Activities for Math Classes

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These are ideas that I have created, or collected from other colleagues. Each idea is broken into general information, instructions, usefulness, insights, a specific example, and ideas. There is also a rating scale of 0 to 3 with "3" indicating that it is highly useful and a 1 indicating that it is useful but maybe not the best way to use the time.

Amigo Bingo (1)

Time: 20-30 minutes **Type:** Answering questions **Grouping:** Individual
Grading: None or bonus points **Rating:** 3
Directions: Every student quickly draws a 4 x 4 or 5 x 5 grid on his paper. He writes a different number (1-25 or 1-16) in each square in PEN (to prevent cheating.) Meanwhile, the teacher writes down random numbers from 1-25. The teacher asks a question to the class. After a brief interval, the teacher chooses a student at random. If the student gets it wrong then the teacher chooses another random student. If either the first student or the second student gets it right, then the teacher reveals a random number and then every student crosses that number off. If both students get it wrong then another question is asked. The winner is the first student who makes "Bingo" with his card.

Insightful ideas:

- This can be done with homework questions by just asking students to do a certain problem number
- If someone gets "Bingo" quickly then just play for most lines etc…
- It takes about 7 problems for someone to get one line and about 15 problems for someone to get 2 lines.

Runner Bingo(2)

Time: 20-30 minutes **Type:** Answering questions **Grouping:** Individuals, pairs, or groups
Grading: Classwork or bonus points **Rating:** 3

Directions: Teacher writes down approximately 30 answers. Students place 25 answers into Bingo spaces in pen. Teacher places about 15 problems posted (or in little baskets) throughout the room. One member looks/gets problem. Team solves the problem. Then they cross the answer out on the Bingo Card.

Insightful Idea: Instead of making students "run around the room", teacher can just lead the students with questions or give them a worksheet.

Row Game (3)

Time: 5 minutes **Type:** Quick questioning **Grouping:** Entire class in rows and columns
Grading: None **Rating:** 2

Directions: The class needs to be seated in rows and columns or in groups. (If they are in groups them number them 1-2-3-4-5). Ask a row (or a certain number) to stand-up. Ask questions and

allow the first person to raise his hand to answer. If he is right then he sits down. Eventually, only one person will be standing. His column (or group of students) must stand-up. Continue with questions. Eventually, one person will be standing and his row (or number) stands up. This continues.

Insightful ideas: The only problem with this game is that occasionally, someone will always stand. Two ways to prevent this: 1) Ask a question like "who is the most handsome boy in the class?" if a girl is standing with two other boys or 2) allow that student to answer any question even if his hand goes up last.

Horse Race (4)

Time: 5 minutes **Type:** Quick questioning **Grouping:** About 5-6 per group
Grading: None **Rating:** 2 Materials: Stuffed animal or baton or spaces

Directions: The first person of each group stands up. Teacher asks a question and calls on the first person to raise his/her hand to answer the question. If he gets it right then he sits down and the "horse" moves to the second person. The teacher asks another questions and chooses the first person who is standing up to answer the question. If it's right then that person sits down and the next person goes. Play continues until the first group is able to have all of its members answer a question and gets the "horse" across the finish line.

Four in a Row (5)

Time: (20-30 minutes) **Type:** Answering questions **Grouping:** 1 vs. 1
Grading: Participation/None **Rating:** 3

Directions: Split the class into pairs and each pair into an 'O' or 'X.' Each pair draws a 7 by 7 grid on their paper (or teacher can give a pre-copied one to save time.) Ask the first question to the class and designate it as a "X" question. Both people write down their answers separately. Reveal the answer. If just one person gets it right then (s)he puts his/her mark on the grid. If both people get it right then the "X" goes since it's an "X" question. (The next question is an "O" question.) Each member is trying to get four of his marks in a row (diagonally, horizontally or vertically). If someone wins, then encourage the pair to keep playing and the person with the most Connect 4's wins.

Insightful idea: For those familiar with the traditional method of Connect Four then ask them to use "gravity."

Bluff (6)

Time: (20-30 minutes) **Type:** Answering questions **Grouping:** 1/2 class vs. 1/2 class
Grading: None or bonus points **Rating:** 3

Directions: Ask Team 'A' a question. If a student knows the answer (or wants to bluff) then he stands up. Count the people. Choose a student. If he gets it right, then his team earns a point for every person who was standing. If he gets it wrong, then ask a student on the other team. If that student gets it right then give that team 1/2 the amount of standing people from the opposing team. Play continues by asking Team B a new question. Continue alternating. The team with the highest points wins. Any student caught telling the answer to a teammate loses five points for his/her team.

Insightful Ideas:
- You can use questions that you asked for homework.
- It's probably best that you assign both teams a question at the same time.
- You can also have a worksheet and then choose questions randomly from the worksheet.

Slap Jack (7) <CAN BE VIOLENT>

Time: 15 minutes **Type:** Answering questions **Rating:** 2
Grouping: Groups of 4 or 5, member of each group vs other members in group
Grading: None or prize or loser of each group has to sing ABC song in front of class

Directions: Have each group select a scorekeeper who also participates. Give each group a sheet of paper with about 20 answers (including a "none of the above") that they place face up on desks equally accessible to all students in that group. Ask a question (usually written on the overhead). If a student touches the correct answer then he gets a point. (The first student to "touch" the correct answer gets an extra point.) If a student touches the wrong answer then he loses a point. Be sure to ask a few questions where the answers are not on the desk!

Examples of Answers and Questions:
1) Find the cos of 45° 2) Find the sin of 135° 3) Find the cos of pi/2
Answer page:

A) -1/2	B) 0	C) -1	D) $\frac{\sqrt{3}}{2}$
E) ½	F) $\frac{\sqrt{2}}{2}$	G) - $\frac{\sqrt{2}}{2}$	H) - $\frac{\sqrt{3}}{2}$

Insightful Ideas:
* Make students put hands on their heads before you call out a question
* To make it easier to check your answers, label each answer with a capital letter so you can just say the answer is A, B, C, etc
* You can also put pictures (such as median, altitude, etc..) and graphs ($y=2x^2$, $y=-2x^2$)
* You can also use vocabulary words, properties, etc...

Grumble (8)

Rating: -10

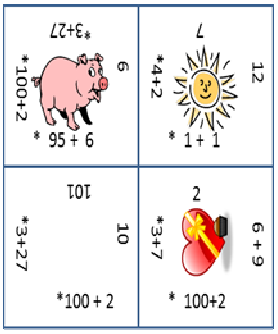
When the students need a break, tell them that they have to complain between 45 seconds and 90 seconds (they choose a number). If they can't think of anything to complain about, then they have to say "grumble, grumble..." Sometimes, I use it to show no correlation between time and grumbles.

Puzzle (9)

Time: 20-30 minutes **Type:** Answering questions **Grouping:** Groups of 2, 3, or 4
Grading: None, group quiz, or bonus points **Rating:** 2

Directions: On a four by four grid, write problems on one side of a segment and the answer on the other side of the segment. Place extraneous answers on the edges. Copy a grid for each group and cut it into 16 pieces. Each group has to complete the puzzle by correctly matching questions with answers.
Insightful Ideas:
*It's best if you write a number (acronym, picture or a secret symbol) in the center of each piece

such that it makes a code that only you know the answer to and can easily check the answer
*Students can make their own and then ask another group to complete their puzzle
*Google "Tarsia" to find an on-line version of a puzzle maker
Example (of a 4 by 4 grid):



Dominoes (10)

Time: 15-20 minutes **Type:** Answering questions
Grouping: Groups of 2, 3, or 4 **Grading:** None, group quiz, or bonus points
Rating: 2

Directions: It's very similar to puzzle except in that you want the students to make a snake. Write the problem on the bottom and the answer on the top of the next segment. (A blank grid is provided on the last page). You can also leave a few answers blank
Insightful ideas: Same as puzzle. **Example:** This is a domino example.

Start 3x = 6 **I**	{2} 5x = -25 **L**	{-5} 3x = 3x+2 **T**	No solution 6x=30 **E**	{-5} 3x = 3x+2 **S**	{5} Finish **N**

Circuit (11)

Time: 15-25 minutes **Type:** Problem solving **Grouping:** Pairs, Individuals or Groups
Grading: Classwork, homework etc.. **Rating:** 3

Directions: Teachers place about 10 sheets of paper around the room with an answer (labeled with A, B, C etc..) on the outside of the fold and a problem on the inside of the fold (labeled as a number) Students start by going to different problems. They solve the problem and then look for the answer throughout the room. They then go to that paper and do the problem that is on the inside. They continue until they have made a "circuit." In the example for the "Dominoes" listed above, 2 would be on the outside and 5x=-25 would be on the inside; -5 would be on the outside and 3x=3x + 2 would be on the inside etc…

Matching Cards (12)

Time: 10-20 minutes **Type:** Finding matches or groups **Grouping:** Pairs or groups
Grading: None **Rating:** 2

Directions: Teachers create about 18 pairs of cards that match up. People then pair up the cards face up.
Insightful Idea and Variation

- Give each student one card as they walk in the room and they have to walk around the room to find their matching card
- Have the students play it like concentration with the cards down
- Students can group cards into "functions, 1-1, and non-function"
- Put the problems on one color of paper and the matching answer on another color

Listening Tree (13)

Time: 10-15 minutes **Type: Short answers of c**oncepts that students get confused
Grouping: Pairs **Grading:** None **Rating: 2**

Directions: Give each student a sheet. Teacher demonstrates two examples by asking students to begin at the top. Teacher then reads out loud a problem that the students choose the correct answer with their finger. Teacher then reads another question that the students choose. This continues until the students get to the bottom. Teacher then asks students to show by hands what

they think the correct answer is. Students then work in pairs with one student reading and the other one trying to figure it out. They then switch roles.

Question Ideas: 3(n+2) vs 3n + 2; 5 – n vs n -5; domain vs range; formula for sum of interior angles vs formula for each interior angle; easy math computation skills;

START

3(n+2) 3n + 2

n-5 5-n n-5

All real y>2 All real y>2

1 2 3 4

Teacher Says (14)

Time: 10-15 minutes **Type:** Answers that the students can demonstrate with arms
Grouping: Class **Grading:** Prize/bonus points **Rating:** 3

Directions: The teacher writes out equations or geometric questions on the overhead. Teacher reveals the equations one at a time. As the teacher reveals an item, the teacher states "Teacher says, make ….." The students then make the shape with their arms. Occasionally the teacher will just say "make …." Teacher should demonstrate the correct answer. Any student who makes an incorrect shape or moves at all when the teacher doesn't say "Teacher says" at the beginning sits down. Eventually a winner will be left standing.

Question Ideas: $y = 3x + 1$; $x = 4$; line perpendicular to $y = 3x - 2$; line with zero slope; $y = |x + 2|$; $y = |x - 2|$; End behavior of $f(x) = 50x^3 - 20x^2 + 1$; scalene triangle; supplementary angels; sin (right hand over left hand);

Insighful Ideas:

- Replace "teacher" in "teacher says" with your last name.
- When you play the second game, tell the students to stand up without saying "teacher says." But then give them a free pass.
- To help eliminate people, start demonstrating bad answers before you actually give the answer.

Vocabulary Recall (15)

Time: 10 minutes **Type:** Vocabulary words; graphs; or shapes
Grouping: Groups of 4-6 people **Grading:** Prize to winning member of each group and/or make the losing member of each group come forward to sing "ABC" song.
Rating: 2 (It's good for having students remember vocabulary words because they say it several times)

Directions: Each group selects a scorekeeper. Give each group a packet of cards of about 10-14 vocabulary words/graphs that you want the students to practice. Ideally put a picture on the front and the word on the back of each card. Each member takes about two cards. The first person begins and states his word and then another word. The person with the other word then says his word and then another word. This continues until someone makes a mistake by either saying an incorrect word or hesitating. A person who makes a mistake gets a point and then begins the next "round." The person with the least amount of points wins and the person with the most amount of points loses.

Question Ideas: Types of triangles, theorems, definitions, properties, vocabulary words of graphs (rational, direct etc..);

Insightful Idea:

After about 5 minutes, have the students change cards.

Color by Number (16)

Time: 20-30 minutes **Type:** Solving problems or Students Creating Problems
Grading: Homework **Rating:** 2

Directions: Teacher creates a picture and designates each region with a letter. Each answer is correlated to a color. Teacher then gives a worksheet with problems. When a student gets an answer, he then colors the region with the color that is coordinated with his color.
(see website for factoring)

Insightful Idea: Have the students create one for extra-credit or as an assignment.

Partner Activity (17)

Time: 20-30 minutes **Type:** Solving problems **Grouping:** Pairs
Grading: Classwork **Rating:** 3

Directions: Teacher creates a worksheet with about 24 problems split into 6 sections A1, A2, A3, B1, B2, and B3. The four answers in A1 are the same to B1 (but in a different problem order) and the same applies to A2&B2; and A3 & B3. Partner A does the four problems in A1 and Partner B does the four problems in B1. Then they compare their answers. If some are different then they analyze their problems until they can reach a consensus. Then they continue with set#2 and #3…
Example of just one set (with answers in { })

Partner A			Partner B		
	SET 1			**SET 1**	
1)	Solve 3x + 6 = 12	{2}	A)	Solve 5x = 60	{12}
2)	Solve x – 2 = 10	{12}	B)	Solve 2x – 6 = 2	{4}
3)	Solve 2x = 12	{6}	C)	Solve x + 4 = 6	{2}
4)	Solve -3x = -12	{4}	D)	Solve –x = -6	{6}

See website for one on rational expressions

What's My Picture or Phrase? (18)

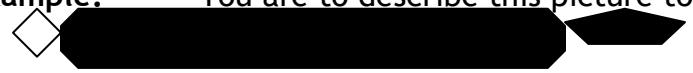
Time: 15 minutes (5 for instructions, 10 for implementation)
Type: Verbal communication of vocabulary or concepts **Grouping:** Pairs
Grading: Participation **Rating:** 2 1/2

Directions: Pairs are assigned and desks are divided such that one student cannot see the other student's paper. A picture is given to each student. Student A describes his picture using vocabulary and B attempts to draw the picture. Then they show their drawings to each other and give hints to the other person on how to correct it. Finally, the original picture is shown to the other student.

Insightful ideas:

- Pairs who finish early are encouraged to draw their own picture and communicate it
- As written communication via the Internet is becoming more prevalent, students are forced to describe in a "messenger" or "email" format
- Arrange the room such that and "A" student cannot see anyone else's "B" picture

Example: You are to describe this picture to your partner.



Other Examples: Verbal expressions such as 5(x+3) and 5x+3, coordinates, lines and curves.

Unlimited Problems (19)

Time: 15 minutes **Type:** Creating Problems **Grouping:** Groups of 4-5
Grading: Bonus points **Rating:** 2

Directions: Teacher gives an answer to a problem. Students then create unique problems (1 pt)that will yield the answer using the specific concept and write them on a large whiteboard (or poster paper) within a given time limit. Students then analyze other papers to look for repetition (0 pts for each group) or incorrect (-1 pt). The group with the most points

Example:

ANSWER: $15x^2y^3$ with mult. of variables & bonus for using the power rule of exponents

Group 1		Group 2	
a) $5xy^3$ (3x)	0 pt (same)	a) $15x^{2*}y^3$	1pt
b) $3x(5y^3)(x)$	1 pt	b) $5*3*x*y*y^2$	1pt
c) $\frac{1}{2}(30x^2y^2)(y)$	1 pt	c) $12 + 3x^2y^3$	-1 pt (incorrect)
d) $3(5x)(y^3)$	-1 pt (incorrect)	d) $5xy^3(3x)$	0 pt (same)
e) $\frac{3}{5}(5xy)^2y$	2 pts (bonus)	e) $3x^2y^3 + 12x^2y^3$	0 pt (criterion not followed)
f) 3*5*x*x*y*y*y	1 pt		
Total 4 pts		Total 1 pt	

Benefits of this activity: Students are encouraged to think critically in order to create a problem that yields an answer. They also have to analyze other answers

You might have to put constraints on students to prevent just changing numbers to quickly come up with problems: (Ex: $x^2y^3+ 14x^2y^3$; $2x^2y^3+ 13x^2y^3$; $3x^2y^3+ 12x^2y^3$; $4x^2y^3+ 11x^2y^3$) etc…

Relay (20)

Time: 15-20 minutes **Type:** Answering questions **Grouping:** Groups of 4 vs other groups
Grading: None, group quiz, or bonus points **Rating:** 2

Directions: Assign each person in a group to be #1, #2, #3 and #4. Put four problems on the overhead such that the answer to the first problem is needed to solve the second problem whose answer is needed to solve the third problem whose answer is needed to solve the fourth problem, which is needed to answer the third question, which is needed to answer the fourth question. Each question goes on an index card and is given to one student. As soon as student one answers his question, he tells his answer to the 2nd person who solves his question and passes his answer to the third person who gives his answer to the fourth person who solves and gives the team's final answer.

Insightful Ideas:
*You can take the students outside and have them run from one to another
*After so many minutes, allow team members to help each other
*For uneven groups, have someone go twice or have two people be number 4
Example: <X is the answer the student receives> (answers in parenthesis)

#1) 1+1 #2) X+2 #3) x-6 #4) X+8 (2, 4, -2, 6)

Gallery (21)

Time: 35 Minutes (Instruction-5, creation-15, presentation-10, clean up-3)
Type: Review of 4-6 related topics **Grouping:** Groups of 4 **Grading:** Participation (homework if their work on it at home) **Rating:** 2

Directions: Each group is assigned a topic, and a location near a wall. They make a short skit (of two people), a song, a picture, a chart, or any other creative idea about their topic. Then, two students remain and perform/explain their works several times to fellow classmates while the other two students walk to the various groups. After five minutes, the students switch places.

Example: The class has been studying the first chapter in Pre-Algebra. Groups of four are assigned one of the following: Order of Operations, Properties, Translations, Simple Equations, Number Line, and Easy Simplifying. Each group spends 15 minutes deciding, preparing, and practicing. Then two students from each group visit the other groups for one-minute intervals.

Insightful Ideas:

- Time can be split into two days by asking students to do the creation at home
- Only two or three students should be at an area at one time.
- This is great for large classes who cannot pay attention. Students not only remember what they created but also what their classmates created.

Other Examples for specific subjects:
Types of numbers, ways to solve system of equations, properties and theorems, simplifying radicals or exponents

Look and Remember... (22)

Time: 20 minutes (5 for instructions, 15 for implementation)
Type: Verbal communication of vocabulary or concepts **Grouping:** Groups of four **Grading:** Participation **Rating:** 2

Directions: Groups are assigned with two being designated as the runners and two as the solvers. The teacher places work problems or questions (photocopied four times) on each wall. The solvers are given questions to answer or are just to solve the questions. The readers go to the wall, remember the information, return, and verbally (without yelling) give the information to the solvers who answer the questions. After 1/2 the questions have been answer then the duties are switched.

Usefulness: It's a different way for students to solve problems.

Insightful ideas:
*Four people work better than pairs since it minimizes the harm of a slow reader or writer.
*Remove objects that could cause students to hurt themselves as they run.

Other applications: Word problems (probability, work, etc) and graphs with various slopes and vertexes.

Problem Cards (23) (similar to I have, who has???)

Time: 10-15 minutes
Type: Problem solving and cooperative learning **Grouping:** Individual with students moving

Grading: Participation **Rating:** 2

Directions: Give each student a card with a problem on the front side and the answer/solution (on the back side). Students walk around the room and pair-up. Each student looks at the front of the other student's card and tries to work the problem. (The card holder can give hints). Once they both have solved the problem then they switch cards and go find other people.)

Auction (24)

Time: 25 minutes (5 for instructions, 10 for problem solving, 10 for bidding and going over answers)
Type: Answering questions **Grouping:** About 4 teams
Grading: Participation, extra-points **Rating:** 3

Directions: Students are given about sixteen questions with answers (some correct and some wrong called "lemons") to work on in groups. Each group decides which answers are correct. After about 10 minutes, the teacher brings the class together and allots $1000 <kept track on the board> to each group. The teacher then starts the bidding for question one and the groups' spokespeople bid on the question they feel the answer are correct. The teacher records which group "bought" each question and subtracts that amount from their $1000. The bidding continues for all the questions. Then the teacher reveals which answers are corrects (while going over them) one by one. Any group that bought a "lemon" question looses $500 and a correct question. The group with the most correct questions wins. If two or more groups have the same amount of correct questions then the group with the highest amount of remaining money wins.

Insightful Ideas: To save time in the bidding, teachers should only go in increments of 50. Students can be given the problems to work for homework or the teacher can use the activity to go over homework.

Example: Students are given the following questions and answers. (T=true, F-false)

1)	Six exterior angles of a heptagon are 50 degrees. What is the measure of the other exterior angle?	60	T
2)	How much is each exterior angle of a dodecagon?	30	T
3)	Elena the bust driver in Vancouver has a bus route that makes a convex polygon with her fourteen streets that she drives on. What is the average degree of her turns?	154.2	F
4)	What is the total number of degrees in an "American Stop Sign"?	720	F
5)	A hexagon has angles of 124, 123, 2x+1, 123, 3x+1, 2x-1. Find the measure of the largest "unknown" angle.	151.4	T
6)	A polygon has a total of 35 diagonals. How many sides does it have?	12	F
7)	An n-sided polygon has a pattern such that every other angle is 142° and other angles are 158°. Find how many sides it is.	12	T
8)	The angles of a polygon have an average of 165°. How many sides does it have?	24	T
9)	What is the measure of each exterior angle of a centagon?	3.6	F
10)	A convex polygon has interior angles that measure 90 100, 110, and 120. What is the measure of the fifth angle?	130	F
11)	Four times the measure of an exterior angle if an n-sided regular polygon is equal to the measure of each interior angle. How many sides? (you may use the solve button)	10	T

Groups select spokesperson and which questions they feel are correct. After 10 minutes, the teacher brings the class together. She writes the four groups (A, B, C, and D) and $1000 on the board. She starts the bidding for question 1 at $50. Group A agrees for $50, then group B agrees for $100, then group A agrees for $150. No other group bids. The teacher writes "1" under group A and changes their money to $850. She continues the bidding for all questions. Pretend that C got question 2 for $500, D got question 4 for $550, and A got question 5 for $850, while no one bid on 3 or 6. The teacher says that 1 is wrong (or a lemon) and subtracts another $500. She then says that 2 is correct, 3 is wrong, 4 is correct, 5 is correct, and 6 is wrong. Group C wins because they got one question correct and they have $500 left. (Group D has one correct and $450).

Which is Larger (25)?

Time: 20 minutes **Type:** Problem solving **Grouping:** Individual, pair, or group
Grading: classwork **Rating:** 3

Traditional Method: The purpose of the problems is to figure out which has the largest value. The winning team is the one that gets the most problems correct. Or you could also have them write the answers in descending order.

Class Group Method: Each group gets a notebook card of A,B,C,D. Teacher displays the problem and the groups decide the order. (5 pts if all correct)

Game-Show format Method:

1) Decide the order of the groups for each question. (it can be decided by lottery, or by asking a very random question with large numbers <IE: area of the U.S.> Let the closest group choose the first answer; the next closest group choose the next answer etc….)

2) Display the answers and talk about the difference etc.. Give each group points based on who got the largest (5 pts), second largest (4pts) etc… You will probably need to create more choices.

Variety: Eliminate the groups that give the smallest answer each time….

Some Example Questions:

A. $3x = 9$	B. $3 - x = 11$	C. $\frac{2}{3}x = 36$	D. $8 - x = -24$	Answer:
A. $3x + 2 = 12$	B. $5x - 3 = -17$	C. $\frac{2}{3}x - 1 = 17$	D. $1 - 7x = -55$	
A. $2(x + 1) = 12 + 4x$	B. $5 - (x + 1) = 1 + 2x$	C. $\frac{3}{4}x - 2 = 4$	D. $3 - 2(x + 3) = 10$	

Two Truths One Fib (26)

Time: 10 minutes
Type: Critical thinking **Grouping:** Individuals and/or groups
Rating: 3+

Directions: Demonstrate three statements. Two are true and one is false. Have the students decide which one is false. Teacher can then demonstrate other questions. Teachers can also have students create three statements/math problems and have their group members decide which is false.

Example: 1) The product of two rational numbers is always rational.
2) The centroid is always inside the triangle.
3) x^2 is always larger than x.

Human Number Line (27)

Time: 10 minutes
Type: Number analysis **Grouping:** Entire class or groups or pairs
Rating: 2+
Directions: Give the students numbers and have them arrange them from smallest to largest. (You could also give one student a number and have the class arrange themselves)
Example: -4^2 $(-4)^2$ $\log_2 8$ $\log_2 1/8$ 3.14 Pi i^2 7^0

$1+1+1+1+1+1*0$ 4^{-2} $Log_3 0$

Give-one Take-one (28)

Time: 10-15 minutes **Type:** Review problems
Grouping: Entire class **Rating**: 2

Directions: Give each student a card with the problem on the front and the answer (or hint to the answer) on the back. Two students share show their cards to each other. They try to solve each other card. If one can't solve it then the holder gives hints to the other person. Once they have solved each other's cards, they swap cards and then go find another person.

Four Group Debate (29)

Time: 60+ minutes (40 for presentations and 20 for rebuttals)
Type: Review or introduction **Grouping:** 4 or 3 groups **Grading:** Group quiz
Rating: 3+

Directions: In the previous class, a question is presented usually in the format of "Which ~ is the best?" Groups are selected and a category is assigned to each group. They spend some time in class generalizing ideas and deciding who will present what. On the debate day, each group (in a randomly assigned order on the day of the debate) presents for a maximum of 10 minutes who their criteria (reason) is the best and why their topic meets the criteria best. Then each group (again in randomly assigned order) speaks up to five minutes rebutting what the other groups have said. Groups may being in visuals (food, pictures, stats, etc...). No questions are asked in the debate and no new information is presented in the rebuttal. Each member of the group must speak in both intervals.

Usefulness: While discussing often the absurd, students are applying and synthesizing their knowledge. They are also more likely to remember the reasoning and applications presented.

Insight:
*If a class is 45 minutes then either having the presentations on one day and the rebuttals on the other day or adjusting the time to be 8 minutes and 3 minutes can modify time.
*Have students be required to give some required information (dates, formulas, etc...) in their presentation.
*Have another person in the room as an impartial judge.
*Award grades with the highest going to the winning group.
*Having students prepare for the debate during a teacher's absence is an efficient use of a substitute teacher.
*This also works if 1/2 the class is on a field trip. The absent half of the class writes a report.

Personal Note:
When my students debated on which conic (circle, ellipse, hyperbole, or parabola) was the best, I was amazed at the originality, depth of thought, and creativity that my students used. I with that I had done this at the beginning of the conic section instead of at the end as students presented many useful applications and I think it would have sparked their interest in the conics more.

Example: Students debated which shape was most important. The circles claimed that the application of a shape was most important and they had the most applications. Triangles claimed that flexibility was most important and why they were the most flexible. Lines claimed they were the most free. Squares claimed that perfectness is the most important and that they were the most perfect. Inevitably, all groups tried to show why they had the most applications, where the most perfect, were the freest, and were the most flexible.
Examples for specific subjects: Which ~ is the best?
Conic, Operation, Shape, Method of solving systems of equations

Other Ideas

Love Letter/Hate Letter (30) Have the students write a love or complimentary letter to someone (or even a fictitious person) using metaphors from the subject being taught. The love letter is best around Valentine's Day or Mother's Day. Brief example: Dear Jane, my heart turns 360 degrees when I see you. I love how our souls are similar. Every exterior angle you have is perfect...

Headline (31) Select a different student each week to make a creative headline about what happened the previous week in class. It should contain a headline, a picture, and a brief paragraph. The headline can either be read out loud and/or posted on the door. Example:
Students Movie the Logs
PICTURE
Last week, students in fifth period explored the rules of logarithmic equations. They condensed and expand log equations. They even changed them into exponential equations. Furthermore, they transformed log graphs.

Bulletin Board (32) Have a different group of students design a bulletin board each week for your class.

Bookmark (33): Have each student make an artistic bookmark for another student (chosen at random). This works great when working with tessellations, isometries, translations, quotes, important dates, or important facts as it causes the giver and receiver to focus.

Projects: See website for a graphing equation project and for a stats project

Songs:

Exponents (Sung to "Flinstones")

Exponents, meet the exponents, they're a common Algebra family
When you multiply them, you add the exponents
When you subtract them, you divide the exponents
When you raise one to a power, you multiply the exponents
When you have a negative one, you flip the location
When you have a fraction, the denominator is a root
Let's see when the exponent is zero then you make the denominator 1
Exponents, use them correctly, use them correctly, and you'll get an A!!!!!!!!

Factoring Binomials (Sung to "If you are happy and you know, clap your hands")

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

(- +) = (-)(-)

Logs (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 can't take log of negative.

Shifting Graph (Sung to "We wish you a Merry Christmas")

A plus in the middle moves it left
A plus in the middle moves it left
A minus in the middle mores it right
That how you move horizontally

A plus on the outside moves it up
A plus on the outside moves it up

A minus on the outside moves it down
That's how you move vertically

A number more than one makes it thin
A number less than one makes fat
A negative flips it upside down
That's how you change the shape

Great Math Videos:

http://www.youtube.com/watch?v=VUTXsPFx-qQ **(meat-a-morphesis)**
http://www.youtube.com/watch?v=m94WTZP14SA **(rational,integers, whole, natural numbers)**
http://www.youtube.com/watch?v=pX57IW5p-YI **(factoring song)**
www.graphingstories.com **(motion versus time)**

$Y = (1.056)^x$ 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

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.

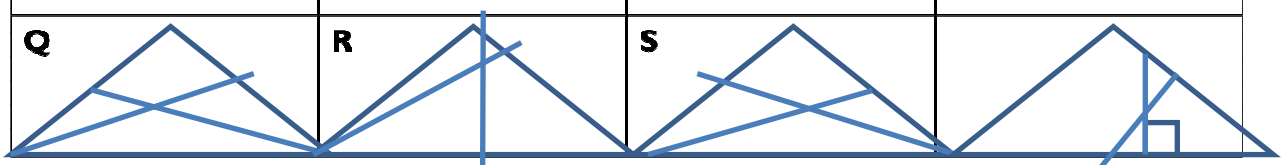
$6(1.04)^x$ J

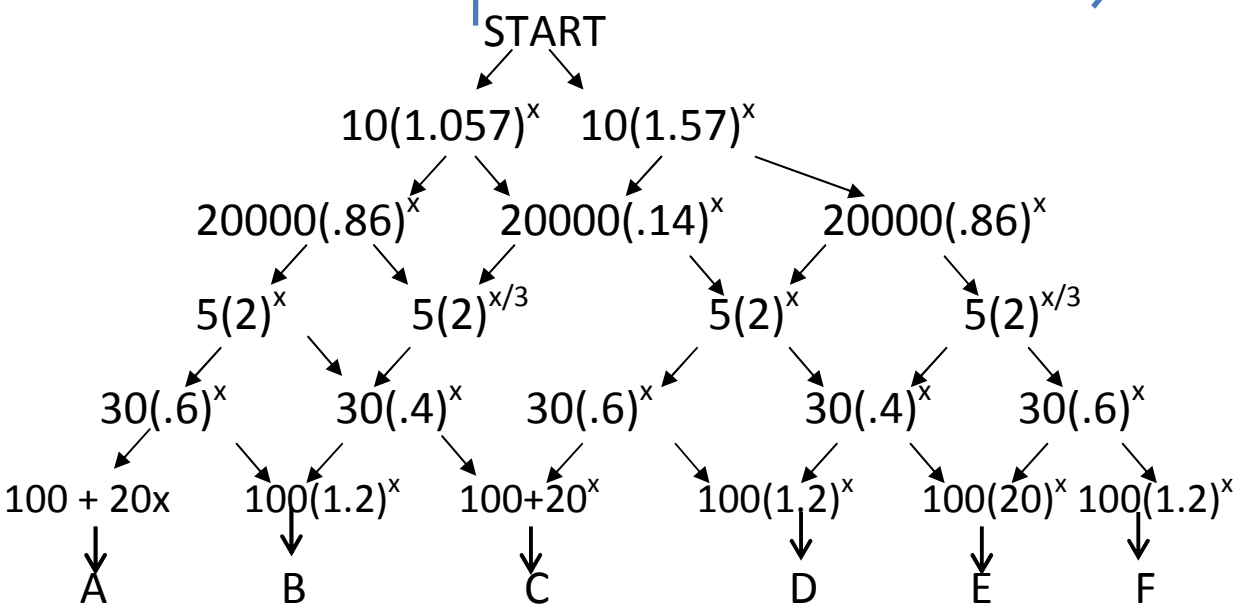
$6 baseball card depreciates 4% a year. Write the equation. $6(.96)^x$ O

200 people decrease by 8% yearly. How many people in 5 years?

$200(.92)^x \rightarrow 132$ M

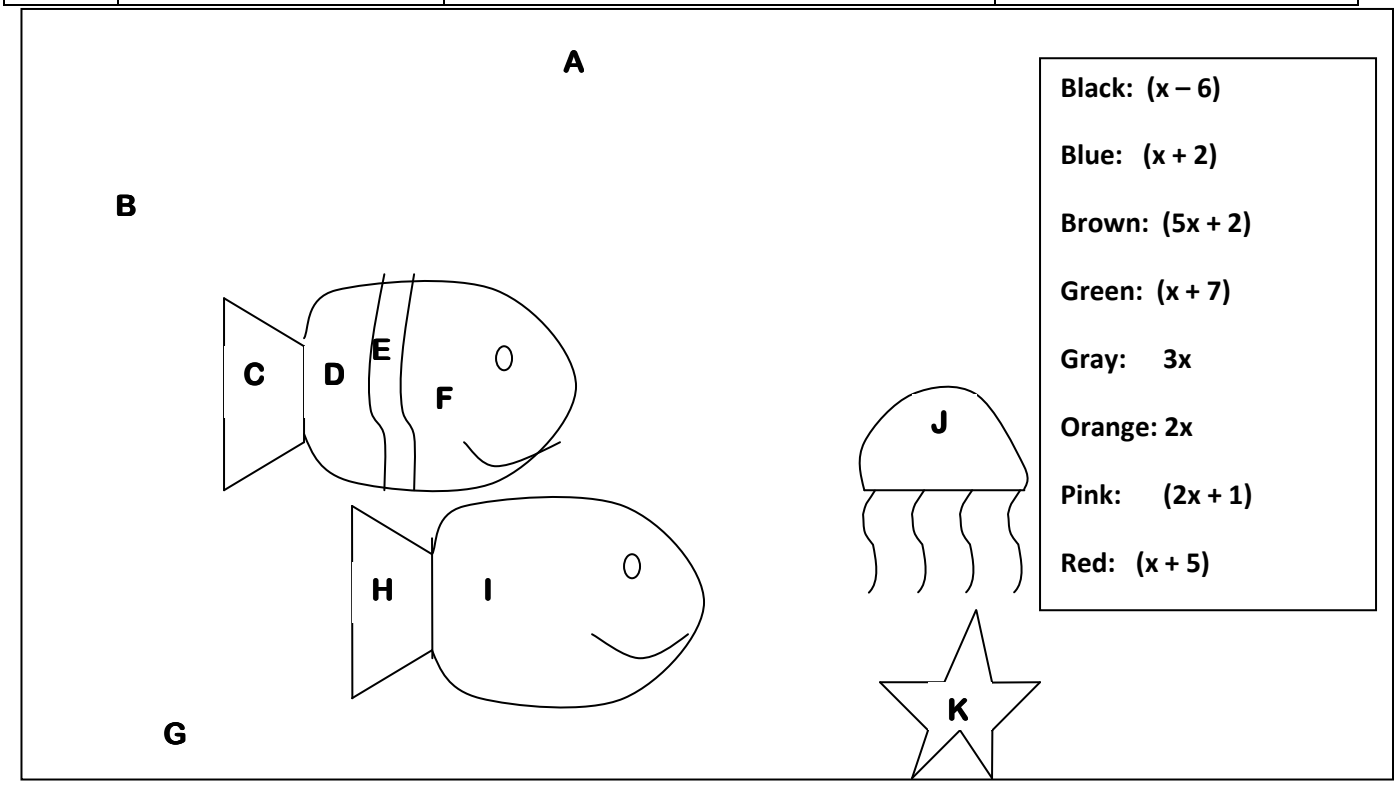
Median **A**	**Altitude** **B**	**Perpendicular Bisector** **C**	**Angle Bisector** **D**
Orthocenter **E**	**Incenter** **F**	**Centroid** **G**	**Circumcenter** **H**
Sometimes **I**	**Always** **J**	**Never** **K**	**Inside the triangle** **L**
Outside the triangle M	**On hypotenuse** **N**	**On vertex of right triangle** **O**	**P**
Q	**R**	**S**	





Directions: Factor each of the following problems and write the factors. Then color the section with appropriate color associated with the factor.

Letter	Problem	Factors	Color
A	$x^2 - 9$	**(x – 3)** (x + 3)	White <*because of* ***(x-3)***>
B	$x^2 + 6x + 8$		
C	$x^2 + x + 12$		
D	$2x^2 - 4x$		
E	$5x^2 - 14x - 3$		
F	$2x^3 + 2x^2 - 12x$		
G	$25x^2 - 4$		
H	$x^2 + 10x + 25$		
I	$3x^2 - 12x$		
J	$10x^3 + 5x^2 + 6x + 3$		
K	$5x^2 - 7x + 2$		
Eyes of all	$2x^2 - 72$		



Connect the Points with the Given Slope

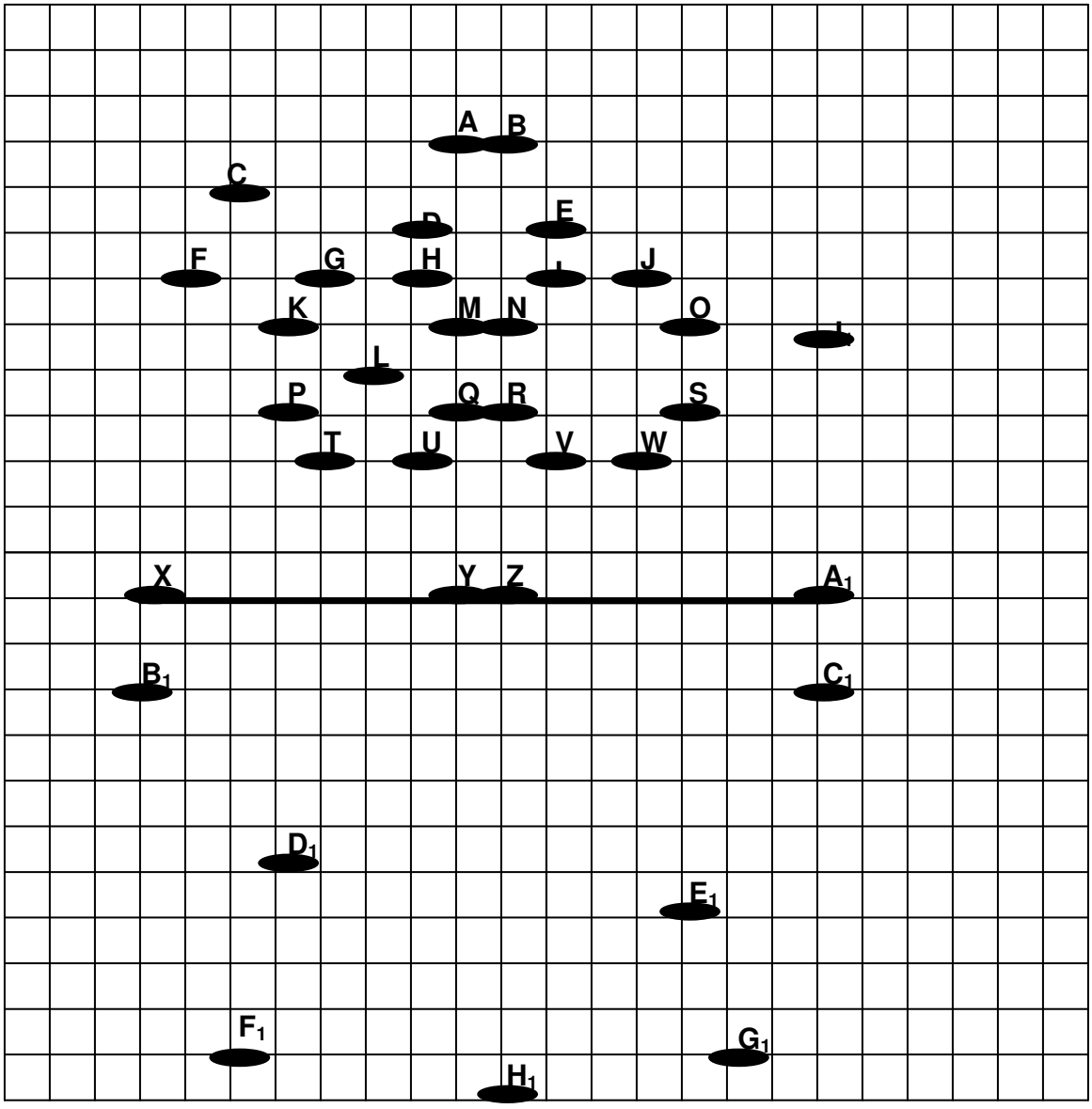
Using the clue, find the slope of the new segment. Then connect the given letter with the slope until you reach the first point.

Example: Draw the segment with undefined slope through K

You would then draw a vertical line from K until it touched P.

Instructions

1. Draw the segment with undefined slope through K
2. Draw the segment through R with a slope of -1
3. Draw the segment with a slope of 0 through A
4. Draw the segment parallel to $\overline{KP}$ through D
5. Draw the segment perpendicular to $\overline{KP}$ through T
6. Draw the segment parallel to the segment from (5,3) to (8,6) through U.
7. Draw the segment parallel to the segment from (5,3) to (2,9) though B.
8. Draw the segment parallel to the line: $4x - y = 3$ through G_1
9. Draw the segment perpendicular to the line $x - 4y = 10$ through B_1
10. Draw the segment parallel to the line $x = 3$ through E.
11. Draw $\overline{QY}$ and $\overline{RZ}$
12. Draw the segment parallel to the line $y = 4$ through W.
13. Draw the segment parallel to the line $y = 4$ through F_1.
14. Draw the segment parallel to the line $y = x + 2$ through N
15. Draw the segment parallel to the line $y = -x + 2$ through J
16. Draw the segment parallel to the line $4x - 2y = 10$ through D
17. Draw the segment parallel to the line going from (-3,2) to (-3,4) through O.
18. Draw the segment perpendicular to the line from (-3, 2) to (-3, 4) through B_1.
19. Draw the segment parallel to the line $2x - 2y = 7$ through K.
20. Draw the segment parallel to $\overline{KG}$ through W.
21. Draw the segment perpendicular to the line $3x - 3y = 8$ through P
22. Draw the segment parallel to $\overline{PT}$ through H.
23. Draw the segment perpendicular to $\overline{RZ}$ through G.
24. Draw the segment parallel to the line going from (-2,3) to (5,3) through J.
25. Draw the segment perpendicular to the line going from (-2,3) to (5,3) from A_1.
26. Draw the segment with an undefined slope through B_1


A
B
C
D
E
F
G
H
I
J
K
M
N
O
L
P
Q
R
S
T
U
V
W
X
Y
Z
A_1
B_1
C_1
D_1
E_1
F_1
G_1
H_1

What do you call a "Doe With Just a Nose and a Mouth on its Face?."

Partner A does the left column and Partner B does the right column. The answers to each set of three problems of each partner should be the same answers as the other partner's. Then write the corresponding letter and number in the box below to answer the question above.

Simplify

9) $\frac{x^2+2x-8}{3x+12}$ _____

7) $\frac{x^2-9}{5x-15}$ _____

2) $\frac{x^2+4x}{2x}$ _____

---

3) $\frac{9}{10x^3y} \bullet \frac{2x}{3}$ _____

4) $\left(\frac{2x}{y^2}\right)^2 \bullet \frac{y^3}{3x}$ _____

8) $\frac{3xy}{5y} \div \frac{6y^2}{5}$ _____

---

5) $\frac{x^2-9}{x^2+7x+10} \bullet \frac{x+5}{x+3}$ _____

1) $\frac{2x}{x^2+4x+3} \bullet \frac{x+3}{x^2}$ _____

6) $\frac{5x-15}{x-1} \div (x^2-5x+6)$ _____

Simplify

E) $\frac{x^2+3x}{5x}$ _____

0) $\frac{x^2-16}{2x-8}$ _____

R) $\frac{x^2-4}{3x+6}$ _____

E) $\frac{4x^2}{3y} \bullet \frac{3x^4y^3}{8x^5y^4}$ _____

E) $\frac{(3x)^2}{5y} \bullet \frac{1}{3x^4}$ _____

Y) $\frac{12y}{7x} \div \frac{9y^2}{7x^2}$ _____

E) $\frac{x^2-3x}{x^2-3x-10} \bullet \frac{x-5}{x}$ _____

D) $\frac{x+4}{x-2} \bullet \frac{5}{x^2+3x-4}$ _____

N) $\frac{4x-4}{2x} \div (x^2-1)$ _____

___	___	___	___	___	___	___	___	___
1	2	3	4	5	6	7	8	9

Created by Gregory Fisher, Winston-Salem Forsyth County Schools, 2011

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. $(5n^3)(4n^2)$ _____

B. $\frac{30n^{10}}{2n}$ _____

C. $\frac{4n^4}{0.25n^{-2}}$ _____

D. $(3n^4)^2$ _____

1. $\frac{18n^6}{2n^{-2}}$ _____

2. $\frac{40n^8}{2n^5}$ _____

3. $(4n^3)^2$ _____

4. $(5n^8)(3n)$ _____

E. $\frac{10r^8t^5}{40r^7t^5}$ _____

F. $\left(\frac{2r}{3t^5}\right)^2$ _____

G. $\frac{6r^0*9t^7}{t}$ _____

H. $(4r^3)^2(3rt^2)$ _____

5. $(3t^3)^2*6t^2$ _____

6. $\left(\frac{t}{2r^2}\right)^2$ _____

7. $\frac{8r^4t}{18r^2t^7}$ _____

8. $\frac{16r^0*3r^7t^5}{t}$ _____

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)**

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 difference of –y and 3	twice y
the product of 6 and y	y cubed	3 more than 2 times y
y squared plus 4	3 less than y	3 less than 4 times y
the sum of 3 and y	2 times y increased by 5	4 more than twice y
the quotient of y and 3	y divided by 4	-6 times y
the difference of 6 and y	y divided by –3	y decreased by 5
the sum of y and 2	the product of 3 and y	3 times y plus 2
the sum of 2y and –4	the product of 2 and 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 $(x – 2y)^3 = x^3 + (-2y)^3$?

$(x-2y)^3 = (x-2y)(x-2y)\mathbf{(x-2y)} = (x^2-2yx-2yx+4y^2)\mathbf{(x-2y)} = (x^2-4xy+4y^2)\mathbf{(x-2y)}$

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

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

INVERSES $f^{-1}(x)$. Some of the content taken from

http://web.psjaisd.us/auston.cron/ABCronPortal/GeoGebraMenu/GeogebraFiles/InverseFunctions/findInvFunc.html

1. Go to www.tinyurl.com/mthsfisherinverse
2. In the **Input** bar, type **f(x)** = **x^3**
3. Use the **Point Tool** 

to place a Point A anywhere on the graph of f(x)
4. In the **Input** bar, type B=(y(A),x(A)).
   B is now considered to be A^{-1} or *A inverse*
5. Use the **Drag** tool (upper left), and move A along the graph of f(x)
6. Write down the 3 different coordinates of A (in quadrants 1 and 3) and coordinates of A^{-1} (B)
   A:_____ A^{-1}:_____
   A:_____ A^{-1}:_____
   A:_____ A^{-1}:_____
7. What do you notice about A and A^{-1}
8. Move A to (1,1). What is A^{-1}?_____ Move A to (0,0). What is A^{-1}?_____
9. In the **Input** bar, type **f(x) = x^2.**
10. Drag A around and describe how A^{-1} moves.
11. Write down the 3 different coordinates of A (in quadrants 1 and 2) and coordinates of A^{-1} (B)
    A:_____ A^{-1}:_____
    A:_____ A^{-1}:_____
    A:_____ A^{-1}:_____
12. Graph $f^{-1}(x)$ on the grid to the right (hint: plot the points of B)
13. Suppose that f(x) is defined by the relation of {(2,3),(-1,4), and (7,6)}, what would the relation of $f^{-1}(x)$ be?

    _____

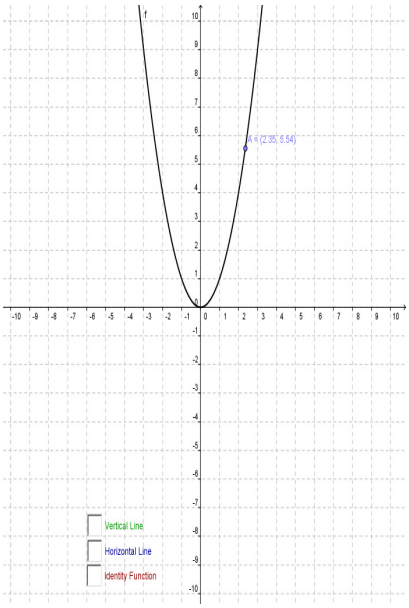
14. Click on the **Locust**tool  . Then click on B and then click on A. You will see the inverse of $f^{-1}(x)$ appear. How does it compare to your answer to #11?

    _____

15. Which of the following lines are f(x) and $f^{-1}(x)$ reflected on?
    Y = 0? x = 0? y= x?
16. At what point(s) do f(x) and $f^{-1}(x)$ intersect at?
17. Is $f^{-1}(x)$ a function? Explain. _____
18. In the **Input** bar, type **f(x) = x^3 – 5.**
19. What line is $f^{-1}(x)$ reflected on?

    _____

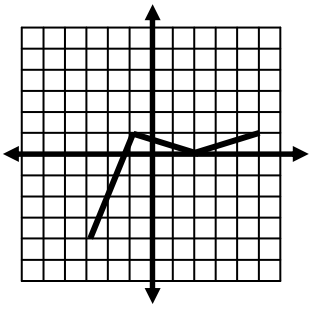
20. Go to the **Grab** tool. Click on the y=x line to verify your answer
21. At what points do f(x) and $f^{-1}(x)$ intersect at?
22. Is $f^{-1}(x)$ a function? Explain_____



23. Click on **Horizontal Line**. Move it up and down.
    Is there any horizontal that touches f(x) more than once?_____
24. How can you tell by looking at f(x) if $f^{-1}(x)$ is a function?
    _____
25. Graph f(x) = 3x – 6. What is the equation of the line of $f^{-1}(x)$? _____
26. Graph f(x) = 2x + 8. What is the equation of the line of $f^{-1}(x)$?_____
27. Suppose you're at a starting spot. You walk 3 blocks **North** and then 2 blocks **EAST**. To return to the same spot going the same route, you would walk 2 blocks **WEST** and then 3 blocks **South.**
    Suppose you're at a different starting point, and you walk 4 blocks **West** and then 2 blocks **South**. How would you return? _____
28. Suppose you start with 5. You multiply by two and then add 4 to get 14. To return to 5, you would subtract 4 and then divide by 2. Suppose you start with 6. You divide by 3 and then add 7 to get _____. To return to 6, you would _____.
29. Suppose you start with 4 and you square it then add 3 to get 19. To return to 4, you would _____
    _____.
30. Suppose you start with x. You multiply by 3 and then subtract 6. To return to x, you would
    _____.
31. Suppose you start with x. You multiply by 2 and then add 8. To return to x, you would
    _____.
32. Verify that your answers to 30 and 31 are the same to 25 and 26.
33. f(x) = ½ x + 4. Find $f^{-1}(x)$ in a similar method to 31. Verify by graphing f(x) on the computer.
34. Here's another way to find $f^{-1}(x)$ if f(x) = 3x - 6. Describe each step…
    y = 3x – 6
    x = 3y – 6
    x + 6 = 3y
    1/3x + 2 = y
    $f^{-1}(x)$ = (1/3)x + 2
35. Find the inverse to f(x)= 1/4x - 6 in a similar method to 34. Describe each step.
36. Find the inverse to $f(x) = x^3 + 5$. Describe each step. Verify answer with teacher and graphically.
37. Let f(x) = 3x -6 and g(x) = 1/3x + 2. Find f o g (x) and g o f(x)
    What do you notice about f o g(x) and g o f(x)?
38. Let $f(x) = x^3 + 2$. g(x) = $\sqrt[3]{x-2}$. Find f(g(x)) and g(f(x)). Is $g(x) = f^{-1}(x)$
39. f(x) = 2x + 5. g(x) = 1/2x – 5. Find f(g(x)). Is $g(x) = f^{-1}(x)$?

Summarize the math.

1. f(x) = {(a,b),(c,d)}, f^{-1}={(,),(,)}
2. To find $f^{-1}(x)$ graphically, you can find coordinates (a,b),(c,d) etc… and change them to (,), (,)
3. To find $f^{-1}(x)$ algebraically, switch ____ and _____; then solve for the new ____.
4. f(x) and it's inverse will always reflect on the line:
5. f(x) and $f^{-1}(x)$ will always intersect at (a,___), (b,___) etc…
6. f o $f^{-1}(x)$ and f^{-1}o f(x) will always be simplified to _____
7. $f^{-1}(x)$ will be a function if f(x) passes the _____ line test
8. The Domain of f(x) will be the _____ of $f^{-1}(x)$



Classwork (on separate paper)

1. Graph $f^{-1}(x)$→

2-7. Find $f^{-1}(x)$

2. {(3,-2), (-1,4)}3. $f(x) = (x + 2)^3$4. $f(x) = 4x - 5$ 5. $f(x) = x^2 + 1$ ($x \geq 0$) 6. $F(x) = \frac{1}{x+2}$ 7.$f(x) = \frac{x}{1+x}$

8. Prove that your answer to #4 is true by showing the graph and doing the composition.

9. $f(x) = 2x + 6$. $g(x) = 0.5x - 6$. Are f(x) and g(x) inverses? Prove it two ways.

SITUATION 1 Snowfall

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

SLOPE
(rate of change)

Y-intercept
(initial value)

TABLE

x	y

EQUATION

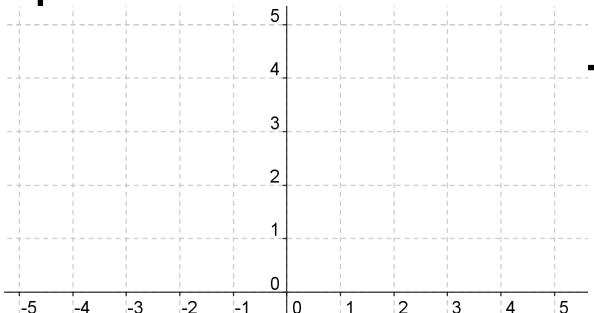
SEQUENCE

Initial Value	1st	2nd	3rd	4th

NEXT-NOW STATEMENT

Practical Domain

Practical Range



For 11 different examples, go to my website.

For 11 examples on exponential growth, go to my website.