Algebra 1 Activities NCTM Regional Conference

Numerous Files can be downloaded from http://wsfcs.k12.nc.us/Page/51682 and from the Conference Planner Handout

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Links:

Box Whiskers/Standard Deviation/Median: http://math.cowpi.com/geogebra/histogram_mean_median.html

Regression Line of Best Fit: http://www.shodor.org/interactivate/activities/Regression/
http://mathbits.com/MathBits/PPT/EstimateAge.htm

Demonstration of Exponential Growth of Walmart and Target:
http://projects.flowingdata.com/walmart/ http://projects.flowingdata.com/target/

Demonstrations of Simple Movement on Graphs: http://www.graphingstories.com

Introduction to Functions (input-Output): https://www.youtube.com/watch?v=VUTXsPFx-qQ

Distance Formula Applet: http://math.cowpi.com/geogebra/distance_formula.html

Worksheet Builder (answers and how to solve): www.easyworksheet.com

Go to http://www.mrbartonmaths.com/jigsaw.htm to download Tarsia (Puzzle maker) and for pre-made puzzle

Songs: Distance/Midpoint/Slope: https://www.youtube.com/watch?v=Z1BiPATzFXA

Distance Formula: https://www.youtube.com/watch?v=YeNqkeYwX_U
https://www.youtube.com/watch?v=m_iyBtstjzs

Slope Song (Slope Rida) https://www.youtube.com/watch?v=HUATvvVxwj0
https://www.youtube.com/watch?v=AV76i4kJHmU

Factor: https://www.youtube.com/watch?v=QFSrINhfNsQ

Systems of Equations: https://www.youtube.com/watch?v=1qHTmxlaZWQ

Exponential Growth: https://www.youtube.com/watch?v=aDkRHY16Py4

Exponents: https://www.youtube.com/watch?v=QIZTruxt2rQ

Graphing Lines: https://www.youtube.com/watch?v=TTYKcHJyLN4
https://www.youtube.com/watch?v=2BHzXltkByU

Solving Equations (more for Algebra 2)
https://www.youtube.com/watch?v=OsEd7X5XuCU&list=PLO7ZzJGcOQfDFVsNIZgXeYS-wf5SaMXbb

Exponent Song (Sung to "Flintstones")

Exponents, meet the exponents.
They're a common Algebra Family
When you multiply them, you add the exponents
When you divide them, you subtract the exponents
When you raise one to a power, you multiply the exponents
When you have a fraction one, the denominator is a root
When you have a negative one, you switch the location
Let's see then when the exponent is zero,
Then you always make the base one.
Exponents, use them correctly...
Use them correctly and you'll get an "A."

Factoring Binomials (Sung to "If you are happy and know it"

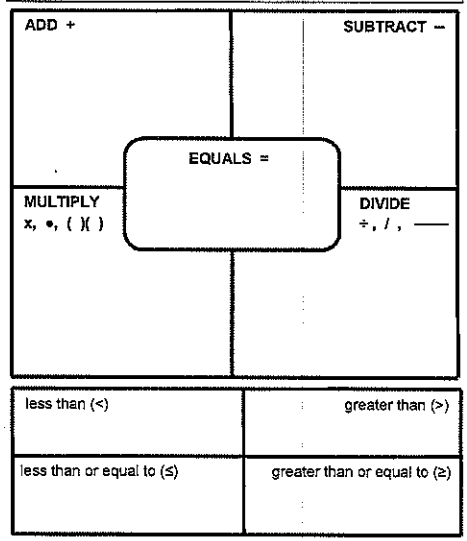
(+ +) = (+)(+) (- +) = (-)(-)
If the second is a plus, two of the first.
If the second is a plus, two of the first.
If the second is a plus, then you add to get the middle
If the second is a plus, two of the first
(+ -) = (+)(-)
If the second is a minus, one of each
If the second is a minus, one of each
If the second is a minus, then you subtract to get the middle
If the second is a minus, one of each.

Math Aerobics

Students act out the "chants" with their bodies and do each one twice

Y=3 x = 3
Positive Negative Zero Undefined
Parallel same, perpendicular negative flip
Rise over Run
Y – y over x – x
Y = Slope x + B

TRANSLATION TERMS SORT ACTIVITY



is	product of ... and ...
is the same as	times
is equivalent to	twice
is equal to	double
sum of ... and ..	triple
plus	half
more than	one-third
increased by	squared
combine	cubed
deposit	quotient of ... and ...
total	per
difference of ... and ...	into
minus	over
less than	separate into equal groups
decreased by	Fewer than
less	At most
withdrawal	No more than
take away	A maximum of
At least	More than
No less than	A minimum of

SOLVING INEQUALITIES

1. Begin by exploring the effects of multiplying both sides of an inequality by a negative number.

a. Consider the following true statements. 3 < 7 -2 < 1 -8 < -4

For each statement multiply the number on each side by -1. Then indicate the relationship between the resulting numbers using < or >.

b. Based on your observations in Part a, complete the statement: *If a < b, then (-1)a ___ (-1)b.*

c. Next, consider relations of the form *c > d* and multiplication by -1. Test several examples and make a conjecture: *If c > d, then (-1)c ___ (-1)d.*

2. Pairs of numbers are listed below. For each pair, describe how it can be obtained *from the pair above it.* Then indicate whether the direction of the inequality stays the same or reverses. The first two examples have been done for you.

		Inequality Operation	Inequality Direction
	9 > 4		
	12 > 7	add 3 to both sides	stays the same
	24 > 14	multiply both sides by 2	stays the same
a.	20 ___ 10	_____	_____
b.	-4 ___ -2	_____	_____
c.	-2 ___ -1	_____	_____
d.	8 ___ 4	_____	_____
e.	6 ___ 2	_____	_____
f.	-18 ___ -6	_____	_____
g.	3 ___ 1	_____	_____
h.	21 ___ 7	_____	_____

3. Look back at Problem 2 and identify cases where operations reversed the inequality.

a. What operations seem to cause this reversal of inequality relationships?

b. See if you can explain why it makes sense for those operations to reverse inequality relationships.

SOURCE: Core Plus Course 1 2nd Edition, 2008 Unit 3, Lesson 2, Investigation 3, page 194-195

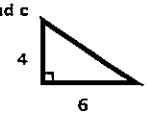
The Pythagorean Theorem/Distance Formula Connection

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

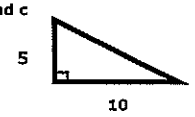
Find the missing side. Show your work.

Round your answer to the nearest tenth, if necessary.

1. Find c

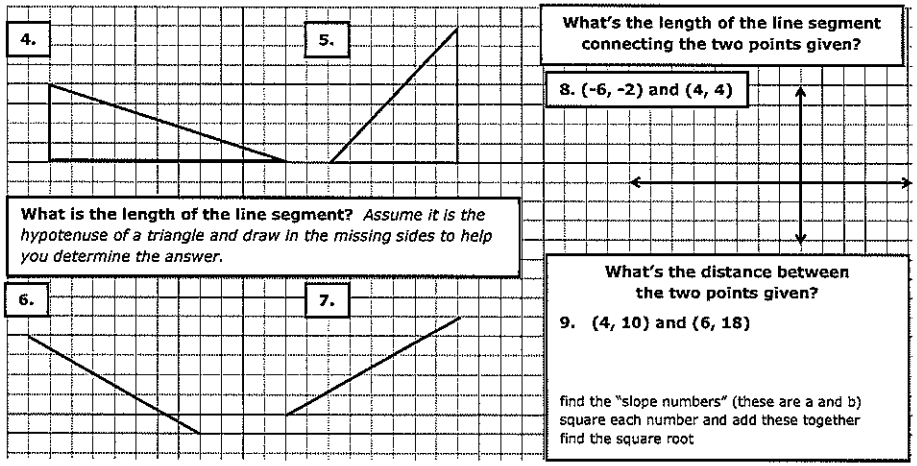


2. Find c



3. $a = 9,\ b = 6,\ c = ?$

Find the length of the hypotenuse for the triangle shown.



What's the length of the line segment connecting the two points given?

8. (-6, -2) and (4, 4)

What is the length of the line segment? *Assume it is the hypotenuse of a triangle and draw in the missing sides to help you determine the answer.*

What's the distance between the two points given?

9. (4, 10) and (6, 18)

find the "slope numbers" (these are a and b)
square each number and add these together
find the square root

Directions: Find the mistake(s) if any in working out the problems. Work the problem correctly on the right side.

Problem 1

a. $2 + 3(x + 4) = 8$ _____

b. $2 + 3x + 4 = 8$ _____

c. $6 + 3x = 8$ _____

d. $3x = 2$ _____

e. $x = 2/3$ _____

Problem 2

a. $5 - (x + 9) > 7$ _____

b. $5 - x - 9 > 7$ _____

c. $4 - x > 7$ _____

d. $-x > 3$ _____

e. $x < -1$ _____

Problem 3

a. $3(x + 2) - 5x < 8$ _____

b. $3x + 6 - 5x < 8$ _____

c. $-2x + 6 < 8$ _____

d. $-2x < 2$ _____

e. $x < -1$ _____

Problem 4

a. $4(5x + 1) - 8x > -20$ _____

b. $20x + 4 - 8x > -20$ _____

c. $12x + 4 > -20$ _____

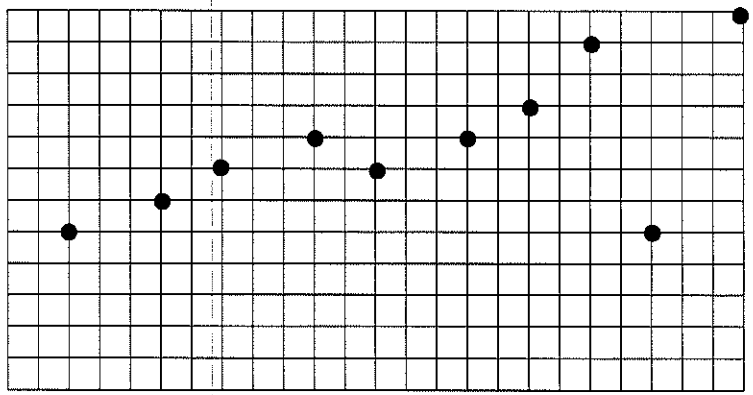
d. $12x < -24$ _____

e. $x < -2$ _____

Lesson Plan on Residuals

1) Find the current ages of 6-10 famous people (include your principal etc...)
2) Have the students guess the ages of the people.
3) Then have them calculate the residual of |Actual – Guessed| and sum the total. Teacher can decide if they want the "squared difference" or just the difference.
4) Talk about which famous person had the highest residual etc...
5) Then have the students complete the following and then talk about the residuals. Teacher can decide if they want the "squared distance" or the regular distance.

Draw what you consider the line of best fit that has the least amount of "net distance". Calculate the vertical distance from the line and then add them.



Teachers can further expound on the subject by going to: http://mathbits.com/MathBits/PPT/EstimateAge.htm

Systems of Equations Around the World, also called a Scavenger Hunt.

Enlarge and place these cards around the room. Students start at different places, solve the problem at the bottom and then look for the answer on top of another card. They then look for their answer etc.. until they have gone around the room.

A (15,-7) $4x + 6y = -12$ $3x - 5y = 29$	B (50,30) $5x - 3y = 4$ $2x + 3y = 52$	C (3,-4) $y = 10x + 60$ $y = 8x + 52$	D (2,6) $x + y = 80$ $3x + 2y = 210$
E (-4,20) $3y = 12x - 66$ $8x - 3y = 26$	F (12,20) $x + y = 8$ $x - y = 22$	G (10,18) $4x + 7y = 50$ $y = 5x - 4$	H (8,12) $.25x + .05y = 4$ $x + y = 32$

Worksheet on Residuals **Name** _____

Use the table below to answer questions 1-3.

Actual	Predicted	Residual (Predicted – Actual) Keep it positive
4	4.5	4.5-4 = 0.5
5	5.2	5.2-5=
6	6.7	
7	6.8	
8	8.3	

1) How many residuals were above .5?

2) What percentage of residuals were above .5?

3) What percentage of residuals were above .2?

Use the table below to answer questions 4-6.

Actual	Predicted	Residual (Predicted – Actual)
11.2	11.5	11.5-11.2 =0.3
12.4	12.4	12.4-12.4=
13.5	13.8	
14.8	14.2	
15.2	15.9	

4) How many residuals were at least 0.3?

5) What percentage of the residuals were less than 0.1?

6) What percentage of the residuals were at least 0.6?

Use the table below to answer questions 7-8.

Actual	Equation Y=1.2x – 1	Residual (Predicted – Actual)
4	3.8	3.8-4 =-0.2=0.2
5		
6		
7		
8.3		

7) What percentage of the residuals were above 0.3?

8) Which value had the highest residual?

Use the table below for question 9-12.

Day	3	4	5	6	7	8
Height of flower (inches)	5	5.3	5.7	6.1	6.3	6.6
Equation (find by linear regression)						
Residuals						

9) What is the coefficient of correlation?

10) How many data points had a residual greater than 0.1?

11) What percentage had residuals less than 0.2?

12) Which data point had the highest residual?

The following table shows the population of Smithville.

Year	1980	1990	1995	2005	2008
Population	52,000	55,432	57,145	60,580	62,123

13) Based on the line-of-best fit, find the percentage of residuals that were greater than 400?

The following shows the amount of wages that Sally took home based on the number of hours she worked in a restaurant.

Hours	1	2	3	4	5
Wages	12	20	30	42	54

14) Write the linear equation of best fit

15) What is coefficient of correlation?

16) What is the slope and interpret the slope

17) What is the y-intercept and interpret the y-intercept

18) Predict how much Sally would make if she worked 8 hours

19) Predict how much Sally needs to work to make $83

20) What percentage of data points had residuals higher than 1.5?

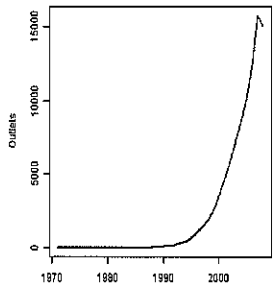
Exponential Growth of Stores

http://projects.flowingdata.com/walmart/
http://projects.flowingdata.com/target/
http://projects.flowingdata.com/ross/

The growth of Walmart and Sam's Club in the United States can be modeled by the equation:
$W(x) = 1(1.1867)^x$ where x is the number of stores in 1961.
The growth of Target can be modeled by the equation:
$T(x) = 1(1.1712)^x$ where x is the number of stores in 1961.
The growth of Ross Stores can be modeled by the equation:
$R(x) = 1(1.2588)^x$ where x is the number of stores in 1984.

1. How many stores did Walmart have in 1961?
2. How many stores did Target have in 1961?
3. Which company grew at the fastest rate?
4. By what growth did Walmart have between 1961 and 2010?
5. By what growth did Target have between 1961 and 2008?
6. How much greater of a rate did Walmart grow faster than Target?
7. Based on the equation, predict the number of stores in 2010 for Walmart.
8. Based on the equation, predict the number of stores in 2008 for Target.
9. Based on the equation, predict the number of stores in 2008 for Ross.
10. Even though Ross grew at a faster rate, why were there less Ross stores in 2008?
11. There were 1240 Target stores by the end of 2004. Find the residual.
12. Can Target and Walmart sustain the same rate of growth?
13. Based on the video, why are there so few Walmarts in Nevada?

Number of Starbucks in the World



$S(x) = 1(1.2718)^x$ where x is the number of years since 1970

14. What is the rate of yearly growth of Starbucks?
15. Using the equation, predict the number of Starbucks in the US in 2000. How does it compare to the graph?
16. Why do you think the number of Starbucks decreased after 2010?

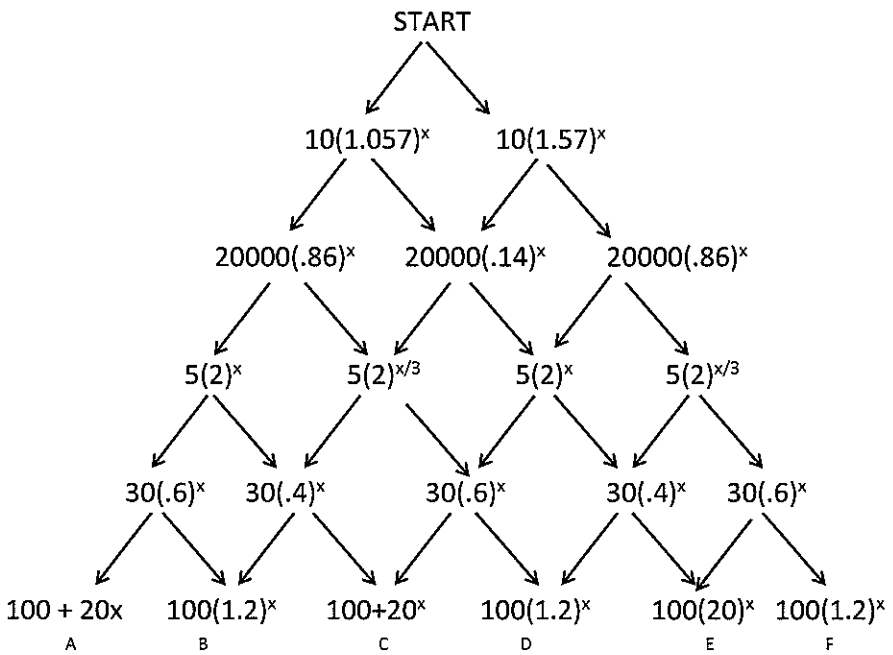
Teacher notes: Target increased a lot in California in the 80's and in other places because it bought out other retailers. It focused on larger cities. Walmart started with small towns in Arkansas and slowly expanded.

Slap Jack

Directions: Teacher gives a board (see below) to every group of 3-6 students who compete against people in their own group. Each group has a score keeper. Teacher displays question (orally or shown) and everyone tries to "touch" the correct square. The first person gets 2 points, other correct people get 1 point and any incorrect response gets -1 points.

Is the following growth, decay, or neither? $Y= 5(.6)^x$ Decay K
Is the following growth, decay, or neither? $Y=2x^3$ Neither B
$Y=7(2)^x$. What is the initial value? 7 E
$Y=56(2)^x$. What is the rate of growth? 2 C
$Y=56(7)^x$ What is the y-intercept? 56 G
$Y=2(1.05)^x$. What is the rate? 5% increase D
$Y=56(1.37)^x$. What is the rate? 37% increase N
$Y=7(.7)^x$. What is the rate? 30% decrease L
6 butterflies increase exponentially by 4% a year. Write the equation. $6(1.04)^x$ J
$6 baseball card depreciates 4% a year. Write the equation. $6(.96)^x$ O
200 people decrease by 8% yearly. How many people in 5 years? $200(.92)^x \rightarrow 132$ M

$Y = (1.056)^x$ A	Neither B	2 C	5% increase D	7 E	$Y = 6(1.4)^x$ F
56 G	50% increase H	Growth I	$6(1.04)^x$ J	Decay K	30% decrease L
132 M	37% increase N	$6(.96)^x$ O	3% decrease P	3.7% increase Q	$Y = (1.56)^x$ R



Direction: This "Tree" is displayed (or copied) for the students to see. The teacher does an example by saying start and then saying just one of the ones directly below it. She then continues going down until she gets to the bottom. The students try to follow her and land at the same spot she ended up at. Then students are paired up & one becomes the reader and the other becomes the listener.

$2x^{\frac{5}{2}}y^{\frac{1}{2}}$ **C** $\sqrt[3]{27x^{12}y^5}$	$3x^4y^{\frac{5}{3}}$ **G** $\sqrt{64x^2y^3}$	_____ **L** $\sqrt{9x^6y^4}$
$3x^3y^2$ **F** $(16x^5y)^{\frac{1}{2}}$	$4x^{\frac{5}{2}}y^{\frac{1}{2}}$ **M** $(8x^7y^2)^{\frac{1}{3}}$	$2x^{\frac{7}{3}}y^{\frac{2}{3}}$ **B** $\sqrt[3]{64x^2y^3}$
$4x^{\frac{2}{3}}y$ **I** $(9x^5y)^{\frac{1}{2}}$	$3x^{\frac{5}{2}}y$— **A** $\sqrt[3]{8x^2y^7}$	$2x—y^{\frac{7}{3}}$ **D** $(9x^3y^7)^{\frac{1}{2}}$
$3x^{\frac{3}{2}}y^{\frac{7}{2}}$ **E** $(64x^5y)^{\frac{1}{3}}$	$4x^{\frac{5}{3}}y^{\frac{1}{3}}$ **K** $(27x^6y^9)^{\frac{1}{3}}$	$3x^2y^3$ **H** $\sqrt{4x^5y}$

Teacher Says (Similar to Simon Says)

Students stand up. Have the students make their chin their "origin." The teacher then instructs the students to make graphs such as "Y=x," "x=2," "y=5," "y=x -3," or to show on their fingers the answer to easy questions such as "What is the y-intercept of y=5x + 3?" or "X-intercept of 2x – y = 8." If the teacher begins the instructions with "Teacher Says" then the students perform the task. If the teacher doesn't say "Teacher Says" then students don't move. Students who either show an incorrect answer or move when they shouldn't are asked to sit down. Play continues until there is a winner. (It's best for the teacher to display the instructions.)

Partner Team Work

The class is split into pairs which each person designated as a "left" or a "right" Teacher displays a set of problems simultaneously for the partners to do. When each pair is done, they raise their hand and the teacher verifies if it is correct or not. Teacher can give "prizes" to the fastest pairs.. Here are some examples:

Left person: Solve for x: $x + 2 = 7$
Right Person: Solve for y: $2x-y = 8$
(x is what you get from your partner)
Left person: Solve for x: $3x + 4 = -11$
Right Person: Solve for y: $2x-y = 25$
(x is what you get from your partner)
Right person: Solve for x: $-3x + 4 = -20$
Left Person: Solve for y: $2x-3y = 25$
(x is what you get from your partner)
For Algebra 2: $L(x) = 3x - 2$ $R(x) = 2x^2 - 5x - 1$. Find LoR(3); R o L(x); etc..

Partner Worksheet:

Partner A does the left side and Partner B does the right side. After both partners have completed the first four problems, compare your answers. Each partner should have the same 4 answers (but in a different order.)

A. $(5n^3)(4n^2)$	_____	1. $\frac{18n^6}{2n^{-2}}$	_____
B. $\frac{30n^{10}}{2n}$	_____	2. $\frac{40n^8}{2n^3}$	_____
C. $\frac{4n^4}{0.25n^{-2}}$	_____	3. $(4n^3)^2$	_____
D. $(3n^4)^2$	_____	4. $(5n^8)(3n)$	_____
E. $\frac{10r^3t^5}{40r^7t^3}$	_____	5. $(3t^3)^2*6t^2$	_____
F. $\left(\frac{2r}{3t^3}\right)^2$	_____	6. $\left(\frac{t}{2r^2}\right)^2$	_____
G. $\frac{6r^6*9t^9}{t}$	_____	7. $\frac{8r^4t}{18r^2t^7}$	_____
H. $(4r^3)^2(3rt^2)$	_____	8. $\frac{16r^0 3r^7t^3}{t}$	_____

Vocabulary Recall

1. Split the following 10 cards to people in your group
2. Select a scorekeeper.
3. One person goes first and says his card, and then says another card. That person then says his card and then someone elses card. Play continues until someone makes a mistake by not responding quickly enough, or not saying another card.
4. The person making a mistake gets a point. (Lowest points wins.)
5. The person making a mistake then begins the next round by saying his card and then another card.

3% Increase $(1.03)^x$	30% Increase $(1.3)^x$	3% Decrease $(.97)^x$	30% decrease $(.7)^x$
5.3% Increase $(1.053)^x$	5.3% Decrease $(.947)^x$	15% Tip $(1.15)^x$	15% Discount $(.85)^x$
7% Tax $(1.07)^x$	7% Discount $(.93)^x$		

Slope Activity Matching (SOLUTIONS)

Slope	Pair #1	Pair #2	Pair #3
5	(1, 6) and (2, 11)	(-2, -3) and (0, 7)	(4, 8) and (7, 23)
2/3	(-1, -8) and (5, - 4)	(5, 6) and (8, 8)	(-4, 1) and (-13, -5)
-1/7	(0, 3) and (14, 1)	(3, -2) and (-11, 0)	(2, 4) and (9, 3)
0	(8, 12) and (4, 12)	(5, -2) and (-3, -2)	(-1, 5) and (10, 5)
Undefined	(3, 8) and (3, 0)	(-2, 6) and (-2, -2)	(0, 7) and (0, 2)
9/5	(3, 6) and (13, 24)	(-3, -8) and (2, 1)	(-7, 8) and (-2, 17)
- 6	(2, -8) and (-1, 10)	(-3, -15) and (-5, -3)	(4, 9) and (6, -3)
-7/6	(5, 12) and (11, 5)	(-3, 8) and (3, 1)	(-7, -7) and (5, -21)

EXPRESSION BINGO

B	I	N	G	O

Answers for BINGO cards:

A. $2y^2$ **B.** $\frac{y}{3}$ **C.** $6y$ **D.** $3 + y$ **E.** FREE **F.** $y - 3$ **G.** $2y - 4$

H. $y^2 + 4$ **I.** $2y + 5$ **J.** $\frac{y}{4}$ **K.** $3y$ **L.** $y + 2$ **M.** $-6y$ **N.** $3y + 2$

O. $y - 3$ **P.** $y - 5$ **Q.** $2y + 2$ **R.** $\frac{y}{-3}$ **S.** $2y + 3$ **T.** $2y$ **U.** y^2

V. $2y + 4$ **W.** y^3 **X.** $4y - 3$ **Y.** $6 - y$

Expressions:

2 times y squared
the product of 6 and y
y squared plus 4
the sum of 3 and y
the quotient of y and 3
the difference of 6 and y
the sum of y and 2
the sum of 2y and –4
the difference of –y and 3
y cubed
3 less than y
2 times y increased by 5
y divided by 4
y divided by –3
the product of 3 and y
the product of 2 and y, plus 2
twice y
3 more than 2 times y
3 less than 4 times y
4 more than twice y
-6 times y
y decreased by 5
3 times y plus 2
y squared

SIMPLIFYING BINOMIAL MULTIPLICATION

Cut up the cards and distribute to the students – so they can practice the Distribution Property!
Students pair up with each other and work together to multiply the 2 binomials.
Each student records the problem and shows their work.
Students find another classmate and repeat the process.
Some different ways for students to pair up:

- ✓ **Same sign in the middle**
- ✓ **Different sign in the middle**
- ✓ **1 each: "a" coefficient = 1 and "a" coefficient ≠ 1**
- ✓ **Both constants are the same (either odd or even)**
- ✓ **1 odd and 1 even constant**

A $2x - 3$	B $3x + 8$	C $2x + 1$	D $4x - 6$
E $x + 5$	F $x - 5$	G $x + 4$	H $x - 2$
I $x + 10$	J $5x + 1$	K $4x - 1$	L $3x - 5$
M $2x - 9$	N $x + 6$	O $x - 5$	P $x + 8$
AA $x + 1$	BB $x - 1$	CC $x + 2$	DD $x - 6$
EE $2x - 5$	FF $4x + 1$	GG $2x + 3$	HH $4x - 3$
II $x + 4$	JJ $5x + 2$	KK $4x - 7$	LL $3x - 4$
MM $2x - 9$	NN $x + 9$	OO $x - 10$	PP $x + 7$

Quadratics Number Line

Place the following from least (left side) to largest (right side). (Teachers can cut these out or just give it as a worksheet)

A: Y intercept of $y = 3x^2 + 2x - 7$
B: x coordinate of vertex of $y = 2x^2 - 8x - 2$
C: y coordinate of vertex of $y = 2x^2 - 8x - 3$
D: The larger x-intercept of: $x^2 - 9x + 8 = 0$
E: The smaller x-intercept of: $x^2 - 9x + 8 = 0$
F: The smaller x-intercept of: $x^2 + 9x - 10 = 0$
G: The larger root of: $-x^2 + 10x - 24 = 0$
H: f(4) of $y = 2x^2 - 3x - 8$
I: The rate of change of $y = x^2 - 7x + 10$ on the interval of [1,5]
J: The sum of the roots of: $y = -x^2 + 5x + 6$

Key:
A: -7 B: 2 C: -11 D: 8 E: 1 F: -10 G: 6 H: 12 I: -1 J: 5 So: C, F, A, I, E, B, J, G, D, H

QUADRATICS FUNCTIONS CONCEPT MAP

Identify the different characteristics for each of the quadratic functions below, using the Concept Map Graphic Organizer.

Show all of your work in each box.

Teacher's Notes:
1. Students can also make their own version of this concept map, either as a regular class assignment, or as creative project.

2. This organizer can also be used for vocabulary, or other "how to" notes.

1. $y = 2x^2 - 10x$ **2.** $y = -3x^2 + 24x$ **3.** $y = x^2 - 16$

4. $y = -x^2 + 25$ **5.** $y = x^2 - 8x + 12$ **6.** $y = x^2 - 5x - 14$

7. $y = -x^2 - 10x - 24$ **8.** $y = 2x^2 - 11x - 12$ **9.** $y = 4x^2 + 6x - 28$

10. $y = 4x^2 + 8x - 5$ **11.** $y = -5x^2 + 20x + 25$ **12.** $y = -16x^2 + 8x + 24$

EQUATION

Axis of Symmetry

y-intercept:

Graph

Vertex

a= **b=** **c=**

x-intercept(s)

EQUATION

Axis of Symmetry

y-intercept:

Graph

Vertex

a= **b=** **c=**

x-intercept(s)

EQUATION

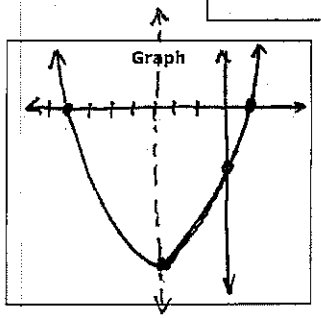
$y = x^2 + 6x - 7$

Axis of Symmetry $x = \frac{-b}{2a} = \frac{-6}{2(1)}$

$x = -3$

y-intercept: "c" -7

Graph



Vertex

$y = x^2 + 6x - 7$

$y = (-3)^2 + 6(-3) - 7$

$y = 9 - 18 - 7$

$y = -16$

$(-3, -16)$

a= 1 **b=** 6 **c=** -7

x-intercept(s) Factors: $-7 \rightarrow 7/-1$ Sum: 6

$x^2 + 6x - 7 = 0$

$x^2 + 7x - 1x - 7$

$x(x+7) - 1(x+7)$

$(x-1)(x+7) = 0$

$x - 1 = 0$ $\quad x + 7 = 0$

$x = 1$ $\quad x = -7$

$\{-7, 1\}$

EQUATION

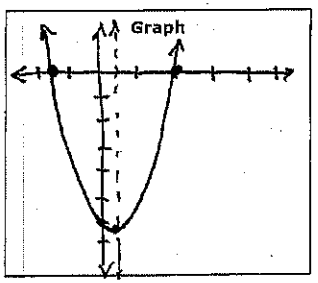
$y = 2x^2 - x - 6$

Axis of Symmetry $x = \frac{-b}{2a} = \frac{-(-1)}{2(2)}$

$x = 1/4$

y-intercept: "c" -6

Graph



Vertex

$y = \frac{b}{2}(x) + c$

$y = -\frac{1}{2}(\frac{1}{4}) - 6$

$= -6.125$

$(.25, -6.125)$

a= 2 **b=** -1 **c=** -6

x-intercept(s) $\frac{X}{-12}$ $\frac{+}{-1}$ $\rightarrow -4/3$

$2x^2 - x - 6 = 0$

$(2x+3)(x-2) = 0$

$2x + 3 = 0$ $\quad x - 2 = 0$

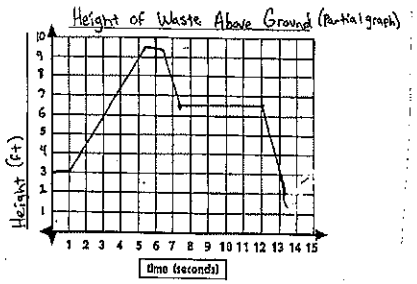
$2x = -3$ $\quad x = 2$

$x = -3/2$

$\{-3/2, 2\}$

	x	-2
$2x$	$2x^2$	$-4x$
$+3$	$3x$	-6

www.graphingstories.com Look at the "Height of Waste Above Ground" with the slide.



1) What is the domain and range?_____

2) Is this a function? Explain._____

3) Is it a 1-1 function? Explain._____

4) Find and interpret f(0.5)._____

5) Find and interpret f(4.5)._____

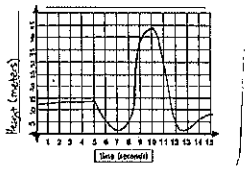
6) Find and interpret f(8.5)._____

7) When is the graph increasing?_____

8) When is the graph decreasing?_____

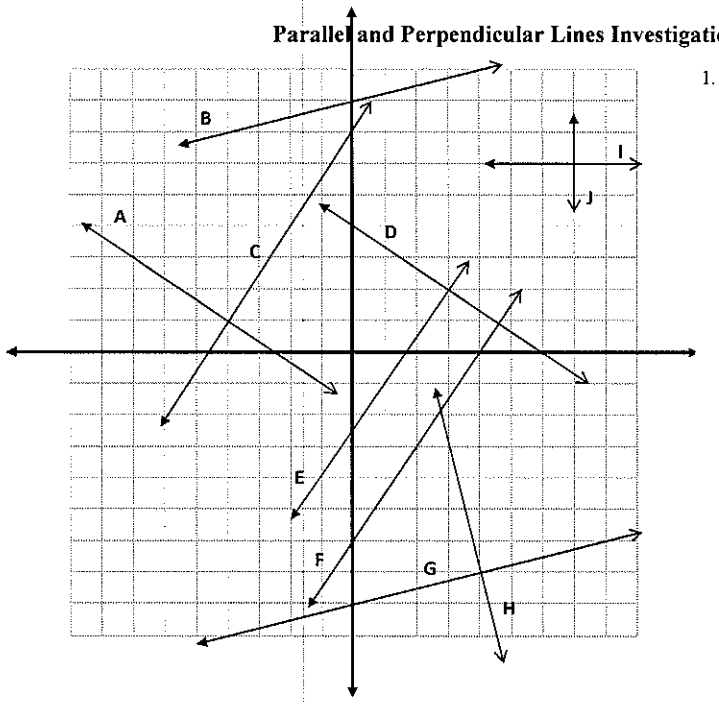
9) What is the maximum height? _____

www.graphingstories.com . Look at the "Height" one with the swing.



1. What is the domain and range?_____
2. Is it a function? Is it 1-1? Explain._____
3. Find and interpret f(2)_____
4. Find and interpret f(8)_____
5. Find and interpret f(x) = 20?_____
6. Find and interpret f(x) = 46?_____
7. How does your answer to #6 relate to your range?_____
8. Suppose that the swing started 10 feet higher. What would f(3) become?_____
9. Explain how the answer to #8 is equivalent to f(3) + 10._____

Parallel and Perpendicular Lines Investigation



1. Find the slopes of all 10 lines.

A:

B:

C:

D:

E:

F:

G:

H:

I:

J:

2. Which line appears to be parallel to Line A? What do you notice about the slopes of these two lines?
3. What line appears to be parallel to Line B? What do you notice the slopes of these two lines?
4. What lines appear to be parallel to E and what do you notice about the slopes of these three lines?
5. Complete this statement:

Two Lines are parallel if they have the _____ slope.

6. Do Lines A and C appear to be parallel or perpendicular? What do you notice about the slopes of these two lines?
7. Do Lines G and H appear to be parallel or perpendicular? What do you notice about the slopes of these two lines?
8. Complete this statement:

If two lines are perpendicular then one slope will be positive and the other will be _____. **They will be _____ _____ of each other.**

9. If a line has an undefined slope then what is the slope of any line that is parallel to it?

Distance and Midpoint Project

You are planning a 5-day trip across the United States.
Choose a place to start and continue in a "round-trip" throughout the country.
Use the map to determine how far you travel each day (distance formula), with a pit stop along the way (midpoint).
Each block on the map equals 50 miles.
Show your work for <u>all</u> questions (NEATLY please!) on a separate piece of paper.

Midpoint Formula: $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ Distance Formula: $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

	Start (ordered pair & State)	End (ordered pair & State)	Distance Traveled (in miles)	Pit Stop (ordered pair & State)
Day 1				
Day 2				
Day 3				
Day 4				
Day 5				

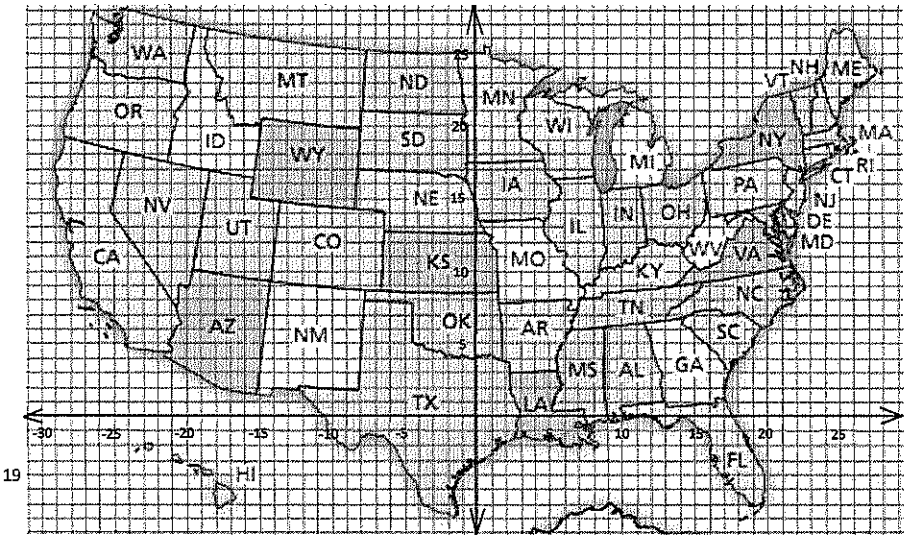
Total Distance of Trip (in miles): _____

TRIP TIME:

How long did it take? Assume your average speed was 60 mph. _____
(time = distance/speed)

FUEL: How many gallons of gas did you use? Assume you averaged 25 miles per gallon (mpg). _____
(gallons used = distance/mpg value used)

How much did the gas cost? Assume $2.30 per gallon. _____

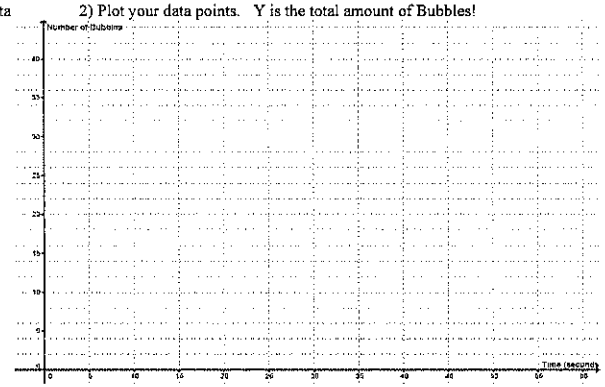


3D Rate of Change Investigation

Your teacher is going to give you bubble gum to chew. Count how many bubbles you blow during each 10 second increment.

1) Fill in the chart based on your data 2) Plot your data points. Y is the total amount of Bubbles!

Time (s) (x)	Bubbles	Total Bubbles (y)
0		
10		
20		
30		
40		
50		
60		



4) Find and interpret the y-intercept from the table: _____

5) How could you find the y-intercept from the plot? _____

6 a) To find rate of change from 0-60 seconds, find out how many bubbles did you increase by from 0-60: _____ bubbles

b) Then find out how much the time increased by from 0-60: Change in time: _____ seconds

c) Then divide your answer from a) by b) Rate of change = _____ bubbles/seconds.

7 a) To find rate of change from 20-40 seconds, find out how many words did you increase by from 20-40: _____ bubbles

b) Then find out how much the time increased by during that interval : _____ seconds

c) Then divide your answer from a) by b) Rate of change = _____ bubbles/seconds.

8) Find the rate of change from 40-50 minutes. Show work

9) How could you have looked at your graph to find the answer from 0-60?

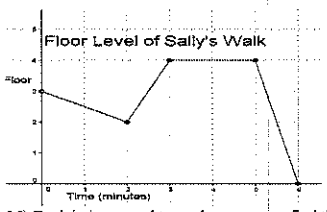
Day	Number of Flowers
0	2
3	5
6	7
8	10

10) Find and interpret the y-intercept: _____

11) Find the rate of change from 3-8 days: a) Change in flowers: _____

b) Change in days: _____

c) Rate of change: _____ flowers/day



12) Find and interpret the y-intercept: _____

13) Will the rate of change always be positive? Explain.

14) Find the rate of change from 2-5 minutes a) Change in floors: _____

b) Change in time: _____

c) Rate of change: _____ floor/min

15) Find the rate of change from 5-6 minutes.

16) Explain in general terms how you can find the rate of change (use "x's" and "y's")

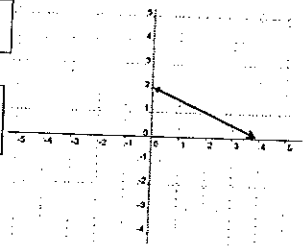
SITUATION 6 (water in bathtub)

GRAPH

SLOPE (rate of change) | Y-intercept (initial value)

TABLE | EQUATION

x	y



SEQUENCE

Initial Value	1st	2nd	3rd	4th

NEXT-NOW STATEMENT

Practical Domain

Practical Range

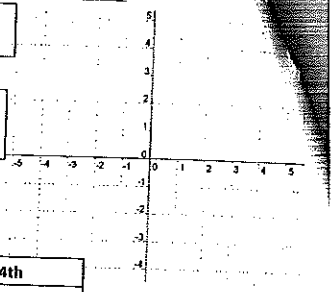
SITUATION 7 (Filling a bathtub)

GRAPH

SLOPE (rate of change) | Y-intercept (initial value)

TABLE | EQUATION

x	y



SEQUENCE

Initial Value	1st	2nd	3rd	4th

NEXT-NOW STATEMENT

Next = Now + ½; starting at 3

Practical Domain

Practical Range

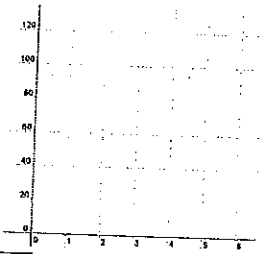
SITUATION 8

GRAPH

SLOPE (rate of change) | Y-intercept (initial value)

TABLE | EQUATION

x Time (min)	y Words typed
2	48
4	96



SEQUENCE

Initial Value	1st	2nd	3rd	4th

NEXT-NOW STATEMENT

Practical Domain

Practical Range

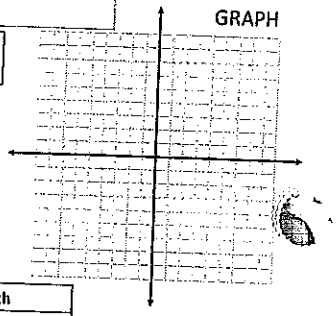
SITUATION 9 (Lemonade Stand)

GRAPH

SLOPE (rate of change) 2 | Y-intercept -10 (initial value)

TABLE | EQUATION

x	y



SEQUENCE

Initial Value	1st	2nd	3rd	4th

NEXT-NOW STATEMENT

Practical Domain

Practical Range

SITUATION 10 (Waiting in Line)

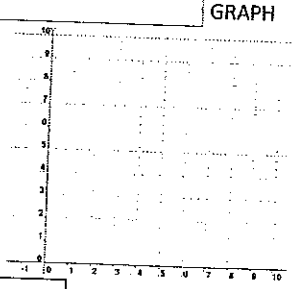
There are 10 people waiting in line before a store opens. Five people enter the line every two minutes.

GRAPH

SLOPE (rate of change) | Y-intercept (initial value)

TABLE | EQUATION

x	y



SEQUENCE

Initial Value	1st	2nd	3rd	4th

NEXT-NOW STATEMENT

Practical Domain

Practical Range

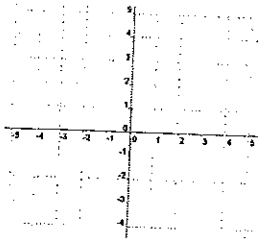
SITUATION 11 (Temperature (C°) over time)

GRAPH

SLOPE (rate of change) | Y-intercept (initial value)

TABLE | EQUATION

x	y



SEQUENCE

Initial Value	1st	2nd	3rd	4th
	7	3	-1	

NEXT-NOW STATEMENT

Practical Domain

Practical Range

4F Slope Intercept Form to Next Now

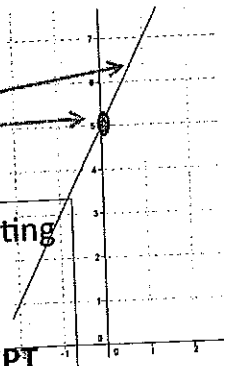
5, 7, 9, 11, 13, 15, 17

+2 +2 +2 +2 +2 +2

Next = Now + 2; Starting at 5

Y = 2x + 5

Slope (change) Y-intercept (starting value)



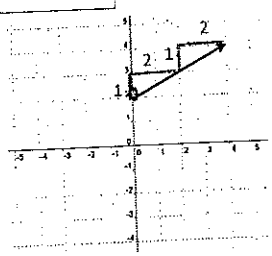
Next = Now + SLOPE; Starting at Y-INTERCEPT

y = SLOPE(x) + Y-INTERCEPT

SITUATION 1 Snowfall

There are two inches on the ground at midnight. Each hour the snowfall increase by ½ inch

GRAPH



SLOPE (rate of change) 1/2

Y-intercept (initial value) 2

TABLE

X Hour after midnight	Y Snowfall (inches)
0	2
1	2.5
2	3
3	3.5

(+1/2 between each pair)

EQUATION

$Y = \frac{1}{2}x + 2$

SEQUENCE

Initial Value	1st	2nd	3rd	4th
2	2.5	3	3.5	4

(+1/2 between each pair)

NEXT-NOW STATEMENT

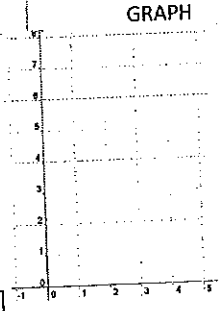
NEXT = NOW + ½; starting at 2

Practical Domain $X \geq 0$

Practical Range $Y \geq 2$

SITUATION 2 Rainfall

GRAPH



SLOPE (rate of change)

Y-intercept (initial value)

TABLE

X	Y

EQUATION

y = 1/4x + 6

SEQUENCE

Initial Value	1st	2nd	3rd	4th

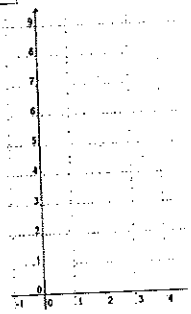
NEXT-NOW STATEMENT

Practical Domain

Practical Range

SITUATION 3 (Cab fare)

GRAPH



SLOPE (rate of change)

Y-intercept (initial value)

TABLE

X Miles	Y Cab fare
0	3
1	5.50
2	8
3	10.5

EQUATION

SEQUENCE

Initial Value	1st	2nd	3rd	4th

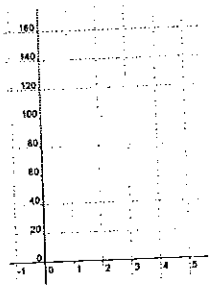
NEXT-NOW STATEMENT

Practical Domain

Practical Range

SITUATION 4 (money saved in bank)

GRAPH



SLOPE (rate of change)

Y-intercept (initial value)

TABLE

X	Y

EQUATION

SEQUENCE

Initial Value	1st	2nd	3rd	4th
	50	70	90	110

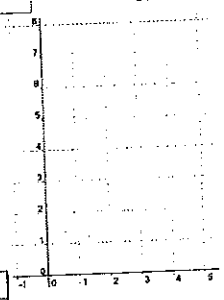
NEXT-NOW STATEMENT

Practical Domain

Practical Range

SITUATION 5 (money in wallet paying for sodas)

GRAPH



SLOPE (rate of change)

Y-intercept (initial value)

TABLE

X	Y

EQUATION

SEQUENCE

Initial Value	1st	2nd	3rd	4th
	8	6	4	2

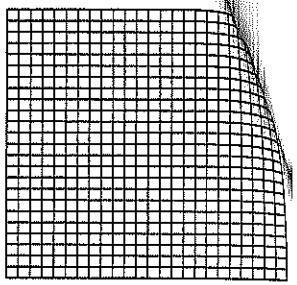
NEXT-NOW STATEMENT

Practical Domain

Practical Range

3C Domain/Range Investigation

Jackson threw a ball in the air from 3 feet high and it went to a maximum height of 10ft after 2 seconds and then hit the ground after 4.2 seconds.



1) Sketch a graph of the ball on your paper.

2) What was the minimum time that the ball was in the air?

3) What was the maximum time that the ball was in the air?

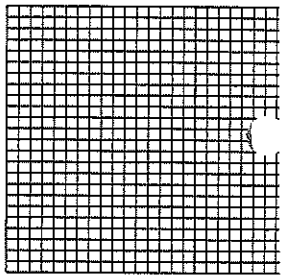
Using your answers from 2 and 3 and x, write an inequality. {ex: $3 \le x \le 5$}

4) What was the minimum height of the ball?

5) What was the maximum height of the ball?

Using your answers from 4&5 and y, write an inequality. {ex: $1 \le y \le 5$}

Now suppose the ball started at 5 ft, went to a maximum of 20 feet after 3 seconds and hit the ground after 6.2 seconds.

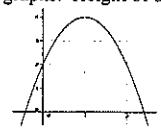


6) Sketch a graph

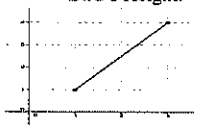
7) Write an inequality that represents the time the ball was in the air for.

8) Write an inequality that represents the ball's height.

Look at the following graphs. Height of ball:.



Bird's Height:



9) Write an inequality that represents the ball's time.

10) Write an inequality that represents ball's height.

11) Write an inequality that represents the bird's time in the air

12) Write an inequality that represents the bird's height.

Suppose that a car uses 1 gallon of gas for every 30 miles it travels. Jack puts 16 gallons of gas in his car.

13) Write an inequality that represents the total gallons of gas in his car.

14) What is the fewest miles he can go? What is the most miles he can go before running out of gasoline? Write an inequality that represents the miles he can travel.

Domain: The x values of the situation **Range:** The y values of the situation

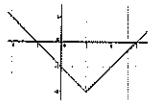
15) Go back and put the word "Domain" in front of the x-inequalities and "Range" in front of the y-inequalities.

16) Sally is at the fair. The fair charges her $5 to enter and $6 for each ride. She has $65 to spend. Let x represent the number of rides and y represent the amount of money. Write the domain and range.

Sometimes the graphs of non-word problems can go on forever. Pretend that the graph in example 1 went forever. The domain would be **all reals** and the range would be $y \le 10$ since the maximum is 10.

17) Pretend that the graph in #9 goes forever. What is the domain and range?

18-19) What is the domain and range of the following graphs (assume they go forever)?



There is a huge difference between $3 \le x \le 10$ and {3,4,5,6,7,8,9,10}. $3 \le x \le 10$ is **continuous** and includes numbers such as 3.2, 4.5, 6.8 etc.. so that all the members cannot be listed. However {3,4,5,6,7,8,9,10} is **discrete** and are just those numbers.

Determine if the following is **continuous** or **discrete** and then give the appropriate domain (x values) of the following

20) The integers between -5 and 3 including those two numbers

21) All numbers between -5 and 3.

22) The possible number of dimes you can have from 0 to 3 inclusive

23) The possible time between 0 and 3 (inclusive)

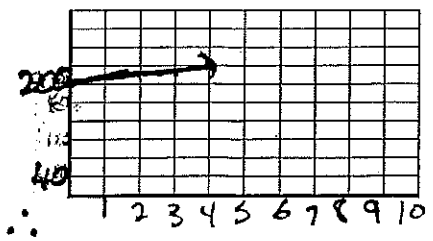
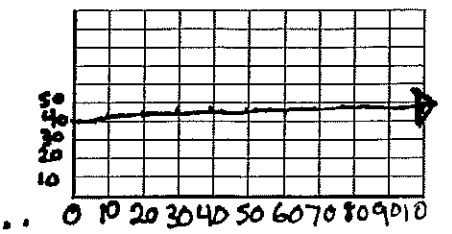
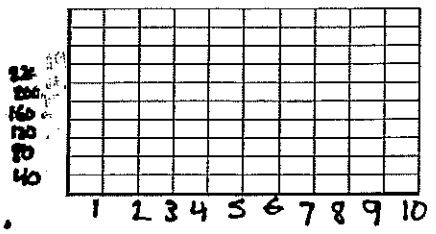
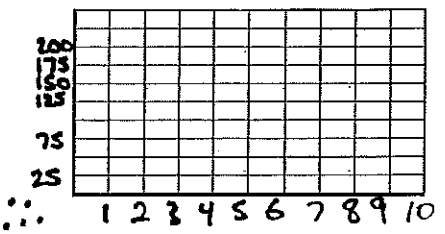
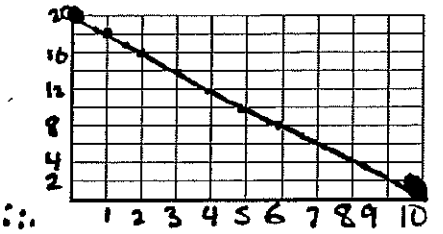
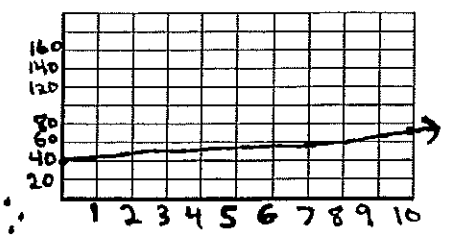
24) The number of miles you travel in a taxi.

Determine if the following is **continuous** or **discrete** and then give the appropriate range (y values) of the following

25) The number of nickels from 0 to 5 (inclusive)

26) You have to pay a flat-fee of $4 and then a certain amount per mile. (range is the fare)

Roman opened a savings account with $200 and saves $10 per month. A	slope = y-intercept = 5	NEXT = NOW + 10, starting at 200 ♡
Caleb's phone company charges a $40 flat rate and $0.10 per minute. B	slope = 0.10 y-intercept = 40 4	NEXT = NOW + 0.10, starting at 40 ☺
Ally's plant was 20 inches tall and grows 1 inch every 2 days. C	slope = $\frac{1}{2}$ y-intercept = 20 1	NEXT = NOW + 0.10, starting at 20 +
Allen weighs 200 pounds but [illegible] pounds per month on his diet. D	slope = –10 y-intercept = 200 2	NEXT = NOW – 10, starting at 200 ☹
Sabrina borrowed $20 from her mom and pays her back $2 each week. E	slope = –2 y-intercept = 20 7	NEXT = starting at 20 ⊗
Isaiah's job pays $40 per day and $3 for each sale that he makes. F	slope = 3 y-intercept = 40 3	NEXT = NOW + 3, starting at 40 △
Jamar began his hike at an elevation of 200 feet and climbed 2 ft per second. G	slope = 2 y-intercept = 200 6	NEXT = NOW + 2, starting at 200 □

$y = 200 + 10x$ b	11 X: 0, 2, 4, 6 Y: 200, , 240, 260	
$y =$ c	14 X: 0, 10, 20, 40 Y: 40, 41, 42,	
$y = 20 + \frac{1}{2}x$ e	16 X: 0, 2, 4, 6 Y: 20, 21, , 23	
$y = 200 - 10x$ a	11 X: 0, , 6, 10 Y: 200, 160, 140, 100	
$y = 20 - 2x$ g	12 X: 0, 3, 5, 8 Y: , 14, 10, 4	
$y = 40 + 3x$ d	17 X: , 8, 10, 13 Y: 55, 64, 70, 79	
$y = 200 + 2x$ f	15 X: 3, 7, , 11 Y: 206, 214, 218, 222