

Distribute the More Patterns and Rules BLM and have the groups work to complete the BLM. Once the students have completed the questions, have groups of four get with another group of four and discuss their answers. Circulate and redirect student thinking as any questions or misconceptions arise. Direct the students back to their notetaking page and have them answer question 3a and 3b and define what is meant by a geometric sequence. The student discussion should bring out the difference in an arithmetic and geometric sequence. At this point, all students should have the questions answered and their own definitions formed on the notetaking sheet.

Have students explain in their own words the difference between arithmetic and geometric patterns in their math *learning logs* (view literacy strategy descriptions).

Activity 5: Make that Connection! (GLE: 14; CCSS: <u>8.F.3</u>, 8.F.4)

Materials List: paper, pencil, calculator, graph paper

Review the slope-intercept form of an equation ($y = mx + b$ where m represents the slope and b represents the y-intercept). An example would be the cost of renting a car is \$25 plus \$0.35 per mile (the rate of change is \$.35 per mile, thus it is the slope and the \$25 is a one-time charge, making it the y-intercept). The equation would be $y = .35x + 25$. Make a table of values and sketch a graph to represent the data (10, 28.50), (20, 32), and (30, 35.50). From this graph, write your equation for the line. Have groups determine the equation of the line by examining the graph for the slope and y-intercept. Ask probing questions that lead students to understand that the value of y (the price of the rental) is determined by the value of x (the number of miles). Therefore, y is the dependent variable and x is the independent variable. Continue leading students to understand that the value of y will always increase as the value of x increases. This is indicated by the fact that there is a positive slope. Finally, help students discover that the *y*-intercept would be located at the origin if there were no initial cost.

This situation states that the initial cost is $25, so the *y*-intercept is 25.

Have students generate a table of values for a given linear function expressed as $y = mx + b$, where m is the slope and b is the *y-intercept.* Have students label the input value column of the table "Independent Variable" and the output value column "Dependent Variable." Have students select their own domain values for the independent variable and generate the range values for the dependent variable. Ask the students what the constant rate of change in the table or graph is represented by? ($.35) This is represented in the equation by *m*. The initial value of the rental would be what? ($25) and this is called the *y-intercept.* In the equation this is represented by the "*b*".

Next, have students calculate the differences in successive values of the dependent variable, and find a constant difference. Then, have them relate this constant difference to the slope of the linear function. Have students graph the ordered pairs and connect them with a straight line. Finally, discuss with the students the connections between the table of values, the constant difference found, and the graph. Last, have students do the same activity using a linear function that models a real-world application. For example, students could investigate the connections between the algebraic representation of a cost function, the table of values, and the graph.

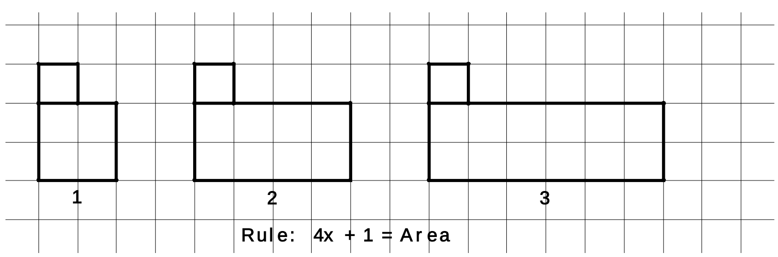
Activity 6: Use That Rule! (CCSS: <u>8.F.4</u>)

Materials List: Use That Rule! BLM, paper, pencil

This activity was not changed because it already incorporates the CCSS.

Before class begins, write on the board before class:

R – The role of the writer is from the perspective of the tile in the pattern;
A – The audience is another math student
F – The format is a letter
T – The topic is how area changes as tile are added.



Area = 4x + 1
y = 4x + 1

Talk briefly about *RAFT writing* (view literacy strategy descriptions) indicating the purpose of the writing is to help clarify, recall and question further ideas. *RAFT writing* is used to helps students extend their understanding. A sample letter follows:

Partner,
I know that you have been working with many of us making patterns. When finding the area, it is best if you will use the arrangement number as your "x" value and the area as the "y" value. If you can imagine my figure number as the input into an input/output machine, and then find a way to come up with the area or the output, you have determined a rule!

Another way to determine the pattern is to make a table like the one shown below:

x (arrangement number)	*y (area)*
1	*5*
2	*9*
3	*13*

There is a difference of 4 between two consecutive y values. The rule is y= 4x +1, so the 20th arrangement would have an area of 81 square units. I also know that this is an arithmetic sequence, and if I graphed the points, I would get a line. The slope of the line is 4, and the y-intercept is 1.

I hope my explanation helped you understand my purpose in the math class.

Sincerely,
The Red Tile

Give the students time to read their RAFTs to a classmate. After monitoring students' sharing of their RAFTs, select one or two of them to read to the entire class. Students should listen for accuracy and logic in their classmates' RAFTs. Clarify misconceptions and add additional explanation as needed.

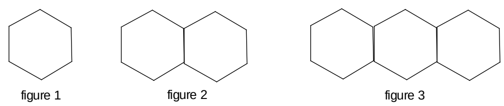
Distribute Use That Rule BLM and have students generate a mathematical representation of the rule and sketch the first three arrangements of the pattern. Then generate ten terms of the sequence and create a table of values for the arrangement number and the area and/or perimeter relationship of the pattern that was developed. It is important that time is spent relating each part of the pattern to the rule.
Spend time relating each part of the rule to the pattern. Students should be able to relate parts of the equation, such as Area = total number of tiles (value of y), 4 = the number of tiles that are added with each arrangement (coefficient of x), and 1 = *y*-intercept.

Have students generate the sequence of values for the rule "start with \$1 and double your money each day." Then have them generate the values for the rule. Start with \$1 and add \$2 each day. Lead a discussion as to the difference in these two examples and how an arithmetic sequence is different from a geometric sequence.

Activity 7: Hexagonal Confusion! (CCSS: <u>8.F.4</u>)

Materials: Hexagon BLM, Polygon Extensions BLM, hexagons (if needed), pencils, paper

Put the following pattern on a PowerPoint or on the board. If you have hexagons available, have students build the first three figure numbers below and compute the perimeter of each one.



Have the students write three mathematical observations about the perimeter of the first three figures. Give students time to share their observations.

Distribute Hexagon BLM to students. Give groups of students time to complete the task and ask them to share their mathematical solutions for finding the perimeter of the 10^{th} figure. Challenge groups to determine the perimeter of the 25^{th} figure. (102 units)

If student understanding is demonstrated, ask the students to determine which figure number has a perimeter of 126 units? Have the students explain their solution.

Challenge: The total perimeter of two consecutive figures in this hexagon pattern is 80 units. What are the two figure numbers?

Let x represent the first figure and (x + 1) represent the second figure

$(4x + 2) + (4(x+1) + 2) = 80$
$4x + 2 + 4x + 4 + 2 = 80$
$8x + 8 = 80$
$8x = 72$
$x = 9$
So figures 9 and 10 would be the answer.

Distribute the Polygon Extensions BLM and give students time to explore these questions with a partner.

Once the BLM is completed, give students opportunities to share discoveries using a *discussion* strategy (view literacy strategy descriptions) called "fishbowl". This discussion strategy involves two small groups of students. One group of students will discuss one or more of the extension questions (in the fishbowl) while the second group stands outside the group and must listen to the discussion without contributing to the deliberations of the students "in the fishbowl." Time the discussions so that the students in the fish bowl have the needed time but not so much time that the observers lose interest and get distracted. Once the discussion is completed, give the observers time to discuss among themselves their reactions to the fishbowl group's responses.

Activity 8: Patterns and Slope (GLE: 13; CCSS: <u>8.F.1</u>)

Materials List: math learning log, paper, pencil, square tiles, Patterns and Slope BLM, graph paper

Have students use the Patterns and Slope BLM to complete this activity.

Divide students into groups and provide them with square algebra tiles. Have the students arrange 3 tiles in a rectangle and record the width (x) and the perimeter (y) on the BLM. Have the students fit 3 more tiles under the previous tiles and continue adding tiles, putting the values in a table. Students should continue working with their groups to complete the BLM through the completion of the table. Guide students as they complete the remainder of the BLM.

Have students notice that the change in the y-values is the same. Have them graph the data and decide if it is linear. Ask students what changed in the pattern *(the widths that keep increasing)* and what remained constant *(the length of the sides added together (3+3))*. Have students write a formula to describe the pattern *(* $y = 6 + 2x$ *)*. Encourage students to think about what function must be done to the x-value to determine the y-value. So the function of x is to double the input and add 6 to get the output.

Direct students to think about the tile pattern. Ask them to determine what stayed the same each time the next pattern in the sequence was built (*the three across the bottom)*. Guide students to conclude that what remained constant in the pattern will be the constant in the formula. Ask students what the rate of change in the pattern had been (*three added in each row).* Explain that the word they will use for rate of change is the slope. Have students take the Vocabulary Self-Awareness activity sheet out and make some clarification to the word slope on the sheet. Guide students to make a connection between the table, graph and algebraic representation of the slope. *(The table representation will be the difference in the y-values in the table divided by the difference in the x-values in the table. The graph representation will be found by following points along the line of the equation at intersection points and finding how far up would have to be counted divided by the number of places right or left to get to the next point. The algebraic expression is the number that they have to multiply by the x-value which shows them the part of the equation that remained the same or proved it was an arithmetic sequence of y-values.)*

In their math *learning logs* (view literacy strategy descriptions) have students respond to the following prompt:

> A child's height is an example of a variable showing a positive rate of change over time. Give two examples of a variable showing a negative rate of change over time. Explain your answer.

Have students share their answers with the class and combine a class list of all student answers. Discuss the answers and have students determine whether the examples are indeed negative rates of change.

Activity 9: Rate of Change (GLE: 13; CCSS: 8.F.4)

Materials List: paper, pencil, Rate of Change BLM, graph paper, straight edge

Use the Rate of Change BLM to introduce the following problem:

> David owns a farm market. The amount a customer pays for sweet corn depends on the number of ears that are purchased. David sells a dozen ears of corn for $3.00. Place the students in groups and ask each group to make a table reflecting prices for purchases of 6, 12, 18, and 24 ears of corn.

Place students in groups and have each group complete the Rate of Change BLM. Students will write and graph four ordered pairs that represent the number of ears of corn and the price of the purchase. They will write an explanation of how the table was developed, how the ordered pairs were determined, and how the graph was constructed. After ensuring that each group has a valid product, ask the students to use a straightedge to construct the line passing through the points on the graph. Each group will find the slope of the line. Review with students the idea that slope is an expression of a rate of change. Ask students to explain the real-life meaning of the slope. *(For every ear of corn purchased, the price goes up $.25)*.

Refer to the slope/intercept form of an equation and have groups determine the equation of the line by analyzing the graph for the slope and the y-intercept. Point out that the y-intercept is at the origin because if someone does not make a purchase, the price is zero. Use their equation to find the cost of 6 ears of corn.

Have students work with their groups to complete the second problem on the Rate of Change BLM.

Have students participate in a math *text chain* (view literacy strategy descriptions) activity to create word problems using real-life applications that are linear relationships. To complete a *text chain*, form groups of four students. Each student should get a sheet of paper and begin a word problem by writing one sentence of a word problem. The student passes his/her paper to the right, and the next student writes a second sentence to the word problem begun by the first group member. These go to the third and fourth person, each adding to the word problem. The fifth stop returns to the originator of the problem who should answer the question and check the problem for accuracy.

Here is an example of a *text chain* for a problem on Rate of Change:

Student 1: Jimi wants to save money to buy a car.
Student 2: He has been mowing lawns to earn money
Student 3: He charges $30 per lawn.
Student 4: What is the rate of change of this linear relationship?

Have groups share their *text chain* problems with the entire class and have the other groups solve and critique the problems.

Activity 10: Sloping Lines (GLE: 13; CCSS: <u>8.F.4</u>)

Materials: Linear Graphs BLM, pencil, paper

Explain to the students that they will be given graphs and they will work with a partner to determine the slope of the lines. Distribute the Linear Graphs BLM and give students time to determine the slope of each of the lines.

Once the students have found the slopes of the lines, have a student describe the method of finding the slope that was used. Most of the students will probably count spaces on the grid using rise over run. If no one used points along the line to find the slope, have students identify (-8, -5) and (1, -1) on the first graph. Ask if anyone can explain how to use these points and find the rise of the line (the distance from -5 to -1 or -5 – (-1) = -4) The run will be the difference in -8 – 1 or -9 and that -4/-9 gives a slope of 4/9. Tell the students that any two points on a line can be used to determine the slope by taking the difference of the *y*-value of one set and the *y*-value of the other set and dividing by the difference in *x*-values by taking the difference of the *x*-value of the first set and the *x*-value of the second set.

Ask the students where the line crosses the *y*-axis. Remind them that this point is the *y-intercept.* Graph 1 crosses the *y*-axis at -1.5, so this would be the *y*-intercept. Ask the students what the *x*-value will be when the line crosses the *y*-axis at -1.5 (0). Have the students write the ordered pair and reflect on the slope-intercept form of an equation, then substitute the values to form the equations for the lines. The three equations are 1) $y = \frac{4}{9}x - 1.5$; 2) $y = \frac{2}{3}x - 2$; and 3) $y = -x + 4$. Students should be able to use the grid and determine the slope and the *y*-intercept, writing the equation in *y*-intercept form.

Activity 11: Horizontal and Vertical lines (GLE: 13; CCSS: <u>8.F.5</u>)

Materials: Exploring Slope BLM, paper, pencil

Post the following ordered pairs on the board (-4, 8) and (6, 8). Ask the students what is special about this set of ordered pairs. Ask students for another point that would fit their explanation.

Explain to the students that they will use the *discussion strategy* (view literacy strategy descriptions) called Round Robin. Tell them that they will work in groups of 4 and will go around the circle, giving possible solutions to the question that is posed. They are allowed one "pass" on a response, but eventually every student must respond. Students should record their response on paper, so that all responses are acknowledged and valued by every student in the group.

Pose the question: How do you think the relationship of these ordered pairs will affect the slope of an equation? *The y-value is the same for both ordered pairs, so the rise will be zero and the points will form a horizontal line.*

After groups have had time to each have input, as group responses are taking place, monitor groups to identify those ideas that may be helpful to others or those that may lead to misconceptions so that they can be clarified.

Have students take a sheet of grid paper and plot these two points and draw a line through them. Give groups time to validate or determine the error in their thinking once this is done.

Tell the students to use the points to determine the slope of the line.

Distribute the Exploring Slope BLM and complete the questions asked independently. When discussing these two graphs, be sure to discuss that the second graph an undefined slope because the denominator would be zero. The horizontal line's slope will always be 0 because the numerator is always 0.

Activity 12: Slopes and *y*-Intercepts (GLE: 13; CCSS: 8.F.4)

Materials List: paper, pencil, Slopes and Y-intercepts BLM, graphing calculator

Have students use the Slopes and Y-intercepts BLM to complete this activity. After students have completed the BLM, have a class discussion of their findings. Have students explain how the changes in the *y*-intercepts affect the graphs. Have students explain the effects of the change in the slope on the graphs. Have students make conjectures about positive and negative slopes. Discuss the slopes of horizontal and vertical lines and the lines $y = x$ and $y = -x$. The $y = x$ is called the parent graph because it is a 1:1 relationship between the independent and dependent variables. Have students relate slope (rate of change) to m and the *y*-intercept in graphs to b for each of these linear functions expressed as $y = mx + b$. Looking at the graphs of these two equations, it can be seen that $y = x$ is positive, the slope is 1, and y-intercept is 0. Looking at $y = -x$, it is seen that graph is negative, the slope is -1, and the y-intercept is 0. If looking at the graphs of these equations, a positive slope will increase from left to right and a negative slope will decrease from left to right. An undefined slope is a vertical line on the graph. The line is at its steepest (rise) but there is no (run). There cannot be division by zero because if the rise is "5" and the run is "0," there is no number that can be multiplied by zero and get 5. This is an example of when the slope is undefined. A good example of this would be an elevator, most elevators go straight up and down; they do not move right and left. The slope is undefined.

After activities 8 - 12, have students participate in a *professor know-it-all* activity (view literacy strategy descriptions). This activity asks students to assume roles of *professor know-it-all* or experts who are to provide answers to questions posed by their classmates. Form groups of three or four students. Give them time to review the content covered in the previous activities. Have the groups generate three to five questions about the content. Call a group to the front of the class. These are the "*professors know-it-all*." Invite questions from the other groups. Have the chosen group huddle, discuss, and then answer the questions. After about 5 minutes, ask a new group to come up and repeat the process. The class should make sure the *professor know-it-all* groups respond accurately and logically to their questions.

Sample Assessments

General Assessments

- The student will make a concentration game matching sequences and rules that describe the sequence. The student will prepare at least 15 matching sets to complete the game.
- The student will generate at least three different patterns of area and perimeter and determine the rule that describes the pattern. The student will also label each rule as either an arithmetic or geometric sequence.
- The student will research and find a real-life situation that demonstrates an arithmetic sequence and another that demonstrates a geometric sequence. The students will present these situations to the class.
- The teacher will provide the student with a list of numbers and have the student explain in writing how to determine whether the list of numbers is an arithmetic sequence or a geometric sequence.
- The teacher will provide the student with an arithmetic or geometric sequence that describes a real-world situation. The student will determine specific terms of the sequence.
- The student will determine whether a specific number is a term in a sequence whose n^{th} term is given. For example, is 24 a term in the sequence whose n^{th} term is $a_n = 5 + 2(n-1)$?
- The teacher will provide the student with several terms of an arithmetic or geometric sequence. The student will generate the rule and the n^{th} term in the sequence.
- Whenever possible, the teacher will create extensions to an activity by increasing the difficulty or by asking "what if" questions.
- The student will create portfolios containing samples of their experiments and activities.

Activity-Specific Assessments

- Activity 4: The student will explain whether his/her sequence is arithmetic or geometric and why. The student will should make a class presentation of the pattern and graph.

- Activity 5 The student will determine the rule for a pattern and determine if the pattern is arithmetic or geometric.

- Activity 8: The student will be given two sets of ordered pairs and be asked to find the slope of the line through these two points.

Unit 6, Activity 1, Practice with Rules

Name ______________________________ Date _______________ Hour ______________

Find the missing numbers in each sequence below.
Describe the procedure used to find the next term in the sequence.
Write a rule or an equation that describes the sequence.
HINT: Make a table with the *x* values representing the arrangement numbers.

a) -3, 2, 7, 12, ______, ______, ______, ______ RULE or EQUATION:

Procedure that describes the sequence (what function(s) did you perform to find the next term?).

b) 2, 5, 8, 11, ______, ______, ______, ______ RULE or EQUATION:

Procedure that describes the sequence.

c) 3, 6, 11, 18, ______, ______, ______, ______ RULE or EQUATION:

Procedure that describes the sequence.

d) 6, 7, 8, 9, 10, ______, ______, ______, ______ RULE or EQUATION:

Procedure that describes the sequence.

e) ______, ______, ______, ______ , 18, 22, 26, 30, ______, ______, ______, ______

RULE:
Procedure that describes the sequence.

Unit 6, Activity 1, Practice with Rules with Answers

Find the missing numbers in each sequence below. Write a rule that could represent the sequence. HINT: Make a table with the x values representing the arrangement numbers.

a) -3, 2, 7, 12, *17, 22, 27* RULE or EQUATION: $y = 5x - 8$
PROCEDURE: *add 5 to previous value*

b) 2, 5, 8, 11, *14, 17, 20, 23* RULE or EQUATION: $y = 3x - 1$
PROCEDURE: *add three to previous value*

c) 3, 6, 11, 18, *27, 38, 51, 67* RULE or EQUATION: $y = x^2 + 2$
PROCEDURE: *add the next odd number to the previous value*

d) 6, 7, 8, 9, 10, *11, 12, 13, 14, 15,* RULE or EQUATION: $y = x + 5$
PROCEDURE: *add one to the previous value*

e) *2, 6, 10, 14,* 18, 22, 26, 30, *34, 38, 42, 46*

RULE or EQUATION: $y = 4x - 2$
PROCEDURE: *The numbers differ by 4. Subtract 4 to find numbers to the left of a given number. Add 4 to find numbers to the right of a given number.*

Unit 6, Activity 2, Real Rules Car Mileage Chart

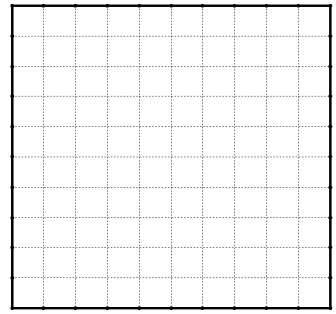
http://www.fueleconomy.gov/feg/best-worst.shtml

2012 Most Fuel Efficient Cars by EPA Size Class (including electric vehicles)

EPA Class	Vehicle Description	Fuel Economy Combined
Two-Seaters	Honda CR-Z 4 cyl, 1.5 L, Automatic (AV-S7), HEV, Regular	37
Minicompacts	Scion iQ 4 cyl, 1.3 L, Automatic (CVT), Regular	37
Subcompacts	Mitsubishi i-MiEV A-1, 66 kW DCPM, Electric Vehicle	112‡
Compacts	Ford Focus BEV Automatic (CVT), 107 kW AC Induction, Electric Vehicle	105‡
Midsize	Nissan Leaf A-1, 80 kW DCPM Electric Vehicle	99‡
Large	Hyundai Sonata 4 cyl, 2.4 L, Manual (6), Regular Hyundai Sonata 4 cyl, 2.4 L, Automatic (6), Regular	28
Small Station Wagons	Audi A3 4 cyl, 2.0 L, Automatic (S6), Diesel	34
	Volkswagen Jetta SportWagen 4 cyl, 2.0 L, Manual (6), Diesel	34
Midsize Station Wagons	Toyota Prius v 4 cyl, 1.8 L, Automatic (CVT), HEV, Regular	42

Unit 6, Activity 2, Real Situations with Sequences

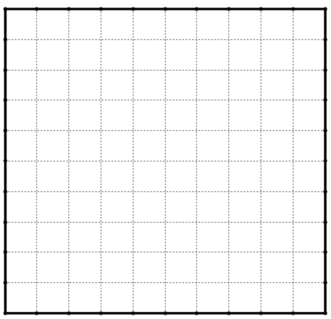
Name ____________________________ Date _________________ Hour _____________

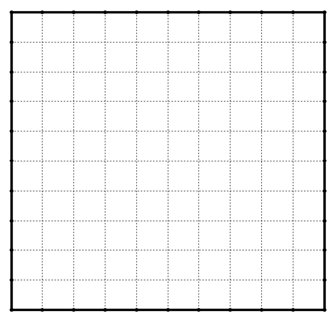


1. Sam's dad drives an Acura NSX that can go 255 miles on a tank of gas. Suppose Sam's dad's car has a 15 gallon tank. Make a table to show how many miles he can travel on 5, 10, 15, 20, and 25 gallons of gasoline. Write a rule and graph your results.

2. Julie's dad drives a BMW Roadster, and he can travel 324 miles on a tank of gas. The table below shows the number of miles he can travel at given distances. Determine the size of his gasoline tank. Complete the chart, write a rule and graph your results.

#gallons	5	8	11	14	18
# miles traveled	90	144	198		





3. Jeremy wanted to mail a letter that weighed 10 ounces. He looked up the charges for the US Post Office and found that they charged $0.45 for the *first ounce and $0.20 for each additional ounce for first class mailings.* Make a table, then write the rule that will help Jeremy find the amount he will have to pay**.** Plot a graph showing the cost for a letter weighing 1 ounce, 5 ounces, 10 ounces, and 15 ounces.

4. Susan wanted to go on a trip with her friend's family over spring break. Her parents told her she could if she worked to earn part of the money. Susan needs $500 to go on the trip and she already has $25.00. Her parents told her that they would double the amount she makes each week babysitting. If Susan makes $8.25/hour babysitting and works 4 hours the first week, 5 hours the second week, 3 hours the third week, 6 hours the fourth week, 5 hours the fifth week and 7 hours the sixth week, will she have enough money for the trip?

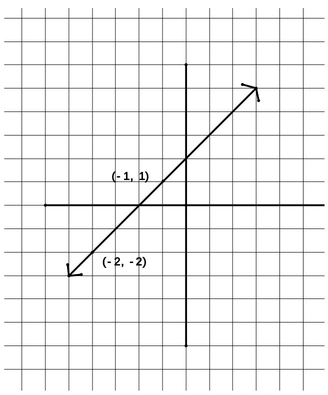
Week #	0	1	2	3	4	5	6	
Amount $								
Susan's total								

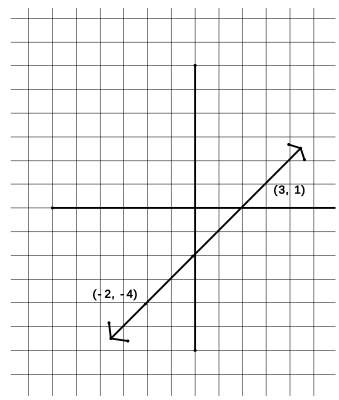
5. The U. S. Post Office will not accept a letter that weighs more than 13 ounces using first class rates given in problem #3. Any package or letter weighing more than 13 ounces will be charged priority mail rates. The rates for local zones are given below:

Weight in pounds	1 pound	2 pounds	3 pounds	4 pounds	5 pounds
Charge	\$1.05	\$4.25	\$7.45	\$10.65	\$13.86

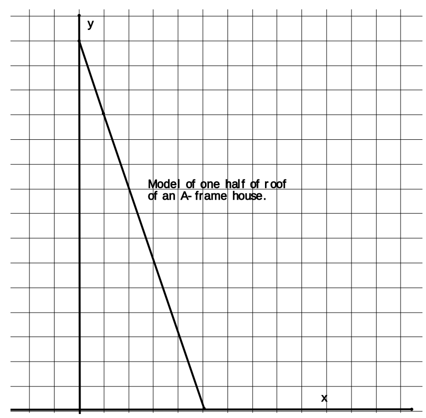
Write a rule and make a graph of the charges per pound for priority mailing. Describe the relationship.

6. Find the slope or rate of change of each linear graph below.





7. The roof of an A-frame cabin slopes from the peak of the cabin down to the ground. It looks like the letter A when viewed from the front or the back. The equation $y = -3x + 15$ can model the relationship formed by one side of the roof. For a point (x,y) on the roof, x is the horizontal distance in feet from the center of the base of the house, and y is the height of the roof in feet. Make a table to represent different points along the roof and graph the equation. Find the slope or rate of change.



Unit 6, Activity 2, Real Situations with Sequences with Answers

1. Sam's dad drives an Acura NSX that can go 255 miles on a tank of gas. Suppose Sam's dad's car has a 15 gallon tank. Make a table to show how many miles he can travel on 5, 10, 15, 20, and 25 gallons of gasoline. Write a rule and graph your results.

Changed by 5

# gallons (x)	*5*	*10*	*15*	*20*	*25*
# miles (y)	*85*	*170*	*255*	*340*	*425*

Changed by 85

CONSTANT RATE OF CHANGE *change in y value* *= Slope* *Slope = 85/5 which is 17/1 or 17*
change in x value

RULE OR EQUATION: $y = 17x$

2. Julie's dad drives a BMW Roadster, and he can travel 324 miles on a tank of gas. The table below shows the number of miles he can travel at given distances. Determine the size of his gasoline tank. Complete the chart, write a rule and graph your results.

Number of gallons *(x)*	5	8	11	14	18
Number of miles traveled *(y)*	90	144	198	*252*	*324*

CONSTANT RATE OF CHANGE *change in y value* *= Slope* *Slope = 54/3 which is 18/1 or 18*
change in x value

RULE OR EQUATION: $y = 18x$

3. Jeremy wanted to mail a letter that weighed 10 ounces. He looked up the charges for the US Post Office and found that they charged \$0.45 for the first ounce and \$0.20 for each additional ounce for first class mailings. Make a table then write the rule that will help Jeremy find the amount he will have to pay. Plot a graph showing the cost for a letter weighing 1 ounce, 5 ounces, 10 ounces, and 15 ounces

Ounces (x)	*1*	*5*	*10*	*15*	*20*	
Amt paid (y)	*\$.45*	*\$1.25*	*\$2.25*	*\$3.25*	*\$4.25*	

Expression .45 + .20(x -1) Notice: The rate of change is not the same(for the x value) from 1 ounce to 5 ounces, but it is constant from 5 to 10 and 15 to 20; therefore, the(y value) is not constant from .45 to 1.25, but becomes constant from 1.25 to 2.25 and 3.25 to 4.25. The EQUATION WILL BE:

$y = .20(x-1) + .45$

4. Susan wanted to go on a trip with her friend's family over spring break. Her parents told her she could if she worked to earn part of the money. Susan needs \$500 to go on the trip and she already has \$25.00. Her parents told her that they would double the amount she makes each week babysitting. If Susan makes \$8.25/hour babysitting and works 4 hours the first week, 5 hours the second week, 3 hours the third week, 6 hours the fourth week, 5 hours the fifth week and 7 hours the sixth week, will she have enough money for the trip. *Yes, she would have enough money.*

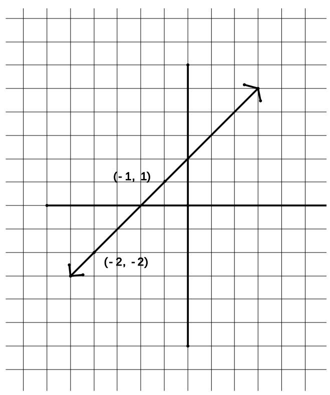
Week # *(x)*	0	1	2	3	4	5	6
Amount \$ *(y)*	25	66	82.50	49.50	99	82.50	115.50
Susan's total		91	173.50	223.00	322	404.50	520

5. The U. S. Post Office will not accept a letter that weighs more than 13 ounces using first class rates given in problem #3. Any package or letter weighing more than 13 ounces will be charged priority mail rates. The rates for local zones are given below:

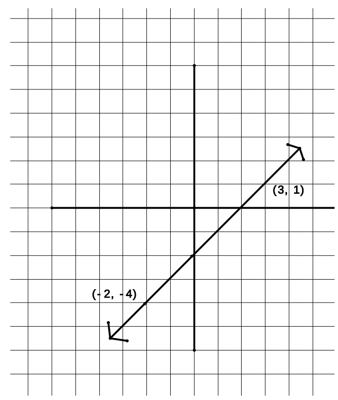
Weight in pounds	1 pound	2 pounds	3 pounds	4 pounds	5 pounds
Charge	$1.05	4.25	7.45	10.65	13.86

Write a rule then make a graph of the charges per pound for priority mailing. Describe the relationship.
Varying rate of change—pounds have a constant rate of change, but the charge does not. 3.85 to 3.95 is a change of .10, 3.95 to 4.75 is a change of .80, 4.75 to 5.30 is a change of .55 and 5.30 to 5.85 is a change of .55 This will not be a linear graph.

6. Find the slope or rate of change of each linear graph below.

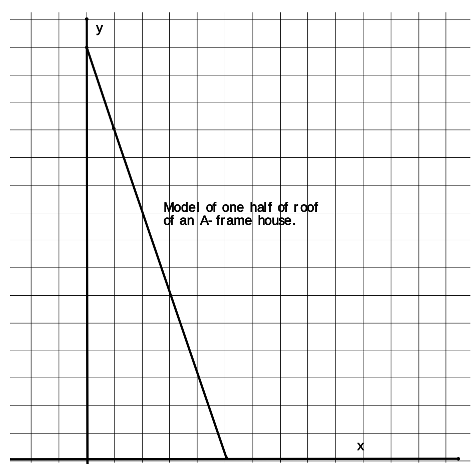


Slope of 1



Slope of 1

7. The roof of an A-frame cabin slopes from the peak of the cabin down to the ground. It looks like the letter A when viewed from the front or the back. The equation $y = -3x + 15$ can model the relationship formed by one side of the roof. For a point (x,y) on the roof, x is the horizontal distance in feet from the center of the base of the house, and y is the height of the roof in feet. Make a table to represent different points along the roof and graph the equation. Find the slope or rate of change.



X	*Y*
5	*0*
4	*3*
3	*6*
2	*9*
1	*12*
0	*15*

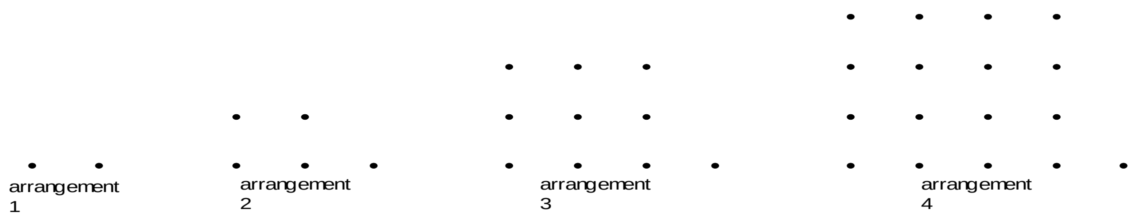
The x value goes down 1 each time, the y value goes up 3. The slope is -3.

Unit 6, Activity 3, Name that Term

Name ______________________________ Date _____________ Hour ______

1.
Dominique sketched the following dot pattern to represent the number of quarters he saved each week during the summer. Make a table to represent the weeks w and the number of quarters q he saved each week.

a) Find the number of quarters Dominique will save during the 5th week.



b) Write a rule or an equation to represent Dominique's savings plan.

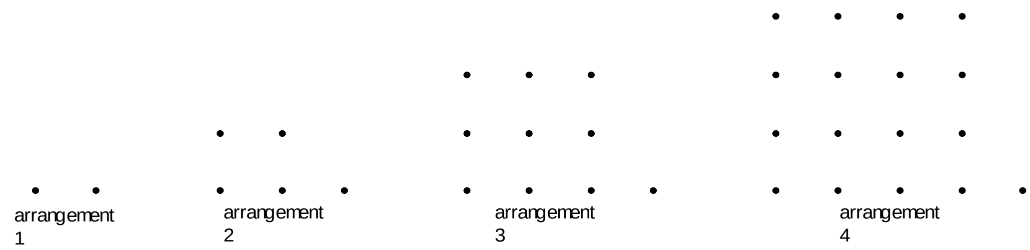
c) During which week will Dominique save 122 quarters? Explain.

d) How much money will Dominique have at the end of 12 weeks if he does not spend any of his savings? Explain.

2. 68 is what term of the sequence given by –2, 3, 8, . . .? Explain.

Unit 6 Activity 3, Name that Term with Answers

1. Dominique sketched the following dot pattern to represent the number of quarters he saved each week during the summer. Make a table to represent the weeks *w* and the number of quarters *q* he saved each week.



x (week)	y # quarters
1	2
2	5
3	10
4	17

a) Find the number of quarters Dominique will save during the 5th week.
He will save 26 quarters
b) Write a rule to represent Dominique's savings plan.
The number of the week times itself plus one is the rule
$y = x^2 + 1$ is the equation
c) During which week will Dominique save 122 quarters? Explain.

11th week. 11 x 11 = 121 + 1 = 122

d) How much money will Dominique have at the end of 12weeks if he does not spend any of his savings? Explain.

12 x 12 + 1 = 145 quarters. 11 x 11 + 1 = 122, 10 x 10 + 1 = 101, 9 x 9 + 1 = 82, 8 x 8 + 1 = 65, 7 x 7 + 1 = 50, 6 x 6 + 1 = 37, 5 x 5 + 1 = 26

145 + 122 + 101 + 82+ 65+ 50 + 37 + 26 + 17 + 10 + 5 + 2 = 662 quarters = $165.50

2. 68 is what term of the sequence given by –2, 3, 8, . . .? Explain.

The sequence increases by 5 each time, and the equation would be $y = 5x – 7$.
Therefore, if $68 = 5x – 7$, then $75 = 5x$, and it would be the 15th term in the sequence.

Unit 6, Activity 5 Generally Speaking

Name ________________________________ Date _______________ Hour __________

Complete the following math grid using the sequences in column on the left.

Sequence	**Procedure to find the next term in the sequence**	**Equation or Rule**
2, 4, 8, 16. . .		
3, 7, 11, 15, . . .		
-5, -9, -13, . . .		
4, 7, 10 . . .		
3, 9, 27, 81 . . .		

Word Grid

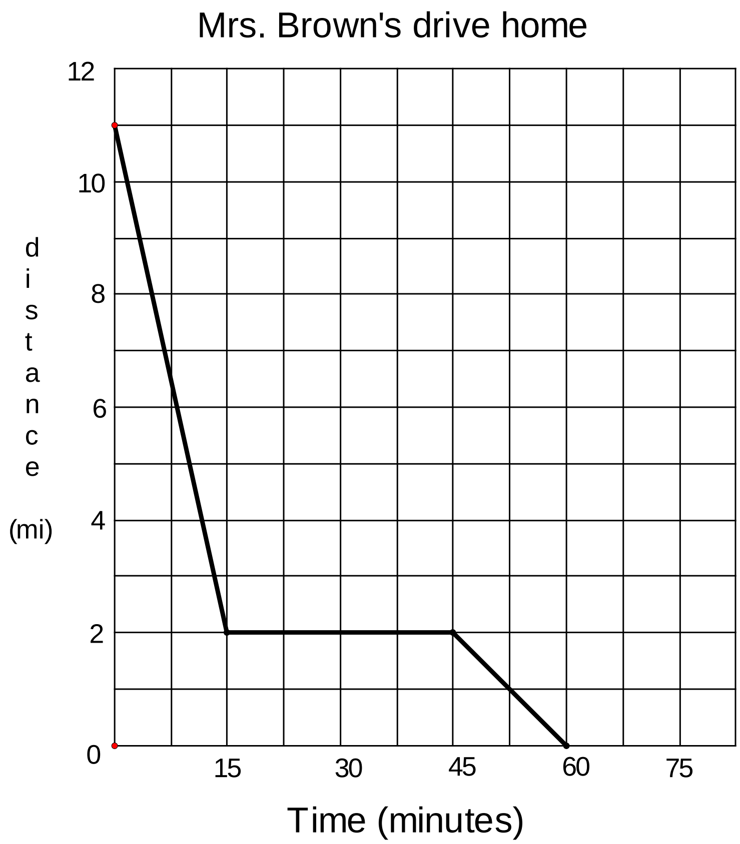
Sequence	**Linear**	**Non linear**	**Arithmetic**	**Geometric**
2, 4, 8, 16. . .				
3, 7, 11, 15, . . .				
-5, -9, -13, . . .				
4, 7, 10 . . .				
3, 9, 27, 81 . . .				

Unit 6, Activity 5, Generally Speaking with Answers

Sequence	Procedure to find the next term in the sequence	Equation or Rule
2, 4, 8, 16. . .	*Two raised to the power of the term*	$y = 2^x$
3, 7, 11, 15, . . .	*Add four to the previous term*	$y= 4x-1$
-5, -9, -13, . . .	*Subtract 4 from the previous term*	$y = -4x$
4, 7, 10 . . .	*Add three*	$y = 3x +1$
3, 9, 27, 81 . . .	*Three raised to the power of the term*	$y = 3^x$

Sequence	Linear	Non linear	Arithmetic	Geometric
2, 4, 8, 16. . .		✓		✓
3, 7, 11, 15, . . .	✓		✓	
-5, -9, -13, . . .	✓		✓	
4, 7, 10 . . .	✓		✓	
3, 9, 27, 81 . . .		✓		✓

Name ________________________________ Date______________ Hour ____



Mrs. Brown works eleven miles from home. She travels 9 miles toward home every day and stops at the grocery store to get something for dinner. The last two miles takes her 15 minutes because it is through neighborhoods with small children.

1. The section on the graph from (0, 11) and (15, 2) has a slope that is ____________________ than the section from (45, 2) and (60,).

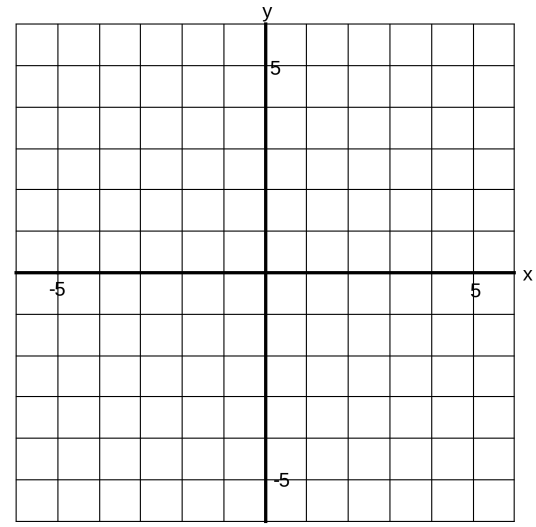
2. The section on the graph from (15, 2) and (45, 2) tells the reader that ____

3. The section on the graph from (15, 2) and (45, 2) represents this amount of time ____

4. The graph shows that Mrs. Brown left work and traveled at a constant speed for __________minutes, stopped at the store for ___________ minutes and then the last _____________ traveled at a slower speed than she traveled at the first part of her trip home.

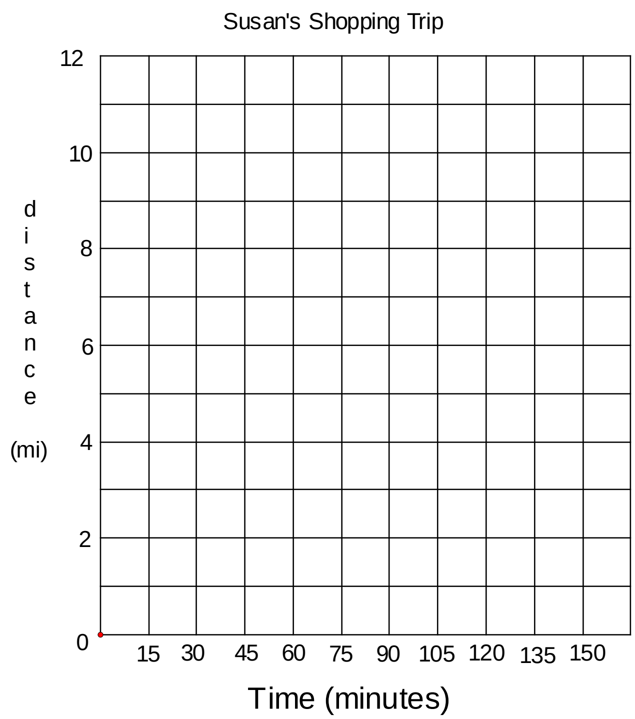
Name_____________________________ Date _________________ Hour _____

1. Graph this function on the graph at the right.
   - It increases at a constant rate between points (-5,-6) and (0, 2).
   - It decreases from point (0, 2) and (3, -3)
   - It remains constant from point (3, -3) to (5, -3)

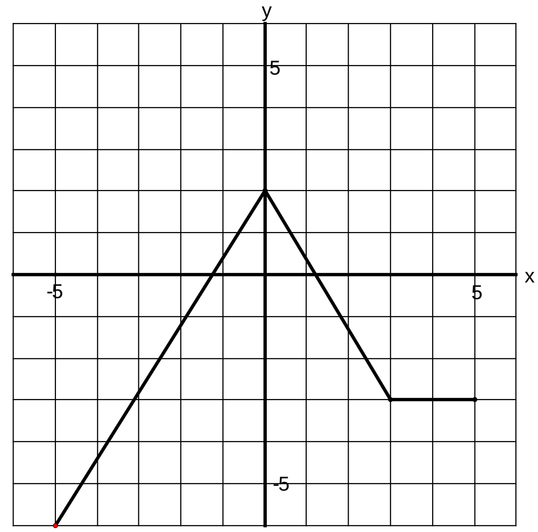


2. Sketch the following situation on the graph at the right.

Susan walked to Sally's house one mile away in 15 minutes. She stopped and waited for Sally and her older sister to get dressed for 15 minutes and then Sally's older sister drove the girls to the mall which took about 30 minutes because it was 10 miles. They shopped for two hours. Then they met Sally's sister and she took both girls to Susan's house to spend the night. This took 30 minutes. Sketch the situation on the graph below.

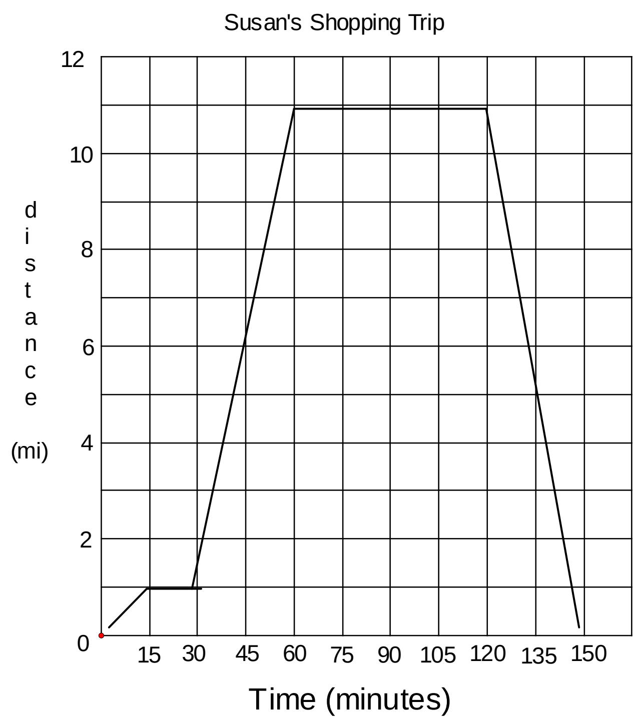


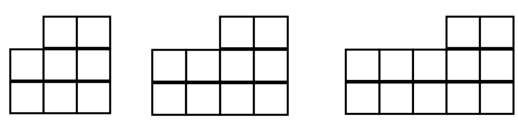
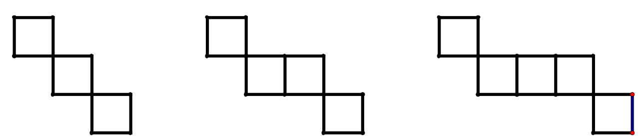
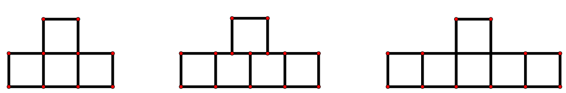
1. Graph this function on the graph at the right.
   - It increases at a constant rate between points (-5,-6) and (0, 2).
   - It decreases from point (0, 2) and (3, -3)
   - It remains constant from point (3, -3) to (5, -3)



2. Sketch the following situation on the graph at the right.

Susan walked to Sally's house which was one mile in 15 minutes. She stopped and waited for Sally and her older sister to get dressed for 15 minutes and then Sally's older sister drove the girls to the mall which took about 30 minutes because it was 10 miles. They shopped for two hours. Then they met Sally's sister and she took both girls to Susan's house to spend the night. This took 30 minutes. Sketch the situation on the graph below.



8, 10, 12, 14…	11, 10, 9, 8…
35, 28, 21, 14. . .	4, 7, 10, 13. . .
2, 5, 8, 11. . .	4, 10, 16, 22. . .
 Arrangement #1 Arrangement #2 Arrangement #3	 arrangement 1 arrangement 2 arrangement 3
 arr. 1 arr. 2 arr. 3	42, 33, 24, 15. . .

Directions for Activity

1) Find the value of the 7th and 10th terms in the sequence you were given.

2) Sketch a tile or dot pattern that represents your sequence or draw a table to show the values of the tile or dot pattern.

3) Write an equation in y-intercept form to represent the nth term in the sequence you were given.

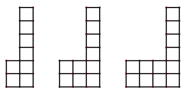
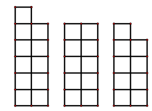
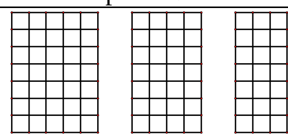
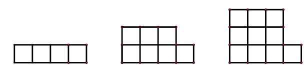
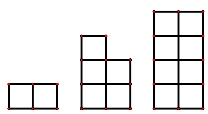
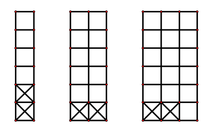
4) Make a graph of your equation.

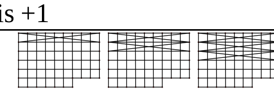
5) Determine whether your sequence represents a positive or negative relationship.

6) Write two questions from your sequence where the solution will be the *"y"* value. Show your work on another sheet of paper with your correct answer.

7) Write two questions from your sequence where the solution will be the *"x"* value. Show your work on another sheet of paper with your correct answer.

8) Explain how you can determine the slope of your equation.

① 8, 10, 12, 14…  7^{th} term =20, 10^{th} term =66 $y = 2x + 6$ positive relationship the slope is 2.	② 11, 10, 9, 8… 7^{th} term =5, 10^{th} term =2 $y = 12 – x$ negative relationship slope = -1 
③ 35, 28, 21, 14. . .  7^{th} term =-7, 10^{th} term =-28 $y = 42 – 7x$ negative relationship the slope is -7	④ 4, 7, 10, 13. . . 7^{th} term = 22, 10^{th} term =31 $y = 3x+1$ positive relationship the slope is +3 
⑤2, 5, 8, 11. . . 7^{th} term = 20, 10^{th} term =29 $y = 3x-1$  positive relationship Slope is +3	⑥4, 10, 16, 22. . . 7^{th} term = 22, 10^{th} term =31 $y = 6x-2$  positive relationship Slope is +6

⑦(picture is already there) 7^{th} term =20, 10^{th} term =26 $y = 2x+6$ positive relationship the slope is +2	⑧(picture is already there) 7^{th} term =9, 10^{th} term =12 $y = x+2$ positive relationship the slope is +1
⑨(picture is already there) 7^{th} term =10, 10^{th} term =13 $y = x+3$ positive relationship the slope is +1	⑩42, 33, 24, 15. . .  7^{th} term =-12, 10^{th} term =-39 $y = -9x+51$ negative relationship the slope is -9

Unit 5, Activity 9, Comparing Slopes and y-Intercepts

Name ________________________________ Date ____________ Hour ____________

1. Graph these equations.

$y = 2x + 4$
$y = 2x + 1$
$y = 2x - 3$

How are these equations alike? ________________________

How are these equations different? ______________________

In the general form y = mx + b, how does a change in b affect the graph?

____

2. Graph these equations.

$y = -3x + 3$
$y = -3x$
$y = -3x - 2$

How are these equations alike? _________________________

How are these equations different? ______________________

In the general form y = mx + b, how does a change in b affect the graph?

____

3. Graph these equations.

$y = \frac{1}{3}x + 5$
$y = \frac{1}{3}x$
$y = \frac{1}{3}x - 1$

How are these equations alike? _________________________

How are these equations different? ______________________

In the general form y = mx + b, how does a change in b affect the graph?

____

4. Graph these equations.

$y = -2x + 5$
$y = \frac{2}{3}x + 5$
$y = 5x + 5$

In the general form y = mx + b, how does a change in m affect the graph?

____

What do you observe about the difference in graphs of functions with positive and negative slopes? __________________________________

Unit 6, Activity 9, Comparing Slopes and y-Intercepts with Answers

1. Graph these equations.

$y = 2x + 4$
$y = 2x + 1$
$y = 2x - 3$

How are these equations alike? __*They have the same slope.*________________
How are these equations different? _*They have different y-intercepts.* ________
How does the change in the y-intercept affect the graph? _*It shifts the line up or down on the y-axis.*_

2. Graph these equations.

$y = -3x + 3$
$y = -3x$
$y = -3x - 2$

How are these equations alike? __*They have the same slope.*________________
How are these equations different? _*They have different y-intercepts.*________
How does the change in the y-intercept affect the graph? __*It shifts the line up or down on the y-axis.*______

3. Graph these equations.

$y = \frac{1}{3}x + 5$
$y = \frac{1}{3}x$
$y = \frac{1}{3}x - 1$

How are these equations alike? ____*They have the same slope.*_________
How are these equations different? ______*They have different y-intercepts.*___
How does the change in the y-intercept affect the graph? _*It shifts the line up or down on the y-axis.*_____

4. Graph these equations.

$y = -2x + 5$
$y = \frac{2}{3}x + 5$
$y = 5x + 5$

How does changing the slope affect the graph? _*It makes the line steeper or flatter and it changes the direction of the slant of the line.*______________
What do you observe about the difference in the graphs of positive and negative slopes? __*Graph of line with positive slope slants right; negative slope slants left.*___

Unit 6, Activity 10, Comparing Functions

Name _______________________________________ Date___________ Hour ______

Work with a partner to solve each of the following situations.
Compare the rates of change for each of the situations below and write the equations that represent information in tables, graphs or charts.

1. Compare the rates of change for each of the functions:

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

Function 2:

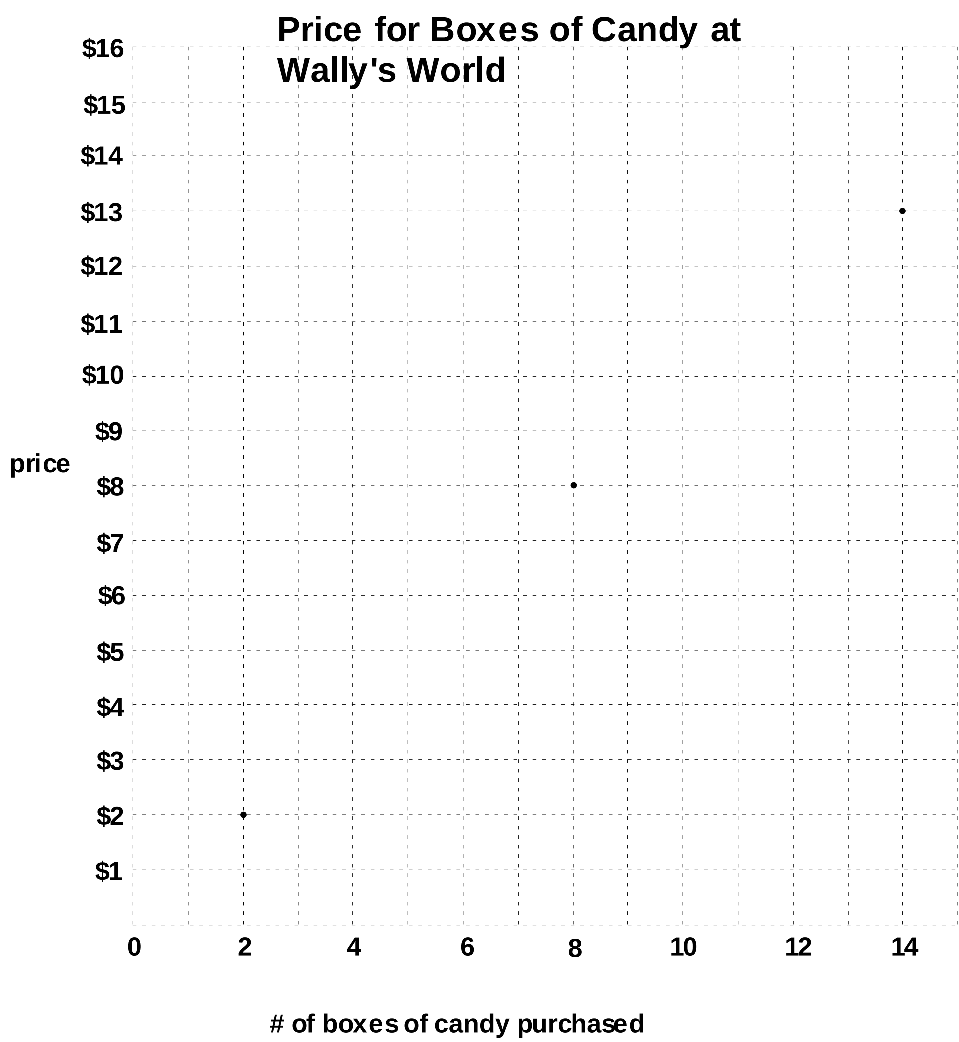
x	2	3	4	5	6
y	-2.5	-1.75	-1	-0.25	0.5

2. Which of the situations is the best if you need 15 boxes of candy? Explain.

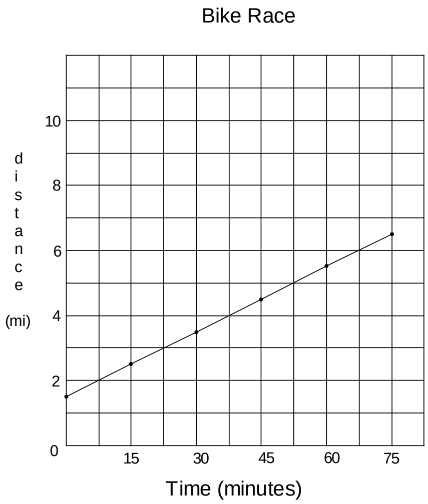
Winston's Discount

Boxes of candy

$3.00 for the first box and $0.75 for each box after that!



3. Cliff and Billy are racing their bicycles around the bike path at the lake. The path is 10 miles long. Since Billy is a practiced bicyclist, he gave Cliff a 1.5 mile head start. The graph shows Cliff's first lap.



Billy's first lap time is represented in the chart below:

x (minutes)	10	20	25	35
y (distance)	2	4	5	7

Write two true mathematical statements about the race.

1.

2.

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

Function 2:

x	2	3	4	5	6
y	-2.5	-1.75	-1	-0.25	0.5

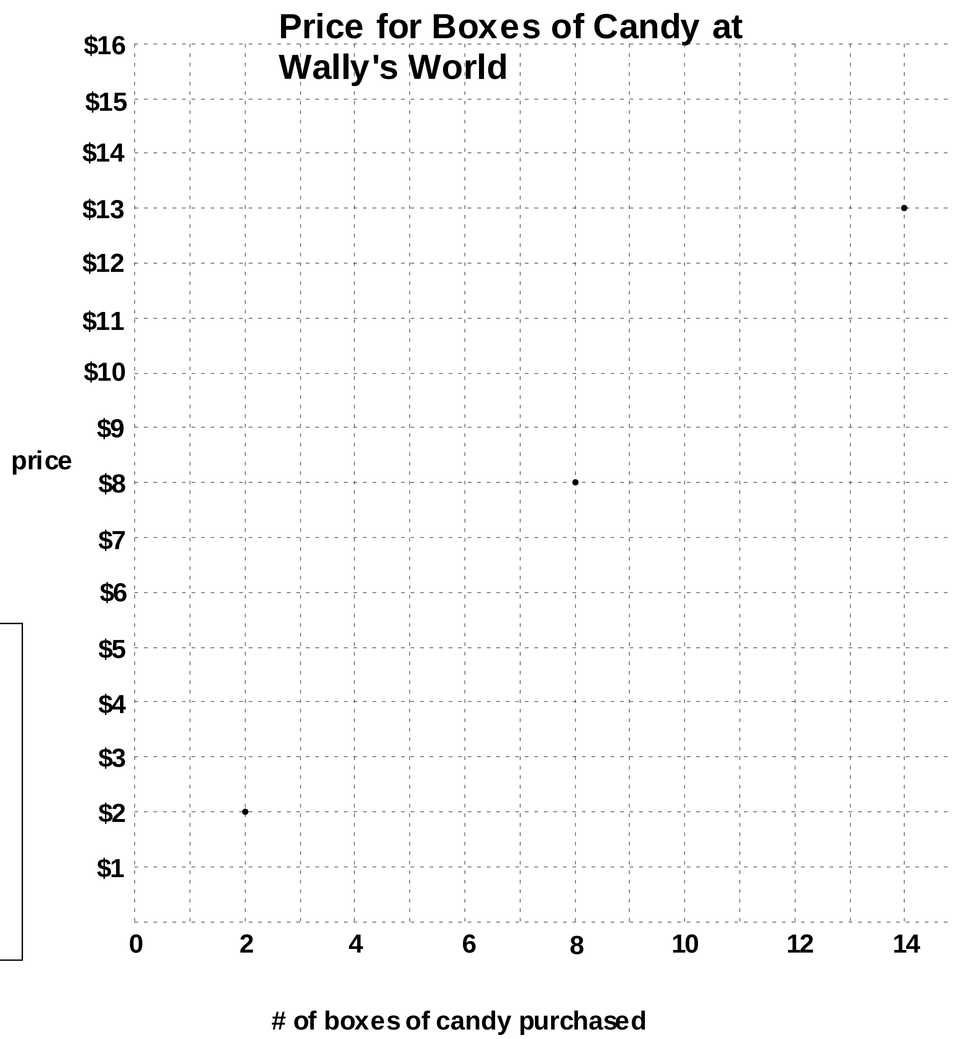
The rate of change in the first function is ¼ and the rate of change in the second function is ¾.

The equation for the table values would be y = ¾ x -4

2. Which of the situations is the best if you need 15 boxes of candy? Explain.

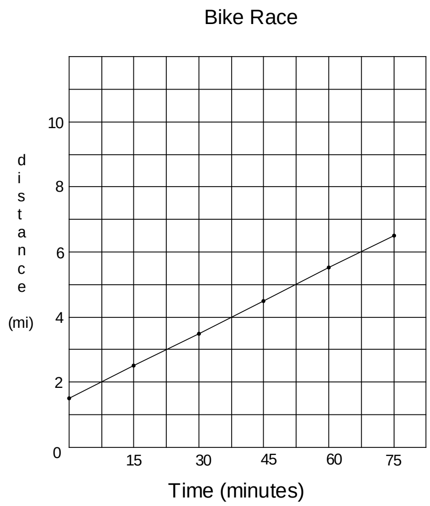
Boxes of candy at Wally's World are $1.00 each and for 15 boxes it would cost $15.00.

Boxes of candy at Winston's Discount are $0.75 for 14 of the boxes and 3 dollars for one. This would cost a total of $13.50, so it would be the best price.



Winston's Discount Boxes of candy $3.00 for the first box and $0.75 for each box after that!

3. Cliff and Billy are racing their bicycles around the bike path at the lake. The path is 10 miles long. Since Billy is a practiced bicyclist, he gave Cliff a 1.5 mile head start. The graph shows Cliff's first lap.



Billy's first lap time is represented in the chart below:

x (minutes)	10	20	25	35
y (distance)	2	4	5	7

The graph shows Cliff traveling 1 mile every 15 minutes and the table shows Billy traveling 2 miles every 10 minutes.

Cliff's equation is approximately $y = 0.067x + 1.5$

Billy's equation is $y = 0.2x$

Write two true mathematical statements about the race.

These will vary.
Possible statements are
Billy travels faster than Cliff.
In 15 minutes, they will have both traveled 2.5 miles because of his head start, he will be at 2.5 miles and Billy at 2.5 miles.

Unit 6, Activity 11, Graphing Systems of Equations

Name ____ Date ___________ Hour ____

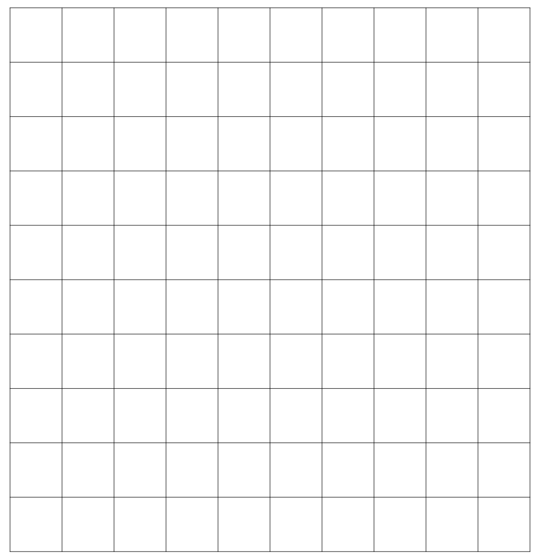
1) Sam left for work at 7:00 a.m. walking at a rate of 1.5 miles per hour. One hour later, his brother, James, noticed that he had forgotten his lunch. He leaves home walking at a rate of 2.5 miles per hour. When will he catch up with Sam to give him his lunch?

Graph each situation on the same graph.

Sam:
Table

Time (hours)	Miles
0	
0.5	
1	
1.5	
2	
2.5	
3	

Equation:



James:
Table:

Time (hours)	Miles
0	
0.5	
1	
1.5	
2	
2.5	
3	

Equation:

Using two or more equations to model a situation is called using a system of equations.

<u>Definition</u>

<u>System of equations</u>:

A solution to a system of equations is the set of points that makes the system true.

2) Solve each of the following systems of equations by graphing.

A. $y = -x + 3$
$y = x + 1$

B. $3x + 2y = 4$
$-x + 3y = -5$

3) Suppose James leaves his house one hour later, but he walks at the same rate as Sam, 1.5 miles per hour. When will he catch up with Sam?

Sam:
Table

Time (hours)	Miles
0	
0.5	
1	
1.5	
2	
2.5	
3	

Equation:

James:
Table:

Time (hours)	Miles
0	
0.5	
1	
1.5	
2	
2.5	
3	

Equation:

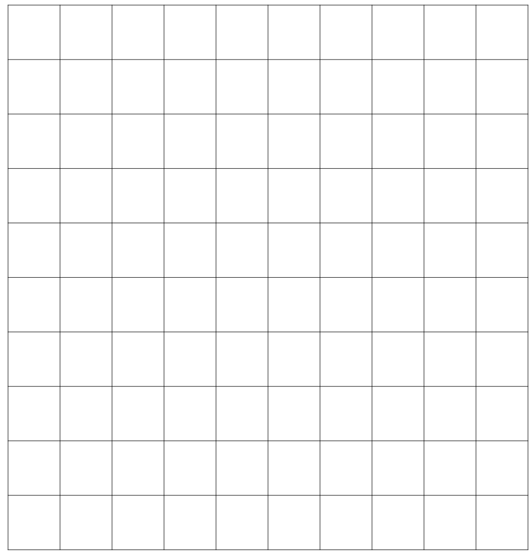
When will a system of equations have no solution?

4) Suppose James leaves at the same time as Sam and walks at the same rate as Sam. Demonstrate what this would look like graphically.

Sam:
Table

Time (hours)	Miles
0	
0.5	
1	
1.5	
2	
2.5	
3	

Equation:



James:
Table:

Time (hours)	Miles
0	
0.5	
1	
1.5	
2	
2.5	
3	

Equation:

When will a system of equations have an infinite number of solutions?

1) Sam left for work at 7:00 a.m. walking at a rate of 1.5 miles per hour. One hour later, his brother, James, noticed that he had forgotten his lunch. He leaves home walking at a rate of 2.5 miles per hour. When will he catch up with Sam to give him his lunch?

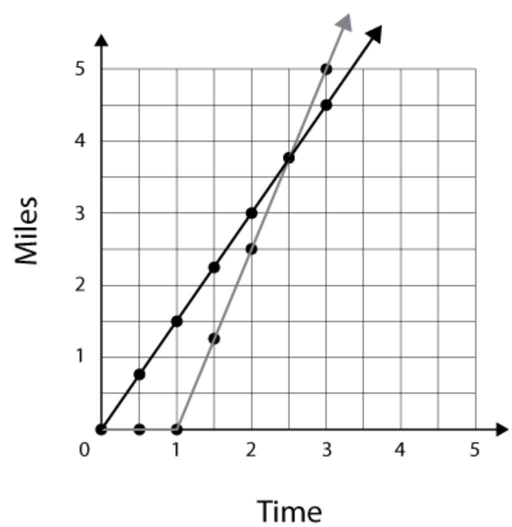
Graph each situation on the same graph.

Sam:
Table

Time (hours)	Miles
0	*0*
0.5	*.75*
1	*1.5*
1.5	*2.25*
2	*3*
2.5	*3.75*
3	*4.5*

Equation:

$y = 1.5x$



James:
Table:

Time (hours)	Miles
0	*0*
0.5	*0*
1	*0*
1.5	*1.25*
2	*2.5*
2.5	*3.75*
3	*5*

Equation:

$y = 2.5(x - 1)$

This situation is an example of a system of equations.

<u>Definition</u>

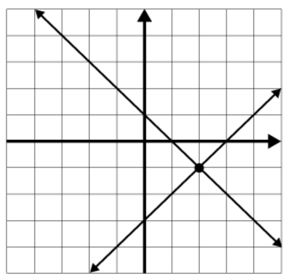
<u>System of equations</u>: *a set of two or more equations with two or more variables*

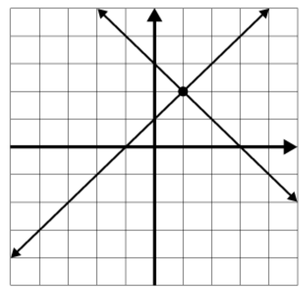
A solution to a system of equations is the ordered pair that makes both equations true.

2) Solve each of the following systems of equations by graphing.

A. $y = -x + 3$
$y = x + 1$ *Answer: (1, 2)*

B. $3x + 2y = 4$
$-x + 3y = -5$ *Answer: (2, -1)*



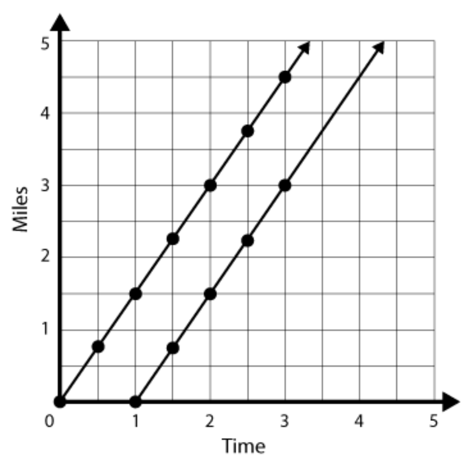


3) Suppose James leaves his house one hour later but he walks at the same rate as Sam, 1.5 miles per hour. When will he catch up with Sam? *never*

Sam:
Table

Time (hours)	Miles
0	*0*
0.5	*.75*
1	*1.5*
1.5	*2.25*
2	*3*
2.5	*3.75*
3	*4.5*

Equation: $y = 1.5x$



James:
Table:

Time (hours)	Miles
0	*0*
0.5	*0*
1	*0*
1.5	*.75*
2	*1.5*
2.5	*2.25*
3	*3*

Equation: $y = 1.5(x - 1)$

When will a system of equations have no solution? *When the slopes of the lines are the same and the y-intercepts are different (parallel lines, the lines will never intersect so there will be no solution.)*

4) Suppose James leaves at the same time as Sam and walks at the same rate as Sam. Demonstrate what this would look like graphically.

Sam:
Table

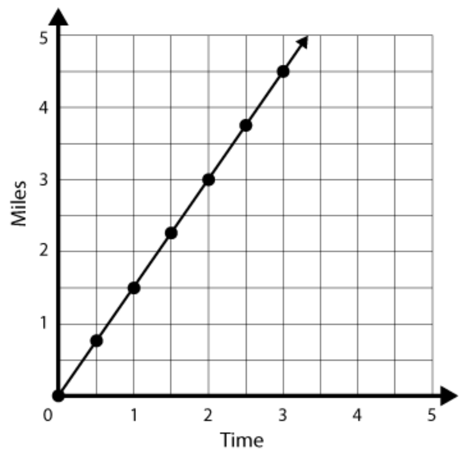
Time (hours)	Miles
0	*0*
0.5	*.75*
1	*1.5*
1.5	*2.25*
2	*3*
2.5	*3.75*
3	*4.5*

Equation: *$y = 1.5x$*

James:
Table:

Time (hours)	Miles
0	*0*
0.5	*.75*
1	*1.5*
1.5	*2.25*
2	*3*
2.5	*3.75*
3	*4.5*

Equation: *$y = 1.5x$*



When will a system of equations have an infinite number of solutions? *When the equations are equivalent.*

Unit 7, Activity 3, Grid

Name ____ Date ____________ Hour ______

Unit 7, Activity 4, Battle of the Sexes

Name ______________________________ Date ______________ Hour __________

Have you ever wondered about the comparison of the athletic abilities of men and women? **Mathematically, you can use the past performance of athletes to make that comparison.**

Listed below you will find the winning times of men and women in the Olympic competition of the 100-meter freestyle in swimming. You will use this data and what you have learned about systems of equations to make comparisons between the men and women.

Men's 100-Meter Freestyle		**Women's 100-Meter Freestyle**	
Year	**Time (seconds)**	**Year**	**Time (seconds)**
1920	61.4	1920	73.6
1924	59	1924	72.4
1928	58.6	1928	71
1932	58.2	1932	66.8
1936	57.6	1936	65.9
1948	57.3	1948	66.3
1952	57.4	1952	66.8
1956	55.4	1956	62
1960	55.2	1960	61.2
1964	53.4	1964	59.5
1968	52.2	1968	60
1972	51.2	1972	58.6
1976	50	1976	55.7
1980	50.4	1980	54.8
1984	49.8	1984	55.9
1988	48.6	1988	54.9
1992	49	1992	54.6
1994	48.7	1994	54.5
1996	48.7	1996	54.5

1. Graph the data from the chart. Describe what the point of intersection on the graph tells you.

2. Use the graph to make a prediction, as to whether there is ever a year that women and men swim the 100-meter freestyle in the same time? If so, what year and what time will they swim?

3. How does the graph show that the men are faster than the women?

Unit 7, Activity 4, Battle of the Sexes with Answers

Have you ever wondered about the comparison of the athletic abilities of men and women? **Mathematically, you can use the past performance of athletes to make that comparison.**

Listed below you will find the winning times of men and women in the Olympic competition of the 100-meter freestyle in swimming. You will use this data and what you have learned about systems of equations to make comparisons between the men and women.

Men's 100-Meter Freestyle		**Women's 100-Meter Freestyle**	
Year	**Time (seconds)**	**Year**	**Time (seconds)**
1920	61.4	1920	73.6
1924	59	1924	72.4
1928	58.6	1928	71
1932	58.2	1932	66.8
1936	57.6	1936	65.9
1948	57.3	1948	66.3
1952	57.4	1952	66.8
1956	55.4	1956	62
1960	55.2	1960	61.2
1964	53.4	1964	59.5
1968	52.2	1968	60
1972	51.2	1972	58.6
1976	50	1976	55.7
1980	50.4	1980	54.8
1984	49.8	1984	55.9
1988	48.6	1988	54.9
1992	49	1992	54.6
1994	48.7	1994	54.5
1996	48.7	1996	54.5

1. Graph the data from the chart. Describe what the point of intersection on the graph tells you.

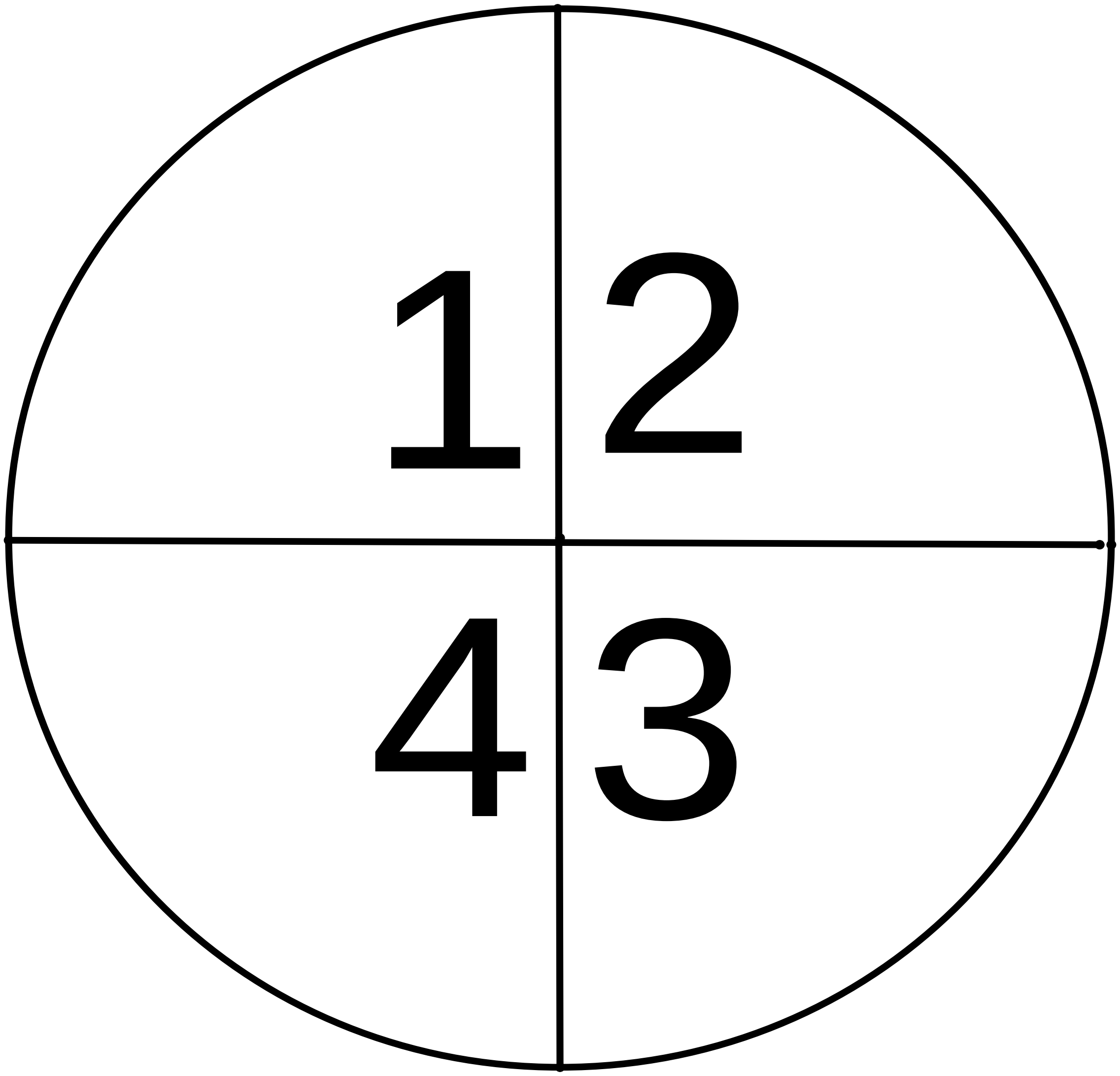
Men are faster swimmers each year in the 100 meter freestyle than women up until 1996

2. Use the graph to make a prediction, as to whether there is ever a year that women and men swim the 100-meter freestyle in the same time? If so, what year and what time will they swim?

The horizontal axis represents the year and the vertical axis represents time. The graphs represent the time that men and women finished a race; therefore, as the times get shorter, the speed becomes faster. The graphs are both showing a negative trend, indicating the speeds are faster and if it continues at this rate, the women could swim as fast as the men in the year 2049 if the same trend continues.

3. How does the graph show that the men are faster than the women?

The men's points show a shorter time each year to finish the 100 meter race than the women's.


1
2
4
3

Relative Frequencies and Batting Averages

Name ________________________________ Date _______________________ Hour _______

Compute the following relative frequencies to find the batting averages:

1. 16 hits out of 50 at bats
2. 25 hits out of 79 at bats
3. 18 hits out of 75 at bats
4. 15 hits out of 75 at bats

Compute the relative frequency to find batting averages for the following players:

1. A player with 2 outs, 1 hit, and 1 walk.
2. A player with 1 walk, 2 hits, 1 base on errors, and 2 outs.
3. A player who over the course of a season had 12 walks, 20 hits, 52 outs, 2 bases on errors, and 3 sacrifices.

Unit 7, Activity 6, Relative Frequencies and Batting Averages with Answers

Batting Averages with answers

Compute the following relative frequencies to find the batting averages:

1. 16 hits out of 50 at bats

$$\frac{16}{50} = .320$$

2. 25 hits out of 79 at bats

$$\frac{25}{79} = .316$$

3. 18 hits out of 75 at bats

$$\frac{18}{75} = .240$$

4. 15 hits out of 75 at bats

$$\frac{15}{75} = .200$$

Compute the batting averages for the following players:

1. A player with 2 outs, 1 hit, and 1 walk.

	AB	H
Outs	2	0
Hits	1	1
Walks	0	0
Total	3	1

BA = 1/3 = .333

2. A player with 1 walk, 2 hits, 1 base on errors, and 2 outs.

	AB	H
Walks	0	0
Hits	2	2
Errors	1	0
Outs	2	0
Total	5	2

BA = 2/5 = .400

3. A player who over the course of a season had 12 walks, 20 hits, 52 outs, 2 bases on errors, and 3 sacrifices.

	AB	H
Walks	0	0
Hits	20	20
Outs	52	0
Errors	2	0
Sacrifices	0	0
Total	74	20

BA = 20/74 = .270

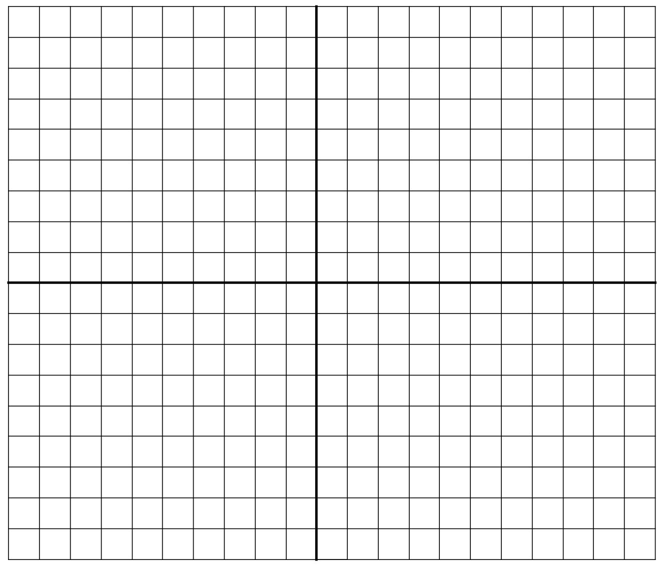
Unit 8, Activity 1, Graphing Equations and Identifying Characteristics

Name ____ Date ________ Hour ________

With the equations below:

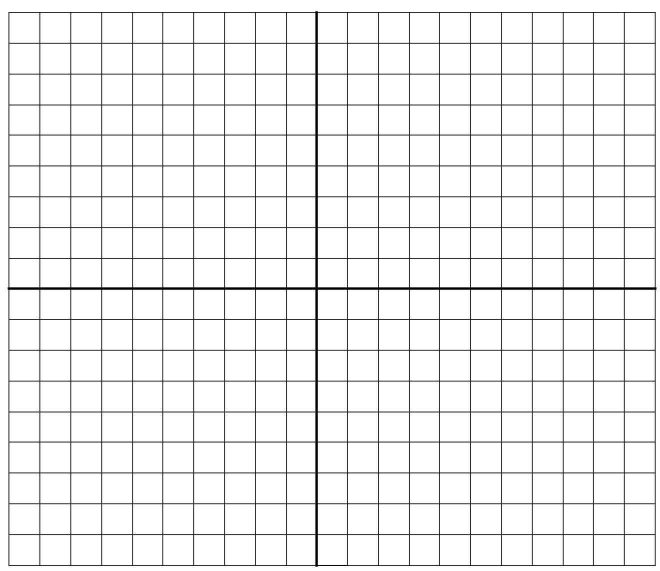
A) graph the equations

B) give some characteristics of the equations that will help to explain the differences in the equations



Group A
$y = 2x + 3$
$y = 2x – 3$
$y = 2x + 5$
$y = 2x - 5$

Characteristics of Group A



Group B
$y = -5x - 4$
$y = 5x - 4$
$y = x - 4$
$y = -x - 4$

Characteristics of Group **B**

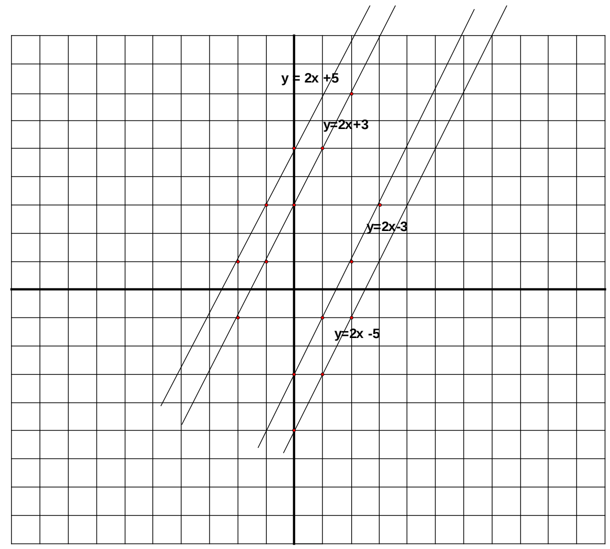
Unit 8, Activity 1, Graphing Equations and Identifying Characteristics* with *Answers

Name ____ Date ________ Hour ________

With the equations below:

A) graph the equations

B) give characteristics of the equations that could explain the set of equations.



Group A
$y = 2x + 3$

$y = 2x - 3$

$y = 2x + 5$

$y = 2x - 5$

Characteristics of Group A
Answers will vary, some possible are

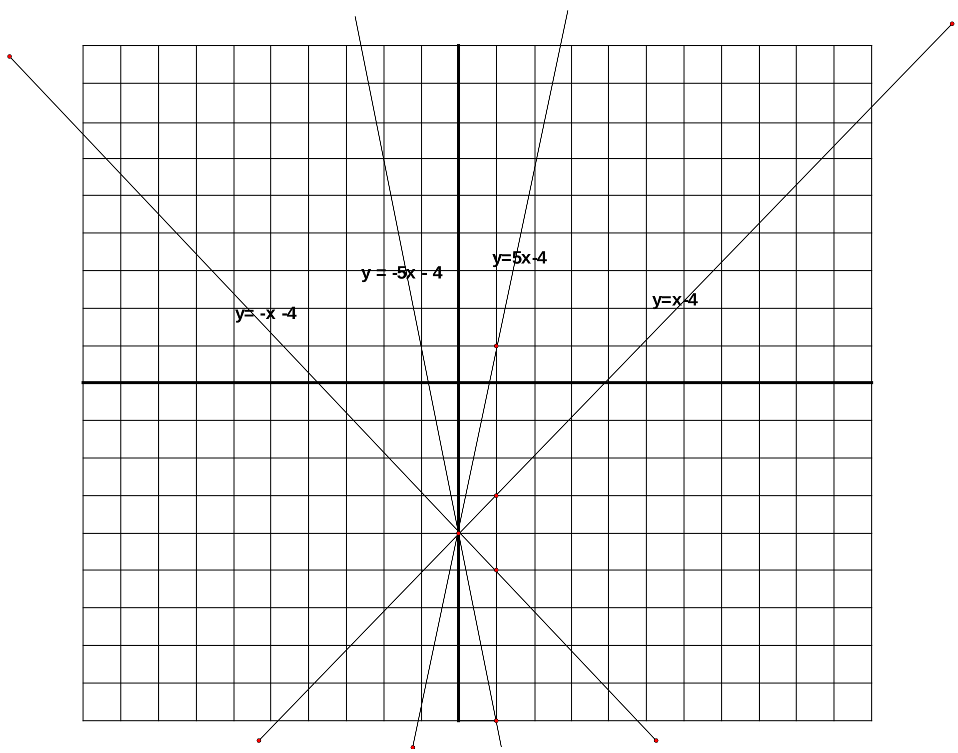
All have a slope of 2.
There are two with a positive y-intercept.
There are two with a negative y-intercept.

Group B
$y = -5x - 4$

$y = 5x - 4$

$y = x - 4$

$y = -x - 4$



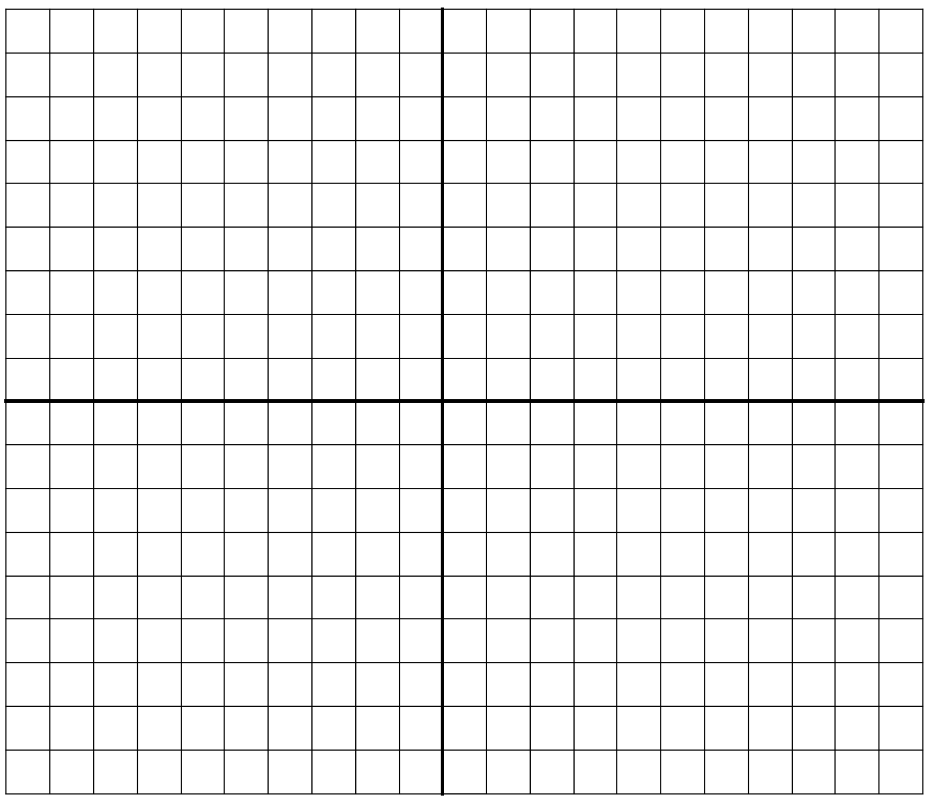
Characteristics of Group B
Answers will vary, some possible are

All have a y-intercept of positive y=-4.
Slopes are opposites.

Unit 8, Activity 2, My Friend the Artist

Name ______________________________________ Date ___________________ Hour _____

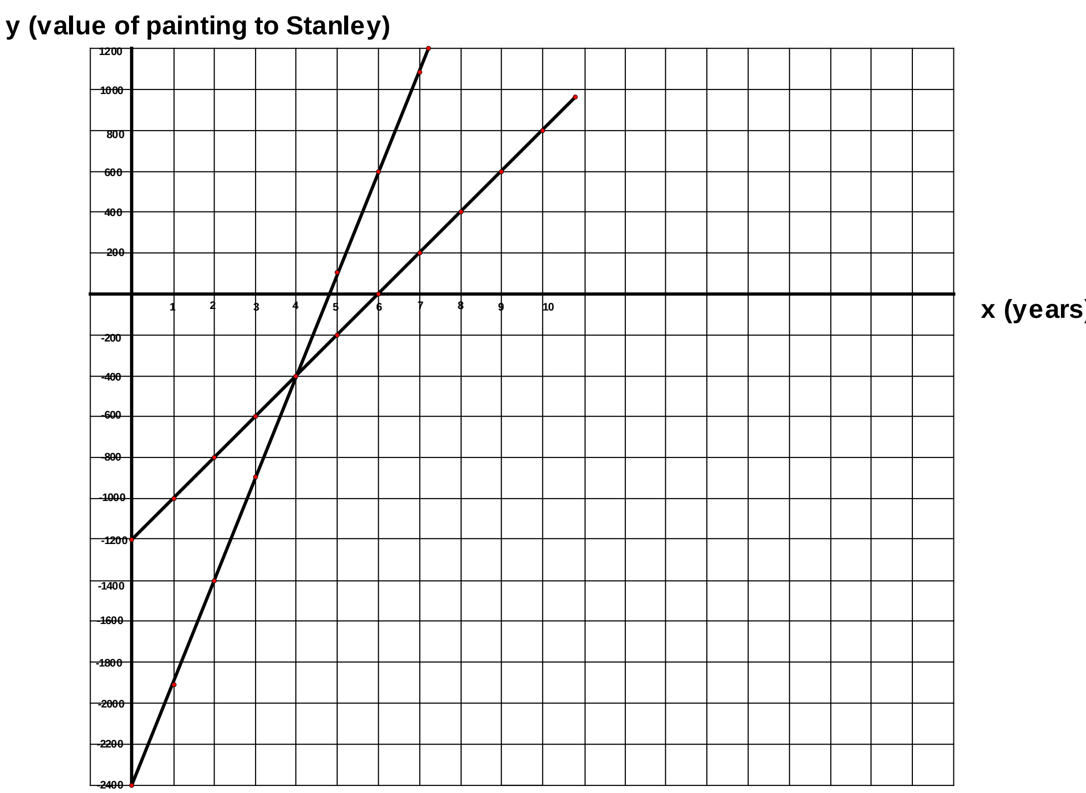
Stanley wanted to purchase a painting that his friend had painted. The last painting his friend painted had increased in value $2500 a year and was sold last week at an auction for $150,000. One painting Stanley wanted to purchase was selling at a road show for $1200.00. He knew that his friend's painting would increase in value $200 a year. The second painting was also selling at the road show and was selling for $4500. The second painting has been in a magazine and the value of this painting will increase $500 a year. These increases in value of the paintings are going to be constant for the next ten years. Write an equation for each of the painting that models the painting value over the years. Determine which of the paintings would be the best investment for Stanley over the next ten years. Prepare a graph and a justification for your choice.



Stanley wanted to purchase a painting that his friend had painted. The last painting his friend painted had increased in value $2500 a year and was sold last week at an auction for $150,000. One painting Stanley wanted to purchase was selling at a road show for $1200.00. He knew that his friend's painting would increase in value $200 a year. The second painting was also selling at the road show and was selling for $2400. The second painting has been in a magazine and the value of this painting will increase $500 a year. These increases in value of the paintings are going to be constant for the next ten years. Write an equation for each of the painting that models the painting value over the years. Determine which of the paintings would be the best investment for Stanley over the next ten years. Prepare a graph and a justification for your choice.

Equation for the first painting $y = 200x + 1200$
Equation for the second paint $y = 500x + 2400$

Justification: These will vary: some points might be that if Stanley has to sell the painting before the 4th year, it would be better to buy the $1200 painting but if it is a 10 year investment, the $2400 painting will be the best investment.



Unit 8, Activity 3, Radio Commentary

Read the commentary below and compare the commentary to the graphs given for each of the animals in the race. Change any parts of the commentary that are inaccurate. We think that the announcer was confused as he commented on the race.

Welcome visitors. We are gathered here today to determine the champion between the deer, the brown hare and the alligator. Each of the competitors is sure that he or she will dominate the 100 meter race.

The competitors are lined up along the starting line and are ready to start. The alligator was given a head start by the organizing committee that allowed him to start at the 10 meter line because they did not want him to be tempted to harass the other competitors. The deer was asked to start five meters behind the starting line because of his size and the hare started the race at the starting line.

They are off; the hare is in the lead 2 seconds into the race, but the deer is close behind.

Gator started off at a really fast pace but has slowed to a steady pace after two seconds.

Oh, no, after 3 seconds, Gator stops in his tracks for 2 seconds. We do not know why this happened but . . . wait! Hare passes him and what is going on? Gator stops. Deer has just passed Hare. Gator is catching up with the others.

Twelve seconds into the race, Deer is still in the lead; will anyone overtake him?

Deer finally has started running at the same pace as before. Hare just took a tumble; he's down just three seconds after Deer stopped. This is a really strange race.

It looks like Hare is massaging his leg; we certainly hope he will be able to continue. Oh, no, 3 seconds have passed, he is back up and running at his original pace.

I have to admit, this has really been a strange race.

They have just crossed the finish line! ________________________ wins, it took only about__________ seconds for him to complete the race.

Unit 8, Activity 3, Radio Commentary with Answers

The “strike throughs” in the answer document mean that the student needed to change those words because the commentary did not match the information in the graph.

Welcome visitors. We are gathered here today to determine the champion between the deer, the brown hare and the alligator. Each of the competitors is sure that he or she will dominate the 100 meter race.

The competitors are lined up along the starting line and ready to start. The alligator was given a head start by the organizing committee by allowing him to start at the 10 meter line because they did not want him to be tempted to harass the other competitors. The deer was asked to start five meters behind the starting line because of his size and the hare started the race at the origin.

They are off, the ~~hare~~ *(gator)* is in the lead 2 seconds into the race, *no one is close behind* ~~but the deer is close behind~~.

Gator started off at a really fast pace but has slowed to a steady pace after two seconds.

Oh, no, after 3 seconds, ~~gator~~ *(deer)* stops in his tracks for 2 seconds. We do not know why this happened but . . . wait! Hare passes him and what is going on? ~~Gator~~ *(deer)* stops. ~~Deer~~ *(hare)* has just passed ~~hare~~ *(deer)*. Gator is ~~catching up with the others~~ *(falling behind deer)*.

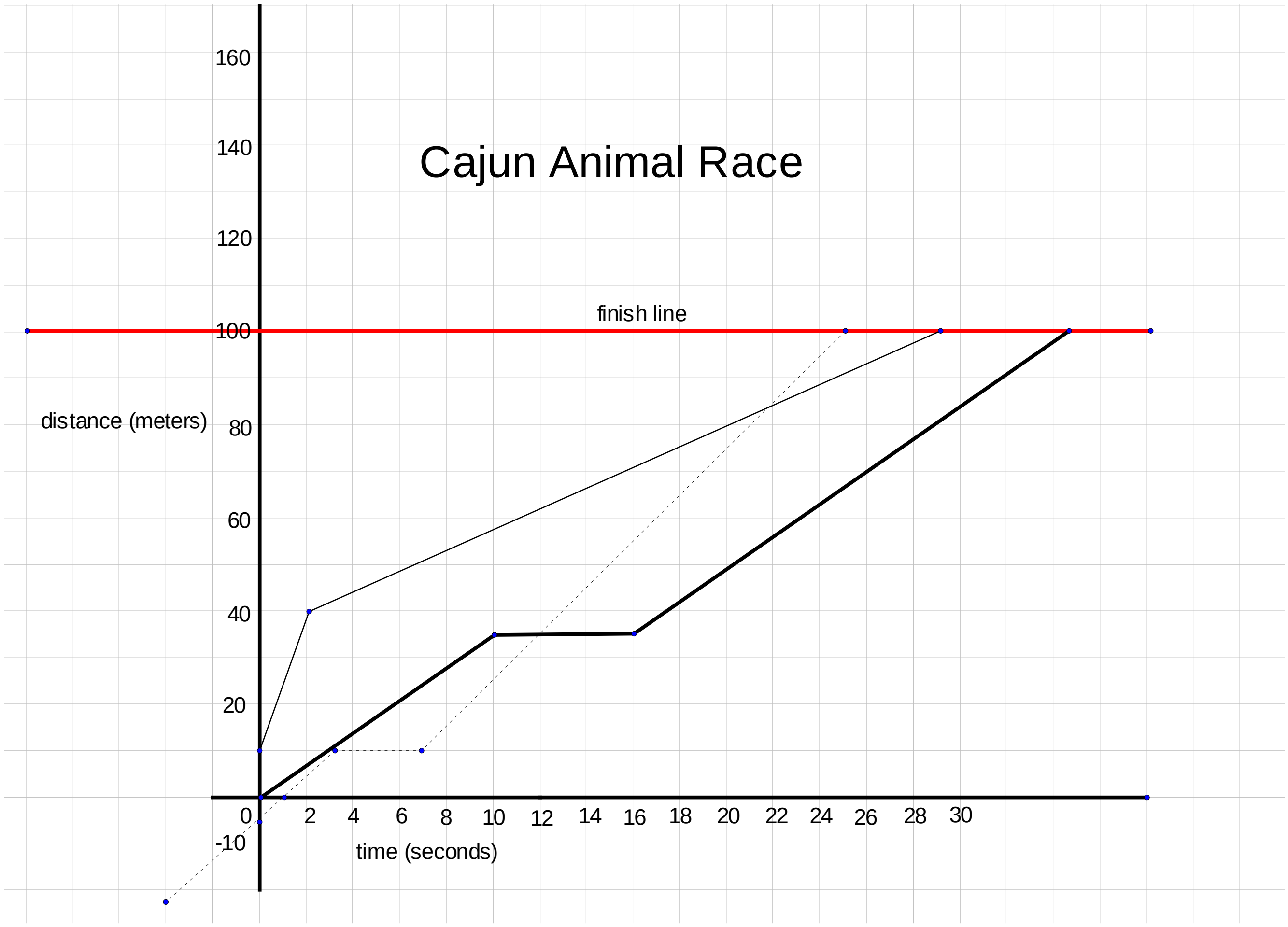
Twelve seconds into the race, ~~Deer~~ *(alligator)*, will anyone overtake him?

~~Deer~~ *(hare)* finally has started running at the same pace as before. Hare just took a tumble; he’s down just three seconds after deer stopped. This is a really strange race.

It looks like hare is massaging his leg; we certainly hope he will be able to continue. Oh, no, 3 seconds have passed; he is back up and running at his original pace.

I have to admit, this has really been a strange race.

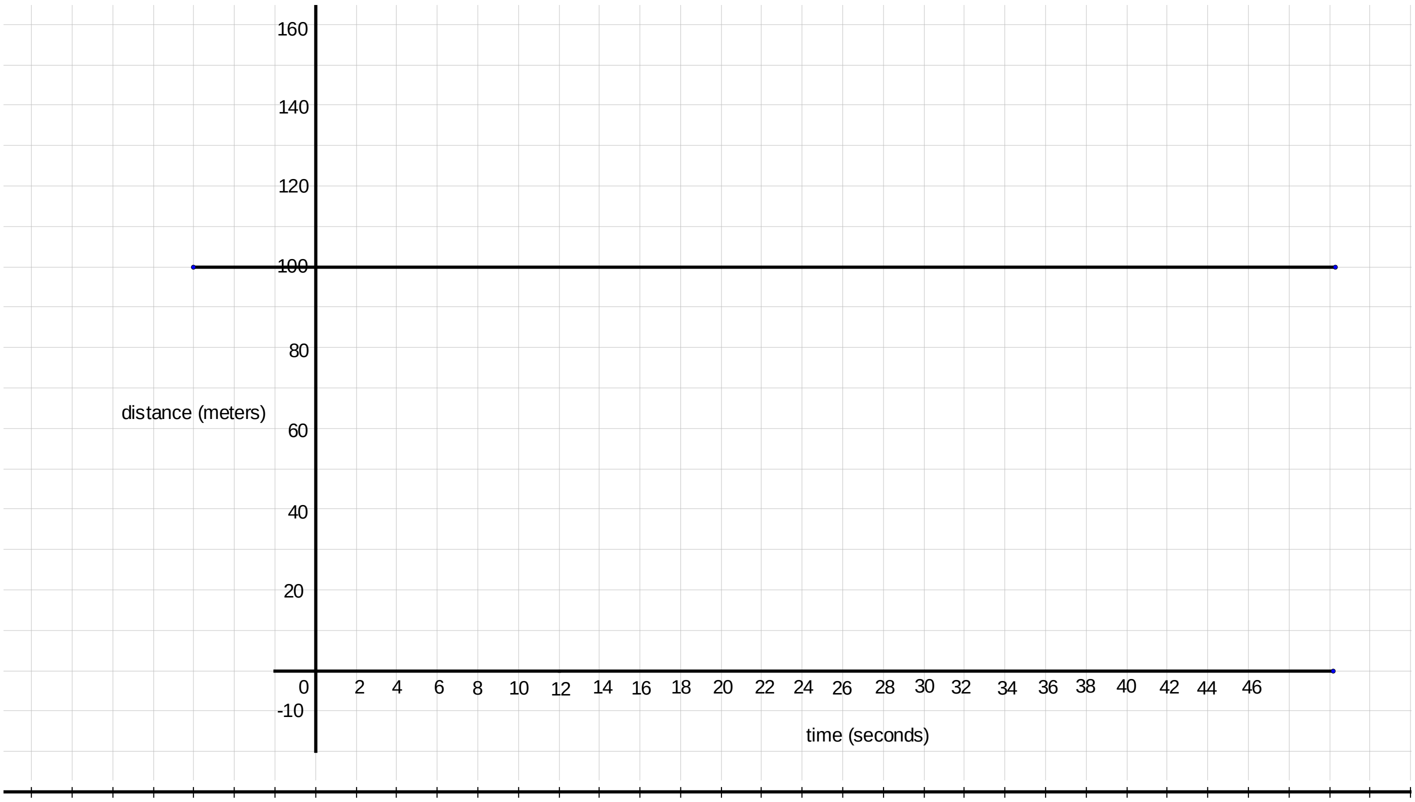
They have just crossed the finish line! ______*(deer)*____________ wins, it took only about___*25*_______ seconds for him to complete the race.



Cajun Animal Race
finish line
distance (meters)
time (seconds)
160
140
120
100
80
60
40
20
0
-10
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30

Unit 8, Activity 3, Graphing Equations for Second Race

Name ______________________________ Date ________________ Hour ___________



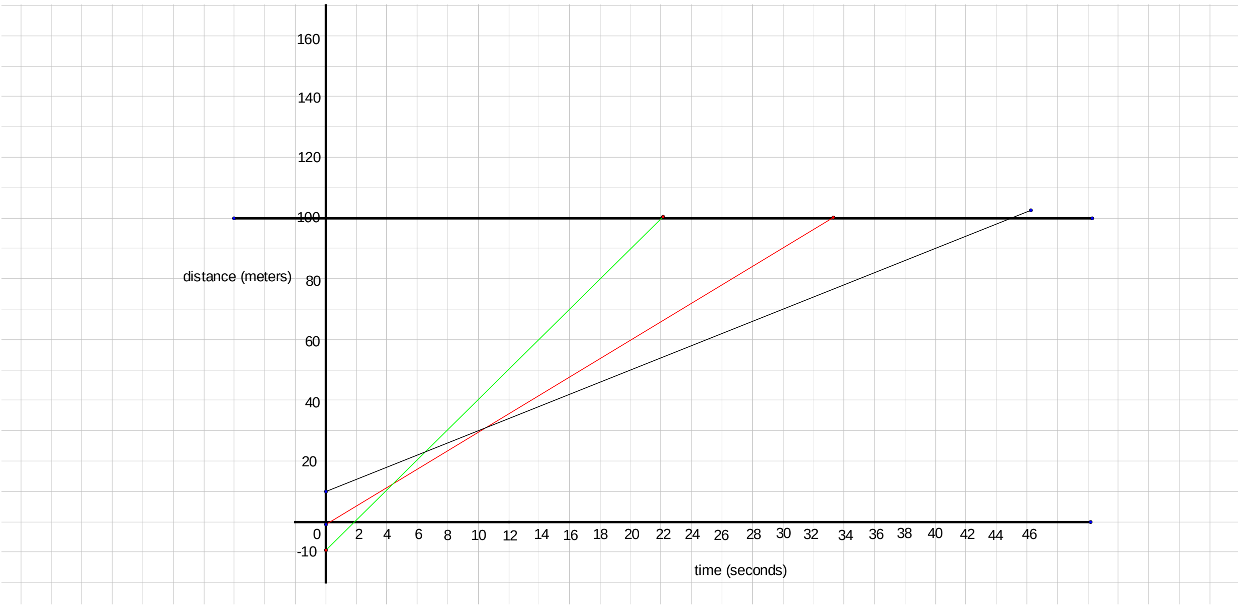
1. Which animal will pass another animal first? How many seconds will it take for this to happen?

2. What is the range of finish times for the race? Who finished first, second, third?

3. Approximately how many seconds did it take for the deer to pass the alligator?

4. Give at least two ordered pair for points along the alligator's line. Explain what each of the numbers in the ordered pair represent.

Unit 8, Activity 3, Graphing Equations for Second Race with Answers



1. Which animal will pass another animal first? How many seconds will it take for this to happen?

The deer will pass the hare first, and it will happen about 4 seconds into the race

2. What is the range of finish times for the race? Who finished first, second, third?

45 – 22 = 23 second range between the finish times. Deer – 1st, hare – 2nd, alligator – 3rd.

3. Approximately how many seconds did it take for the deer to pass the alligator?

More than 6 seconds but less than 7 seconds

4. Give at least two ordered pair for points along the alligator's line. Explain what each of the numbers in the ordered pair represent.

(10, 30) and (20, 50) are two points on the alligator's line. The "x" variable stands for the elapsed time and the "y" refers to the distance the alligator has traveled after this amount of time.

Unit 8, Activity 3, Text Chain Commentary of Race

Names of group members________________________________ Hour ________

Welcome visitors.

We are gathered here today for a rematch to determine the champion between the deer, brown hare and the alligator. Each of the competitors is sure that they will dominate the 100 meter race.

The competitors are lined up along the starting line and ready to start. The alligator was given a head start by the organizing committee by allowing him to start at the 10 meter line because they did not want him to be tempted to harass the other competitors. The deer was asked to start five meters behind the starting line because of his size and the hare started the race at the origin.

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Name ____ Date ______________ Hour ______

Destiny and Rachel decided they would make some money babysitting during the summer. Destiny said that she will charge \$5.00 per hour and a flat rate of \$2.00 each time. Rachel thinks that she will encourage more business if she does not charge a flat rate but charges \$5.50 per hour.

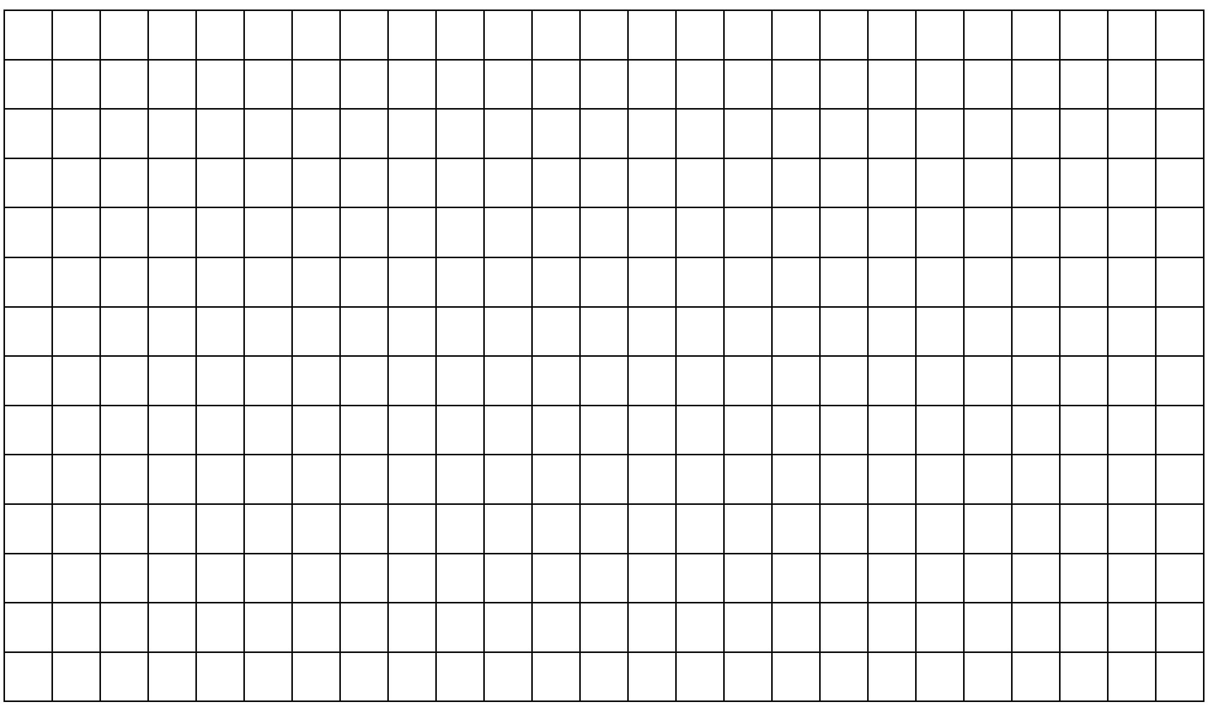
1. Make an input/output table for each of the girls using 1, 2, 4, 6, and 8 hours.

Destiny	1	2	4	6	8

Rachel	1	2	4	6	8

2. Write an equation that will represent each girl's babysitting charges.

3. On the graph below, graph each girl's rate of pay in a different color. Label the axes of your graph and your graphs of the equations.



4. Determine the number of hours Rachel must work to make the same pay as Destiny for the same number of hours. Show how to solve the problem in at least two different ways.

5. What is the ordered pair that represents the answer to question #4?

6. Verify your answer to #5 by substituting into the equations.

Destiny and Rachel decided they would make some money babysitting during the summer. Destiny said that she will charge $5.00 per hour and a flat rate of $2.00 each time. Rachel thinks that she will encourage more business if she does not charge a flat rate but charges $5.50 per hour.

1. Make an input/output table for each of the girls using 1, 2, 4, 6, and 8 hours.

Destiny	1	2	4	6	8
	$7	$12	$22	$32	$42

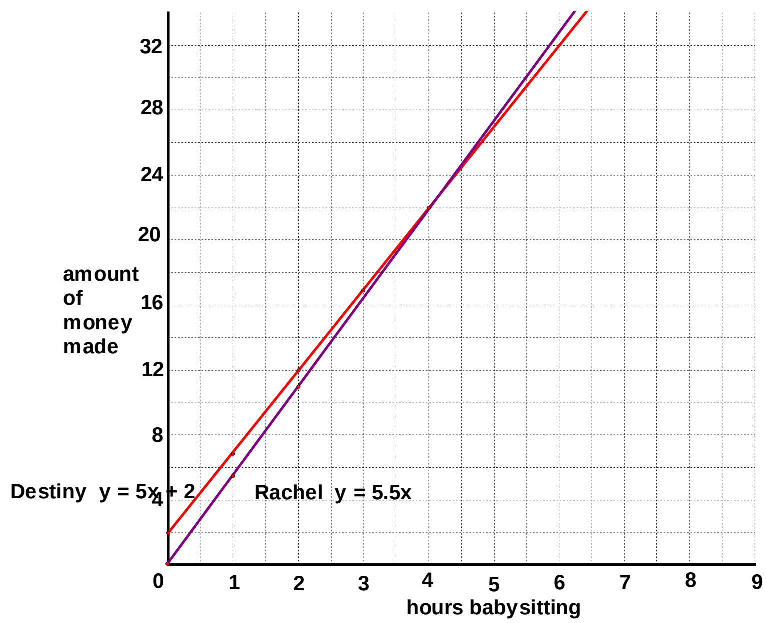
Rachel	1	2	4	6	8
	$5.50	$11	$22	$33	$44

2. Write an equation that will represent each girl's babysitting charges.

Destiny $y = 5x + 2$

Rachel $y = 5.5x$

3. On the graph below, graph each girl's rate of pay in a different color. Label the axes of your graph and your graphs of the equations.



4. Determine the number of hours Rachel must work to make the same pay as Destiny for the same number of hours. Show how to solve the problem in at least two different ways.

Both girls make $22 when they work 4 hours.

5. What is the ordered pair that represents the answer to question #4?
   (4, 22)

6. Verify your answer to #5 by substituting into the equations.

$5x + 2 = 5.5x$

$-5x + 5x + 2 = 5.5x - 5x$

$2 = .5x$

$2/.5 = x$

$4 = x$

$y = 5x + 2$

$y = 5(4) + 2$

$y = 22$

and

$y = 5.5x$

$y = 5.5(4)$

$y = 22$

Unit 8, Activity 5, Practice with Systems of Equations

Name ______________________________________ Date ________________ Hour ______

Solve each system of equations. Be sure to justify your solution.

1. The basketball tournament is always a big event in middle school. The adult tickets cost \$5.00 and student tickets cost \$2.00. The first fifteen minutes of the game Sally sold 18 tickets. She collected a total of \$54.00 during this time. Let x represent the number of student tickets and let y represent the number of adult tickets.

    a. Write the two equations that can be written from the information given in the problem.

    b. Determine the number of student tickets that were sold. Justify your answer.

2. Mrs. Williams has a jar that contains only nickels and quarters. The total number of coins in the jar is 15. She has a total of \$1.75 in the jar. How many of each type of coin does she have? Let x represent the number of quarters and let y represent the number of nickels.

    a. Write the two equations that can be written from the information given in the problem.

    b. Determine the number of each coin Mrs. Williams has in the jar. Justify your answer.

Unit 8, Activity 5, Practice with Systems of Equations

Solve each system of equations. Be sure to justify your solution.

1. The basketball tournament is always a big event in middle school. The adult tickets cost \$5.00 and student tickets cost \$2.00. The first fifteen minutes of the game Sally sold 18 tickets. She collected a total of \$54.00 during this time. Let *x* represent the number of student tickets and let *y* represent the number of adult tickets.

   a. Write the two equations that can be written from the information given in the problem.

   $x + y = 18$

   $2x + 5y = 54$

   b. Determine the number of student tickets that were sold. Justify your answer.

   $-2(x + y = 18)$

   $2x + 5y = 54$

   $-2x - 2y = -36$

   $\underline{2x + 5y = 54}$

   $3y = 18$ $\quad\quad$ $18 – 6 = 12$ *student tickets*

   $y = 6$ *adult tickets*

2. Mrs. Williams has a jar that contains only nickels and quarters. The total number of coins in the jar is 15. She has a total of \$1.75 in the jar. How many of each type of coin does she have? Let *x* represent the number of quarters and let *y* represent the number of nickels.

   a. Write the two equations that can be written from the information given in the problem.

   $x + y = 15$

   $.25x + .05y = 1.75$

   b. Determine the number of each coin Mrs. Williams has in the jar. Justify your answer.

   $-.05x + -.05y = .75$ $\quad\quad$ $5 + y = 15$

   $\underline{.25x + .05y = 1.75}$ $\quad\quad$ $\underline{y = 10}$ *nickels*

   $.2x = 1.0$

   $x = 5$ *quarters*