Lines, Links, Lullabies, and Lessons for Algebra 1. NCTM Conference New Orleans 2014

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=Z1BjPATzFXA

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=OFSrINhfNsQ

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=2BHzXItkByU

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

Trig (Algebra 2) https://www.youtube.com/watch?v=t2uPYYLH4Zo

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."

Log Song (Sung to "Jingle Bells")

Adding logs, Adding logs, multiply them
A number in front of the log becomes the exponent.
Minus logs, minus logs, divide them
Log of 1 is zero and the domain is positive

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

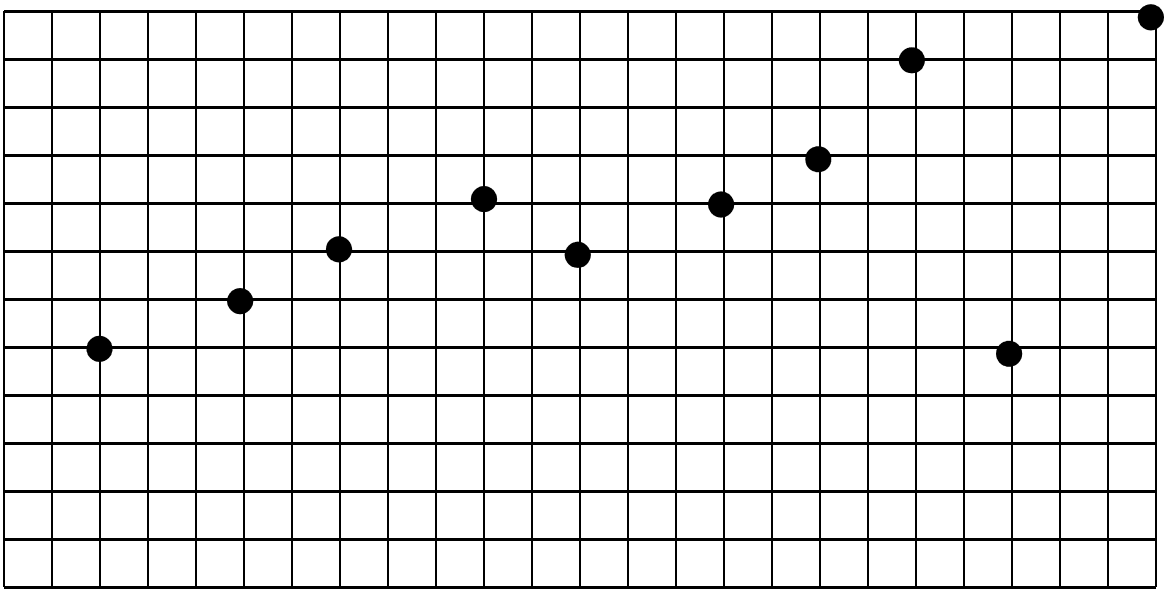
(+ +) = (+)(+) (- +) = (-)(-)
If the second is a plus, two of the first.
If the second is a plus, two of the first.
If the second is a plus, then you add to get the middle
If the second is a plus, two of the first

(+ -) = (+)(-)
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.

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

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:

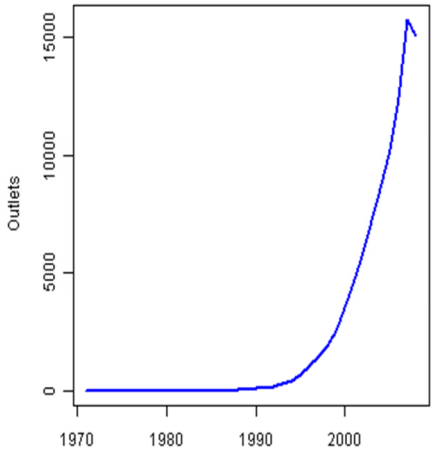
$T(x) = 1(1.1712)^x$ where x is the number of stores in 1961.

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

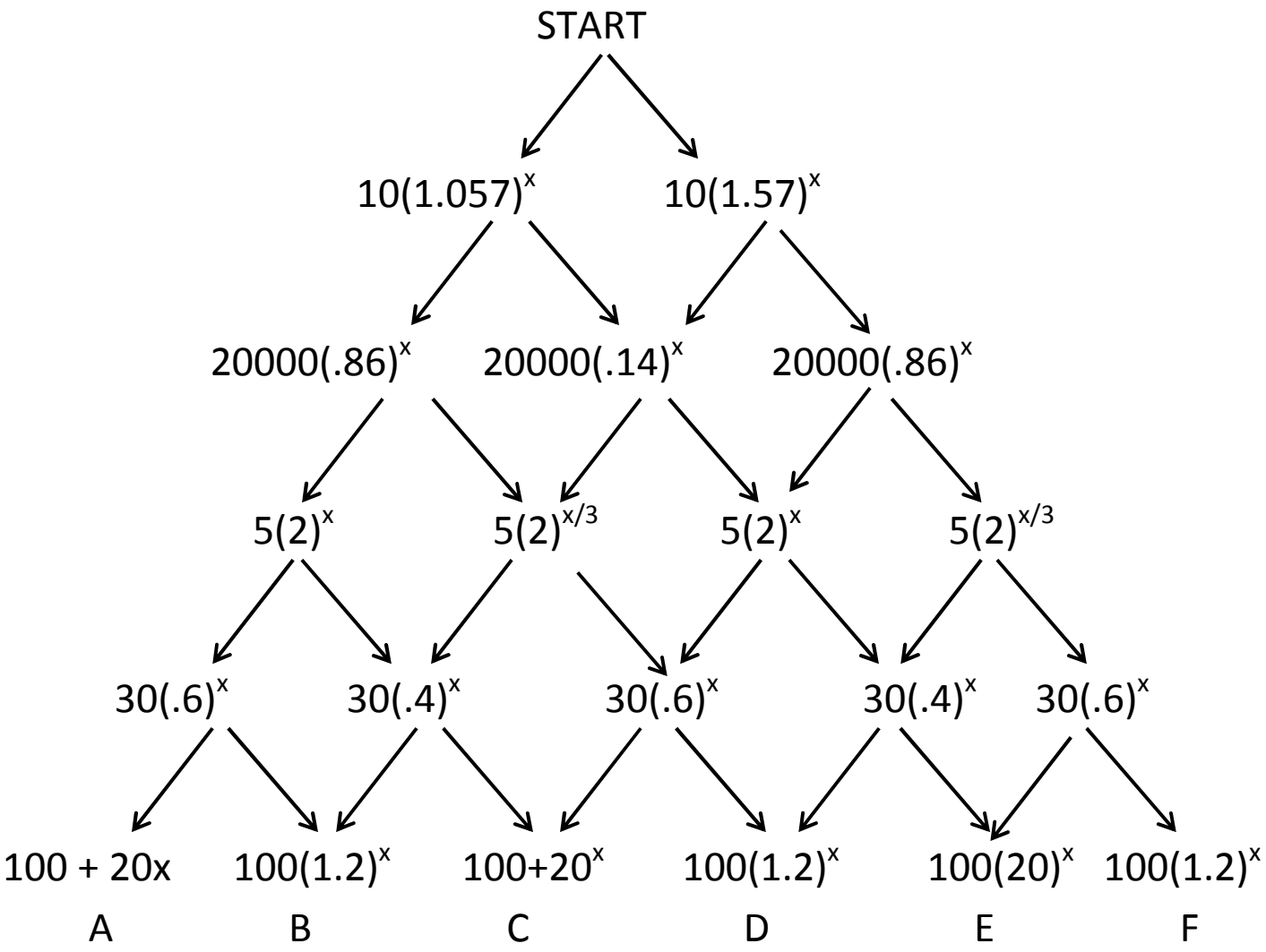
$6 baseball card depreciates 4% a year. Write the equation.

$6(.96)^x$ 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. Teacher does another example. Then students are paired up. One becomes the reader and the other becomes the listener. They try to get to the same spot.

$2x^{\frac{5}{2}}y^{\frac{1}{2}}$ **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** $\sqrt{4x^5y}$

EXPONENT DOMINOES

The problem is on the right side, with simplified "answers" on the left side. Start with any tile. Tile H leads to tile C. The dominoes are cut up to each group and they try to place them together. They also fill in the blanks. Use the blanks to create your own!

Directions: Find the mistake(s) if any in the working out of the following 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. $x < -1$ _____

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. $\frac{6r^0*9t^9}{t}$	_____	7. $\frac{8r^4t}{18r^2t^7}$	_____
H. $(4r^3)^2(3rt^2)$	_____	8. $\frac{16r^0 3r^7t^3}{t}$	_____

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 $x + 7$

Systems of Equations Around the World. Problems taken from Glencoe Algebra 2 Textbook

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.

(7,5) $y = 2x - 4$ $y = -3x + 1$	(1, -2) $2x + 3y = 7$ $2x - 3y = 7$	(3.5,0) $3x - 7y = -6$ $x + 2y = 11$	(5,3) $5x - y = 17$ $3x + 2y = 5$
(3,-2) $3x - 5y = 6$ $2x - 4y = 4$	(2,0) $3x - 7y = -3$ $2x = -6y - 34$	(-8,-3) $x + 3y = 27$ $.5x + 2y = 19$	(-6,11) $3x = -14 + 7y$ $4x = -x - y + 45$

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

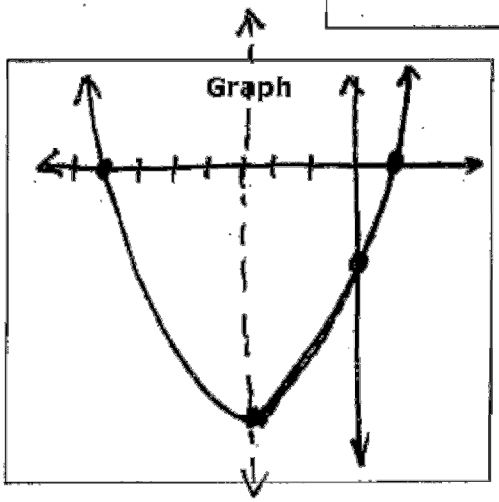
$y = x^2 + 6x - 7$

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: $-7 \rightarrow 7/-1$

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

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

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

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

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

$x = 1$ $x = -7$

$\{-7, 1\}$

EQUATION

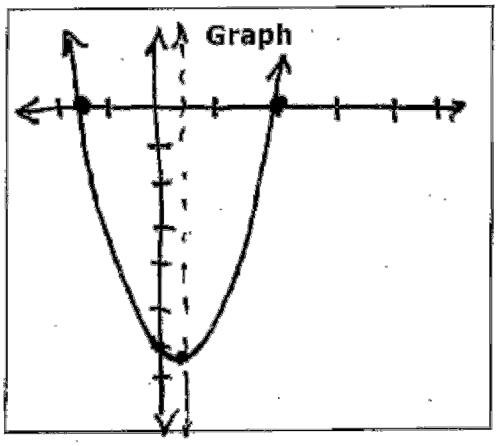
$y = 2x^2 - x - 6$

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

$x = 1/4$

y-intercept: "c" -6

Graph



Vertex

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

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

$= -6.125$

$(.25, -6.125)$

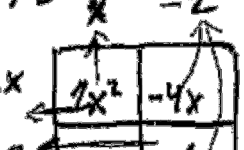
a= 2 b= -1 c= -6

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

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

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

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



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

Squaring a Binomial

Example 1: 32 * 24 can be written as (30 + 2)(20 + 4) which can be foiled to 30*20 + 30*4 + 2*20 + 2*4
= 600 + 120+ 40 + 8

Example 2: 28* 53 can be written as (30-2)(50+3) which can be foiled to 30*50 + 30*3 – 2*50 – 2*3
= 1500 + 90 – 100 – 6 = 1484

1. Rewrite 84*53 similar to example 1 and simplify.

2. Rewrite 98*23 similar to example 2 and simplify.

3. Jane thinks that $(3 + 4)^2 = 3^2 + 4^2$. Is she correct or incorrect?

   (Prove/disprove your thought by simplifying each side of the '='.)

   If she is wrong, how much is she missing from the right side?

   Is what is missing equivalent to 2*3*4?

   Is $(3+4)^2 = 3^2 + 2*3*4 + 4^2$?

   Is $(3+4)^2$equivalent to (3 +4)(3 + 4)? <show by "foiling" that it works.>

4. Jack thinks that $(1 + 5)^2 = 1^2 + 5^2$.

   Is he correct? If not, what exact number does he need to add to the right to get it?

   The number that he is missing is equivalent to _*1*5.

   Therefore $(1 + 5)^2$ = _____ + _____ + _____ <look at the part of #3>

   Or $(1 + 5)^2 = (1 + 5)(1 + 5)$ = _____ + _____ + _____ + _____ <foiling method>

5. Jack thinks that $(8-3)^2 = 8^2 – 3^2$. Is Jack correct?

   Is $(8 – 3)^2 = 8^2 + 2*8*(-3) – 3^2$?

   Is $(8-3)^2 = 8^2+ 2*8*(-3)+(- 3)^2$?

   $(8 – 3)^2$ is also = (8 – 3)(8 - 3) = _____ + _____ + _____ + _____ <foiling method>

6. Find $(9-2)^2$ two ways similar to #5

7. Is $(x + 3)^2 = x^2 + 3^2$? (Verify by choosing a number for x and simplifying both sides)

   Therefore Similarly, $(x + 3)^2$ can be written as $x^2 + 2*x*3 + 3^2$ or _____

   Or $(x + 3)(x+3) = x^2 + 3x + 3x + 9$ =_____

8. Is $(x -5)^2 = x^2 – 5^2$?

   How can $(x – 5)^2$ be found with two different methods?

9. True or false: <hint replace x with 1 and verify>
   $(4x + 3)^2 = 4x^2 + 9$

   $(4x + 3)^2 = 16x^2 + 9$?

$(4x + 3)^2 = 4x^2 + 2*4x*3 + 9 = 4x^2 + 24x + 9$

$(4x + 3)^2 = (4x)^2 + 2*4x*3 + (3)^2 = 16x^2 + 24x + 9$?

$(4x + 3) = (4x + 3)(4x + 3) = 16x^2 + 12x + 12x + 9 = 16x^2 + 24x + 9$

10. True or false (use any method). If it is false, write the mistake

$(5x – 2)^2 = 5x^2 – 4$

$(5x – 2)^2 = 5x^2 + 4$

$(5x – 2)^2 = (5x)^2 + 2(5x)(-2) + (-2)^2 = 25x^2 – 20x + 4$

$(5x – 2)^2 = (5x)^2 + 2(5x)(-2) + -2^2 = 25x^2 – 20x – 4$

$(5x – 2)^2 = 5x^2 + 2*(5x)\ (-2)\ + -2^2 = 25x^2 – 20x – 4$

$(5x – 2)^2 = (5x – 2)(5x – 2) = 25x^2 – 10x – 10x + 4 = 25x^2 – 20x + 4$

11. Find $(5x + 2)^2$ two different ways

12. Find $(3x – 2)^2$ two different ways

13. Find $(3x^2 – 5y)^2$ two different ways

14. Find $(54)^2$ in a similar manner to example 1

15. Find $(126)^2$ in a similar manner to example 1 $(120 + 6)^2$

Summary: $(a + b)^2$ can be simplified to $(a)^2 + 2ab + (b)^2$ **or** $(a+b)(a+b) = a^2 + ab + ab + b^2 = (a)^2 + 2ab + (b)^2$ $(a + b)^2$ is **NEVER** $(a)^2 + (b)^2$. It is equal to **First Squared + Last Squared + 2*First *Last**

Ex: $(3x + 5y)^2 = (3x)^2 + 2(3x)(5y) + (5y)^2 = 9x^2 + 30xy + 25y^2$
Or $(3x + 5y)(3x + 5y) = 9x^2 + 15xy+15xy+25y^2$ or $9x^2 + 30xy+ 25y^2$

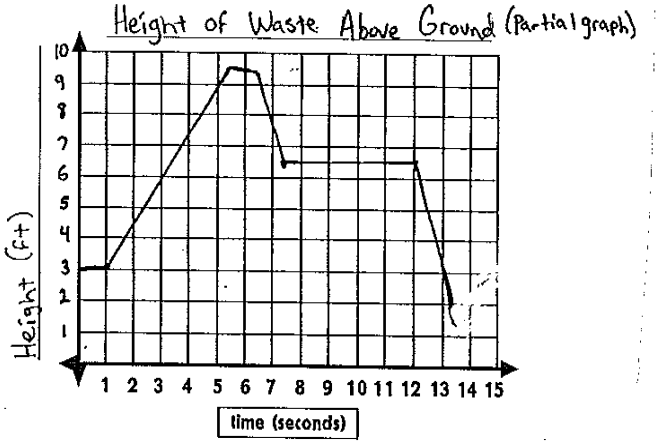
Ex: $(4x^3- 2y)^2 = (4x^3)^2 + 2(4x^3)(-2y) + (-2y)^2 = 16x^6 – 16x^3\ y + 4y^2$
Or $(4x^3- 2y)^2 = (4x^3 – 2y)(4x^3 – 2y) = 16x^6 – 8x^3y – 8x^3y + 4y^2$

16. Simplify $(5x^4 – 3y^2)^2$
17. Is $(2 + 3)^3 = 2^3 + 3^3$? Is it equal to (2+3)(2+3)(2+3)?
18. Will $(x – 2y)^3 = x^3 + (-2y)^3$?

$(x – 2y)^3 = (x – 2y)(x – 2y)$**$(x – 2y)$** $= (x^2 – 2yx – 2yx + 4y^2)$**$(x – 2y)$**$= (x^2 – 4xy + 4y^2)$**$(x – 2y)$**

$=x^3 -2x^2y-4x^2y+8xy^2 + 4xy^2 – 8y^3 = x^3 -6x^2y + 12xy^2 – 8y^3$

19. Simplify $(x – 4)^3$ by writing it out 3 times and "foiling twice"



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)._____

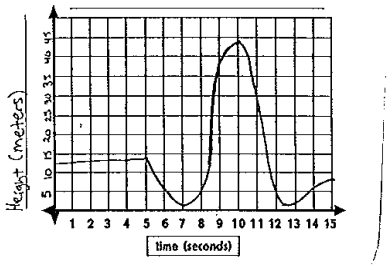
6) Find and interpret f(8.5)._____

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._____