Managing the Math Classroom for MAXIMUM Success!

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Across California, schools are devising creative and progressive ways of meeting our state's more rigorous mathematics standards. This paper will suggest strategies that I have seen enacted throughout the state as well as successful strategies from my own school.

Many districts are trying to increase minutes in math instruction. This is a great way to increase the effectiveness of a mathematics program. But where do we get these minutes? My site, Mistletoe Elementary School in Redding, California came up with a unique idea. Language arts is often presented in a two-period block at many schools. This includes a period of English and a period of literature. At Mistletoe, we have instituted a double math period. While other schools have done this for remediation of struggling students, we have offered this to our more advanced students. In addition to taking a general 8th grade mathematics course in the morning, the top 50% of our students return in the afternoon to take high school algebra or geometry. They do this in lieu of their literature period. By taking algebra on top of their regular mathematics instruction, many advantages arise. First of all, the content of the typical algebra class now spills into two periods allowing students to spend more time on each concept. For example, since integers are a normal component of middle school instruction, they are included for all students in the a.m. class. This is true for other topics such as area formulas, the properties of mathematics, and simple equations. Since these topics do not need to be covered again, the afternoon algebra class can spend more time on the more challenging part of the curriculum. In fact, we have so much time, we are able to spend a good portion of the last semester reviewing for the final that we take in April or May–a month before the students at the high school. This double helping of math for the advanced students serves two other purposes.

Many algebra topics can be addressed in the morning class in a concrete, manipulative, or real-world context. Then the same topic can be revisited in the afternoon at the more abstract level typically seen in a secondary algebra class. The students make a much stronger connection to the subject matter this way. It is similar to the building of a house–first we lay a solid concrete foundation, then we build a greater superstructure upon that. Just as this creates a solid and long lasting building, it also cements the understanding in the student. The result is students that not only can perform algebra, they *get* it.

Secondly, students make more *connections* this way. They see the similarity between the concrete experiences they had in the a.m. and the abstract presentation in the afternoon. It is in these connections where learning occurs. An example of this is presented in the activity included here called *Hundreds Magic*. Students see how the arithmetic is explained by the algebra and the algebra is embedded within the arithmetic.

Another key factor in maximizing success in mathematics is ongoing instruction in number sense. Often this strand gets neglected in middle and upper grades. We assume that students who have studied number operations have number sense. In fact, we need to be constantly revisiting this. Number sense is not synonymous with proficiency in number operations. Moreover, a lack of number sense will ultimately lead to problems with accuracy. Number sense contains five key components:

1. Estimation
2. Mental mathematics
3. A knowledge of the effects of number operations
4. A fluency with mathematical properties
5. An understanding of number magnitude

Additionally, number sense can be fostered using five strategies:

1. Toying with numbers
2. Solving problems in multiple ways
3. Creative practice
4. Exploring patterns
5. Thinking, talking, and writing about mathematics

In order to be maintained number sense must be taught on an ongoing basis over a period of many years. It cannot be addressed through a single chapter in a textbook. For this reason, we must be willing to set the book aside on occasion to let students become proficient with numbers. Like a plant, number sense must be constantly tended and nurtured. Here is a sample of some creative practice in multiplication that will promote mathematical thinking while providing drill work:

$7 \times 7 =$ $6 \times 8 =$

$5 \times 5 =$ $4 \times 6 =$

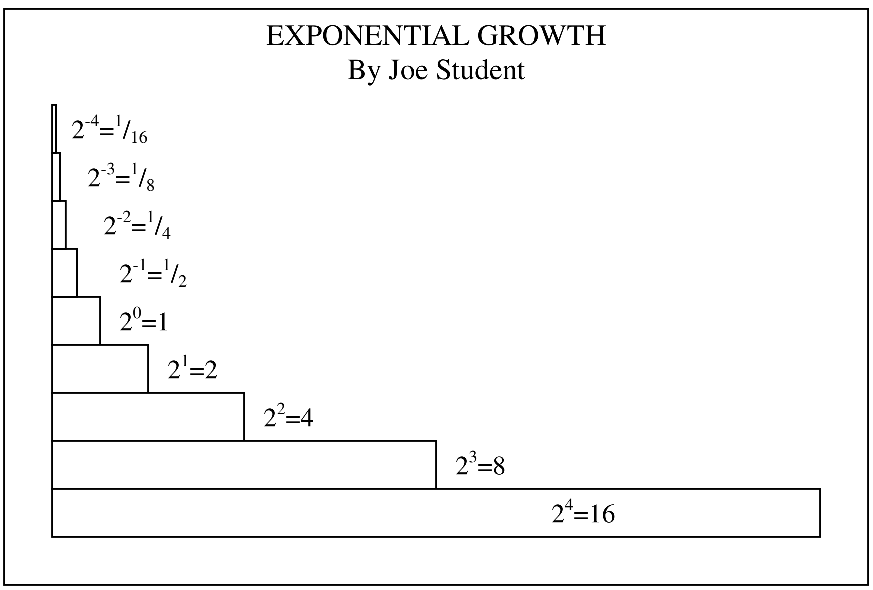
$8 \times 8 =$ $7 \times 9 =$

$10 \times 10 =$ $9 \times 11 =$

$4 \times 4 =$ $? \times ? =$

What numbers would replace the question marks in the last problem? What do you notice about the answers in the second column compared to those in the first? Why does this happen? Will it *always* happen?

Mathematical projects can be a great way of embedding concepts students have learned. The creative format engages all students while immersing them in the mathematics involved. Additionally, this provides a great management tool for the math teacher. Have you ever noticed that language arts teachers can have a free reading day that frees them up to work with students individually or in small groups? Unfortunately, you can't tell your math class, "Find an interesting math book and read it for the next 40 minutes." However, math projects allow us the time to have these necessary connections with smaller groups of students. Here is a math project my students made that allowed them to demonstrate exponential notation, the zero power of a number, and negative exponents while connecting these concepts to bar graphs, linear measurement, and areas of rectangles.



Using 12" by 18" paper, students make rectangles that are 1 inch tall. The middle one has a length of 1 inch and an area of 1 square inch. Below that, each subsequent rectangle doubles in length and in area and is represented by exponential and standard notation. Above the 1 square inch rectangle, each new rectangle is one half the length of the previous one. These are labeled with negative exponents and fractions. The top rectangle is one sixteenth of an inch in length, giving students practice in using the fine gradations of a ruler. The result is a horizontal bar graph of an exponential curve. The final projects are colored to create a pleasing presentation. And why shouldn't math be anything but beautiful?

Perhaps a math teacher's biggest obstacle is time. It is so easy to get caught up in the paper chase, that we lose valuable time that could be better spent on instruction and planning. For this reason, I have adopted a management system that frees me from much number crunching. Each week my students get a math packet. If complete by Friday, they get 40 out of 40 points. The students receive full credit if the assignment is completed and turned in on time regardless of the answers. These homework packets are often self-assessing or will have an answer bank at the bottom of the paper. I may also offer extra credit during the week. This is turned in stapled to a completed homework packet. That way a student cannot turn in only extra credit without completing the main work.

The following week the student takes a test. The first ten questions, worth three points each, are typical test questions on the previous week's material or on review material. The second ten questions, also worth three points each, are about the homework packet. The student may consult his or her packet to get the answers to these questions. For example, a question may say, "What is the answer to question 6 on page 2 of the packet?" Thus it is in a student's best interest to be diligent when completing the homework. It becomes not only a component of the test, but also a set of notes from which to work. These three categories account for 100 points each week:

Completing the homework on time	40
10 test questions, 3 points each	30
10 homework questions, 3 points each	+ 30
Total:	100

There are some advantages to this system in my opinion. First, a student who is conscientious about completing homework will probably get at least a C (40 for the packet and the second 30 on the test). On the other hand, a student who is smart but doesn't complete work will probably realize that there is little chance of passing without doing the homework. I believe that work ethic is a better predictor of success beyond school, than pure talent or intelligence. Therefore, I have designed my grading system accordingly.

I have included a sample test and math homework packet on the following pages.

TEST: Adding and Subtracting Integers

HW PACKET	TEST 1–10	HW 11–20

Name________________

Solve:

1. (-8) + (-19) =
2. 8 + (-19) =
3. (-8) + 19 =
4. (-8) – (-19) =
5. 8 – (-19) =
6. (-8) – 19 =
7. 14 + (-22) + 6 =
8. (-9) + 16 + (-17) =
9. (-2) – (-7) + 15 =
10. (-11) + (-14) – (-8) =

11. What is the answer to question 4 on page 1 of the packet?
12. What is the answer to question 9 on page 1 of the packet?
13. What is the answer to question 15 on page 1 of the packet?

14. What is the answer to question 3 on page 2 of the packet?
15. What is the answer to question 11 on page 2 of the packet?

16. What is the answer to question 6 on page 3 of the packet?
17. What is the answer to question 12 on page 3 of the packet?

18. What is the answer to question 5 on page 4 of the packet?
19. What is the answer to question 8 on page 4 of the packet?
20. What is the answer to questions 10 on page 4 of the packet?

BONUS:
Mr. Fulton can eat 6 chocolate bars in 9 minutes. At $.89 per chocolate bars, how much money will he spend in one hour?

Answer Column:

1. ________
2. ________
3. ________
4. ________
5. ________
6. ________
7. ________
8. ________
9. ________
10. ________
11. ________
12. ________
13. ________
14. ________
15. ________
16. ________
17. ________
18. ________
19. ________
20. ________

BONUS:

____

Activity master

Foursquare Addition 2

Name____________________

Add across as in the example. Then add downward. Add the sums on the right side and write the answer in the upper triangle. Then add the lower sums and right the sum in the lower triangle. Do your answers match? Congratulations!

Example

-6	3	*-3*
-8	-12	*-20*
-14	*-9*	*-23* / *-23*

1

-8	-11	___
-5	-10	___
___	___	

2

-8	11	___
-5	10	___
___	___	

3

-8	-11	___
5	10	___
___	___	

4

4	-13	___
-6	-1	___
___	___	

5

14	0	___
-14	-3	___
___	___	

6

-25	6	___
12	-14	___
___	___	

7

-15	15	___
16	-16	___
___	___	

8

22	-11	___
11	-22	___
___	___	

9

-24	9	___
19	-16	___
___	___	

10

21	3	___
-3	-6	___
___	___	

11

24	-15	___
-4	-5	___
___	___	

12

18	-25	___
13	-7	___
___	___	

13

-18	25	___
13	-7	___
___	___	

14

-18	-25	___
13	7	___
___	___	

15

-18	-25	___
-13	-7	___
___	___	

Activity master

Foursquare Addition 5

Name____________________

Find the missing addends to solve each problem as in the example. You will need to work backwards to be successful.

Example

18	*26*	44
9	*12*	21
27	38	65 / *65*

1

	8	-1
12		32

2

24		
	36	
28		20

3

19		64
15	27	

4

	35	
		39
36		32

5

	-1	99
34		
	62	

6

-1		
		45
	87	101

7

	-19	73
		24
	48	

8

	17	41
	28	-11

9

29		38
-29	19	

10

		26
17		0
	19	

11

23		55
	16	
1		

12

	17	
		0
70		59

13

	-46	
46		
72		0

14

-11		-44
	-38	-65

15

	33	-35
41		
	-51	

Pyramid Math 3

Name____________________

Add pairs of adjacent numbers and write their sums in the box above them as in the first example. Keep going until you reach the top of the pyramid.

1

		-2	
-4	7	3	-5

2

4	-7	-3	5

3

4	7	-3	-5

4

-1	-2	-3	-4

5

-1	2	-3	-4

6

1	-2	3	-4

7

8	-6	15	-11

8

-13	-5	0	-6

9

11	-21	31	-41

10

40	-15	40	-15

11

8	2	-14	29

12

9	3	-13	30

Pyramid Math 8

Name____________________

Each number is the sum of the two numbers below it. Work backward to fill in the bottom row.

1

7			
3			
2			
6			

2

-18			
-10			
	-6		
	-12		

3

-18			
8			
		-20	
	6		

4

-62			
-24			
	-15		
		-9	

5

11			
-8			
-8			-20

6

-3	10		
	10		
		16	

7

-71			
-16			
		-27	
21			

8

39			
	-16		
41			
			-14

9

-113			
-65			
		-2	
11			

10

0			
	20		
-20			
	-3		

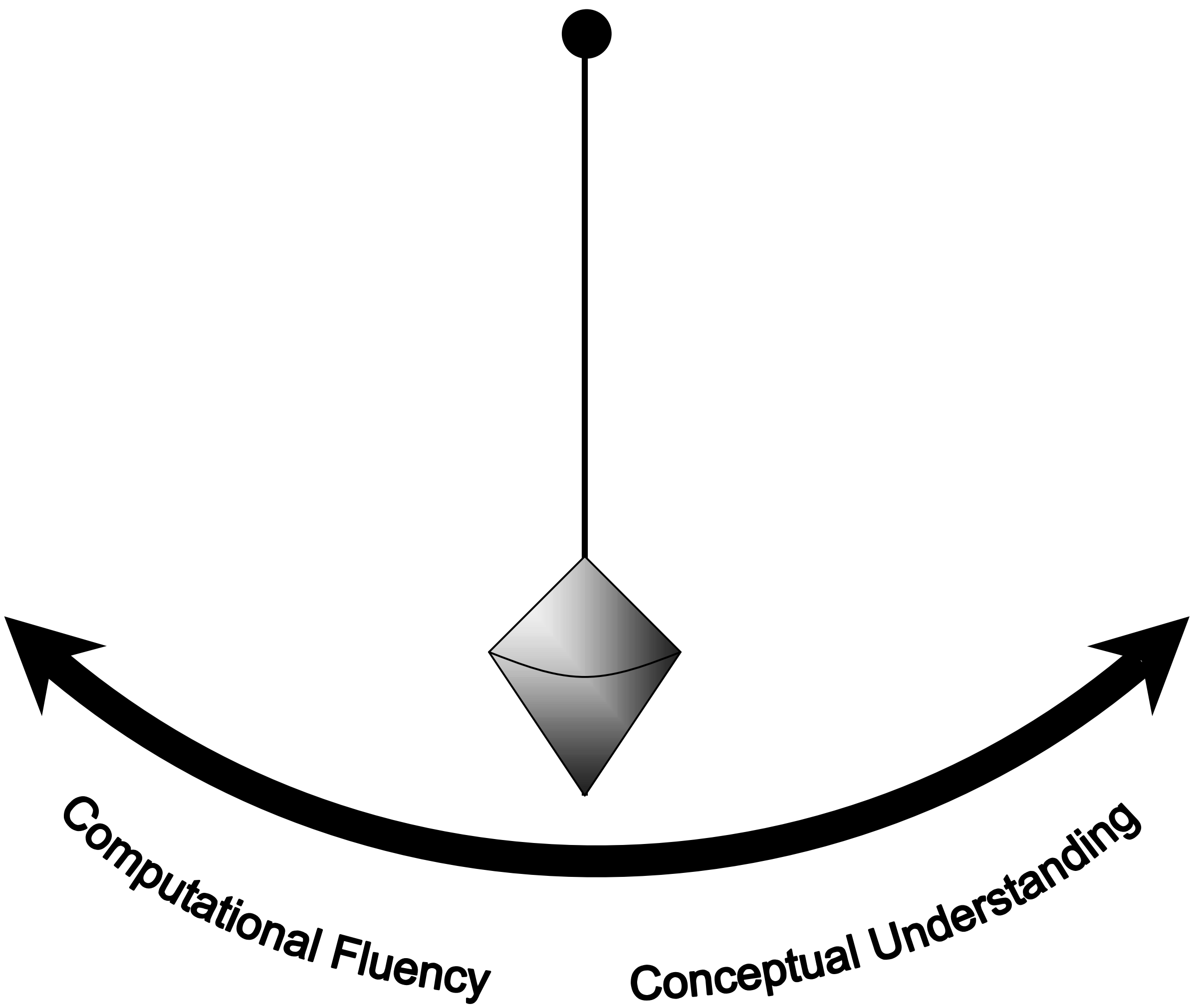
11

1			
-20			
	-5	6	

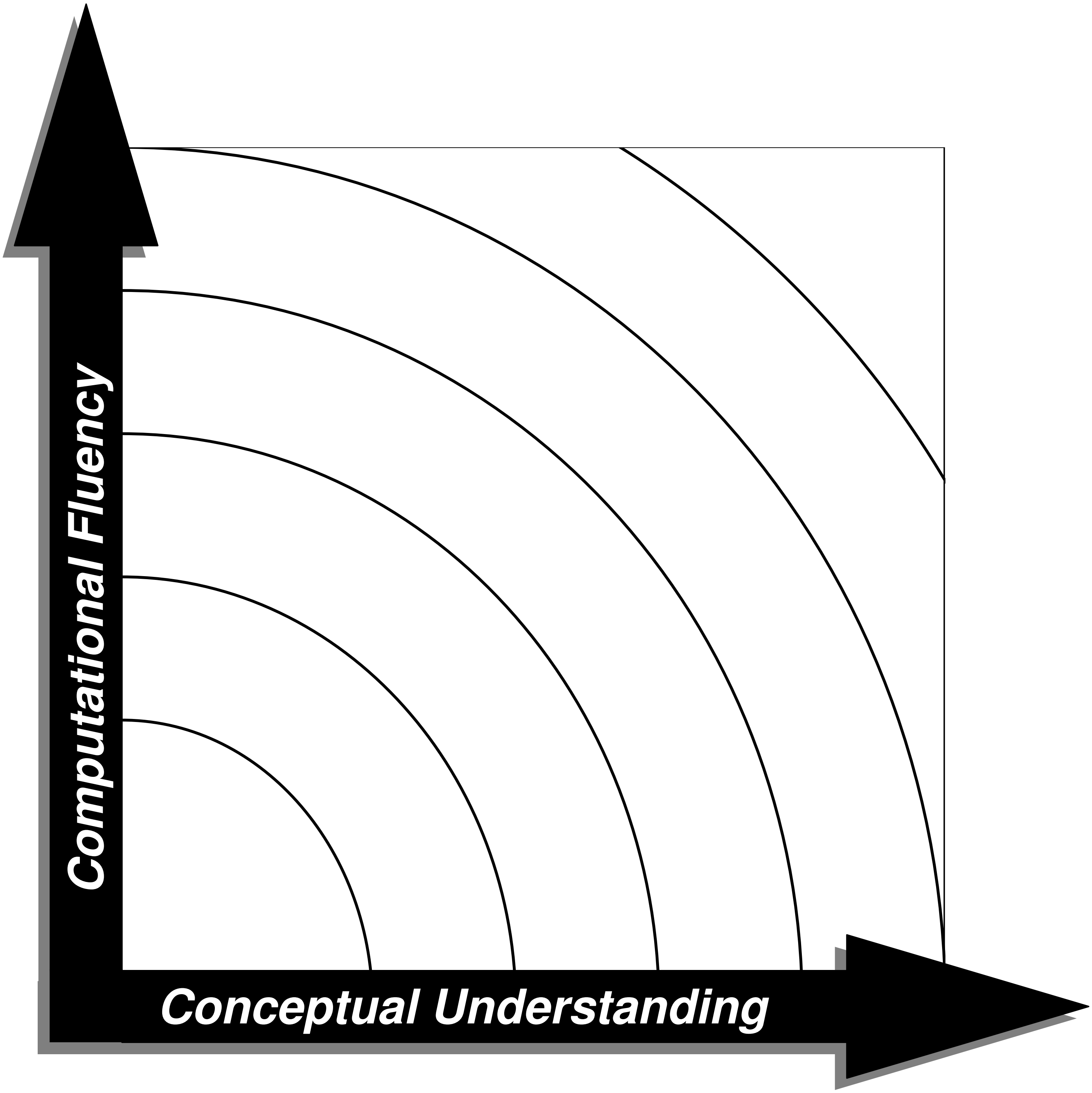
12

	0		
		3	
18			-3

The Political Winds Blow The Educational Pendulum



A Teacher's Perspective



ACTIVITY 8

Playing Catch Up

Materials:
- [x] Activity Master
- [x] Transparency Master
- [ ] Calculators

Overview:
Many students don't realize how one missing assignment impacts their grade. This activity will show them that exponential growth is the problem they must overcome to catch up.

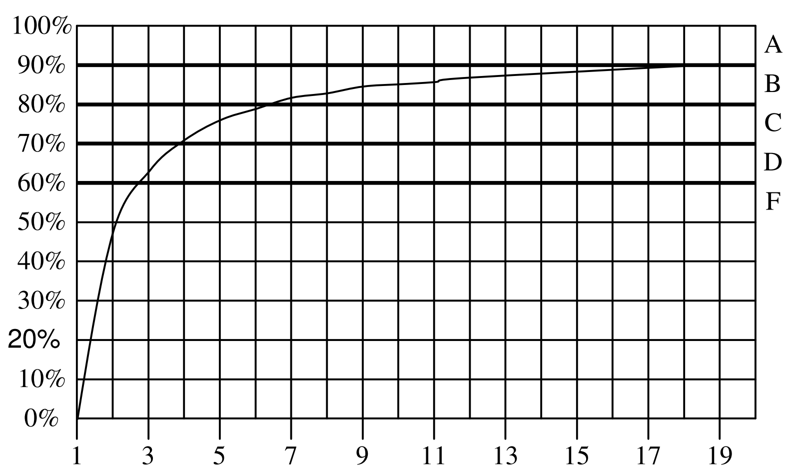
Vocabulary: percent, exponential growth, asymptote

PROCEDURE

- Skills:
- Modeling exponential growth
- Graphing functions
- Using t-charts
- Studying asymptotes
- Converting decimals to percents
- Learning the importance of completing work

1. Pose this question to the class: A student usually scores 95% on his assignments. However, he doesn't complete the first assignment and receives zero points. How many 95% grades will the student need to achieve an average of 90% overall? You may wish to allow students to discuss this in groups or write about the solution in their journals.
2. Pass out the graph paper, or use the activity master to model the activity. The class will see that on assignment one, the student received zero points and has an average grade of zero percent. Have the class put a dot on the graph at week one to show the student has zero percent. Ask them what grade this would be.
3. On line two, the students should enter 95 points and calculate the average of 95 and zero. The new average of 48% (rounded from 47.5%) should be marked on the graph at week two. Ask the students what grade this represents. They can see from the graph that a grade below 60% is an F. Ask them how long they think it will take to catch up to the A grade. Some may say it will take two weeks, believing this to be a linear pattern.
4. Have the students complete the line for assignment three on the t-chart. They will now have a total of 190 points and an average of 63%. This would be a D grade. Upon graphing this, the students will see that the function is not linear. They may want to revise their predictions.
5. Have the students continue working on the problem until they reach a 90% average. This will happen on the nineteenth assignment as shown in this graph and t-chart.

Assign.	Total	Avg.	Grade
1	0	0%	F
2	95	47.5%	F
3	190	63.3%	D
4	285	71.3%	C
5	380	76%	C
6	475	79.2%	C
7	570	81.4%	B
8	665	83.1%	B
9	760	84.4%	B
10	855	85.5%	B
11	950	86.4%	B
12	1045	87.1%	B
13	1140	87.7%	B
14	1235	88.2%	B
15	1330	88.7%	B
16	1425	89.1%	B
17	1520	89.4%	B
18	1615	89.7%	B
19	1710	90%	A



Journal Prompts:

Why does it take so long for the student to catch up to an A?
If the second assignment raised the average over 45%, why didn't the next assignment do the same?

Homework:

You can assign the homework master at the end of this section. Students will make t-charts and graphs for related problems.
You can have students explore the following problem or others like it. Assume that the student usually gets 85% on assignments. Use a t-chart and graph to show how long it takes to get back into the B range. Would the student have a D after three assignments as in the previous example? How high would the grade be after 25 assignments? Could the student get an A at this rate?

Taking a Closer Look:

You may wish to have students explore the following extensions. What will be the student's average after 25 assignments? ...after 50 assignments? ...after 100 assignments? When will they reach an average of 95%? These questions lead students toward an understanding of asymptotes. The student can never complete enough 95% assignments to achieve a 95% average due to the effect of the initial zero. However, the student can get increasingly close to a 95% average. Thus the asymptote for this problem is at 95%.
Have students explore each of these options. Some of them are included in the homework master.

a. How many assignments would it take to reach the 90% level if the student only averaged 94% on each assignment?
b. How many assignments would it take to reach the 90% level if the student averaged 96% on each assignment?
c. How many assignments would it take to reach the 90% level if the student averaged 100% on each assignment?
d. How many assignments would it take to reach the 90% level if the student only averaged 91% on each assignment?
e. How many assignments would it take to reach the 90% level if the student averaged 105% on each assignment through the use of extra credit?
f. How many assignments would it take to reach the 90% level if the student averaged 95% on each assignment, but the first assignment was a 50% instead of a zero? (This should help students to see that getting an F on an assignment is better than not doing it at all.)

> **Good Tip!**
> Divide the class into groups and have each explore one of the options shown on the left. Then they can present their solutions and conclusions to the class.

Algebra students can use a formula to solve these problems. If x represents the total number of assignments, then the number on which the student scored 95% would be x – 1. These assignments have a value of .95 each. However, we would need to divide by x to get an average of .90. Thus the equation yielding the number of assignments would be:

$$\frac{.95(x-1)}{x}=.90$$

The solution of the equation would be:

$$\frac{.95(x-1)}{x}(x)=.90(x)$$
$$.95(x-1)=.90x$$
$$.95x-.95=.90x$$
$$.95x-.95+.95=.90x+.95$$
$$.95x=.90x+.95$$
$$.95x-.90x=.90x+.95-.90x$$
$$.05x=.95$$
$$\frac{.05x}{.05}=\frac{.95}{.05}$$
$$x=19$$

If the students are exploring option f above, the formula would be:

$$\frac{.95(x-1)+.50}{x}=.90$$
$$\frac{.95(x-1)+.50}{x}(x)=.90(x)$$
$$.95(x-1)+.50=.90x$$
$$.95x-.95+.50=.90x$$
$$.95x-.45=.90x$$
$$.95x-.45+.45=.90x+.45$$
$$.95x=.90x+.45$$
$$.95x-.90x=.90x+.45-.90x$$
$$.05x=.45$$
$$\frac{.05x}{.05}=\frac{.45}{.05}$$
$$x=9$$

Assessment: ☑

While students work on the problem, walk about the room and check their graphs. Since the graph is based on the t-chart it provides a visual key for quick assessment.

By having students work on problems as a group and then presenting their results to the class, you will not need to correct a large amount of papers.

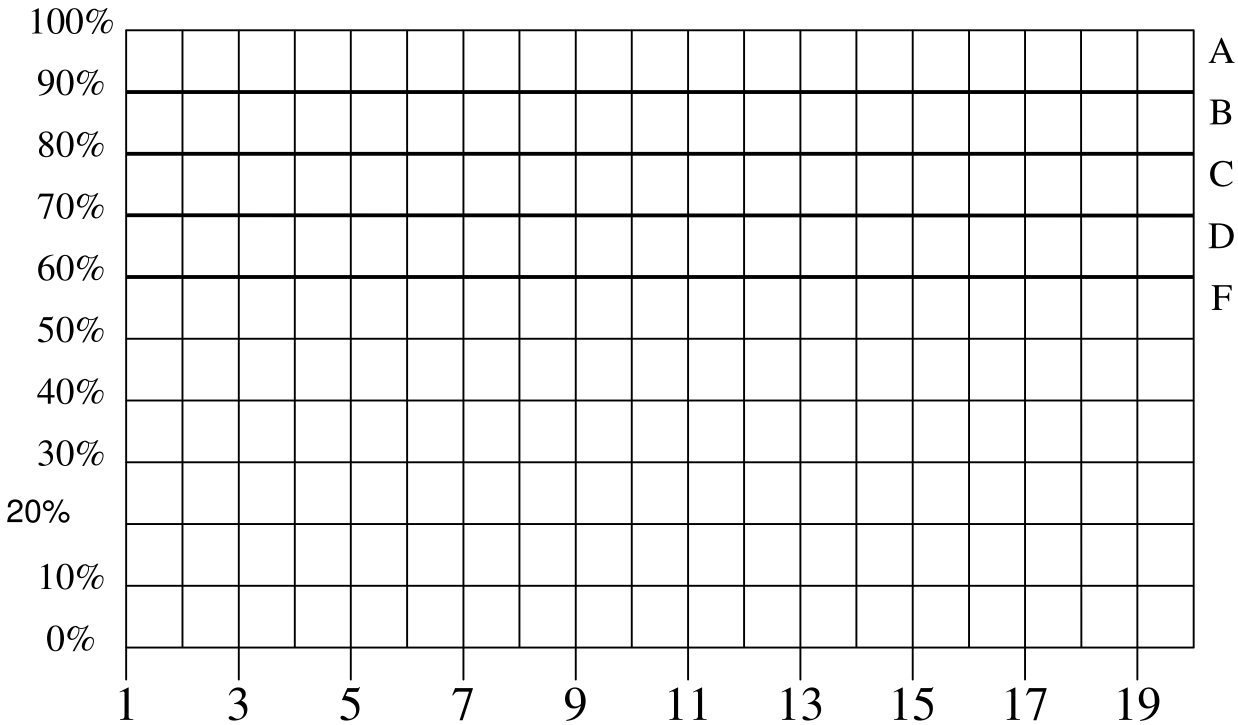
Lastly, by using the formula provided, you will be able to check the accuracy of their work quickly.

Name________________________

Playing Catch Up

Assign:	Total	Percent	Grade
1	0		
2			
3			
4			
5			
6			
7			
8			
9			
10			

Assign:	Total	Percent	Grade
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

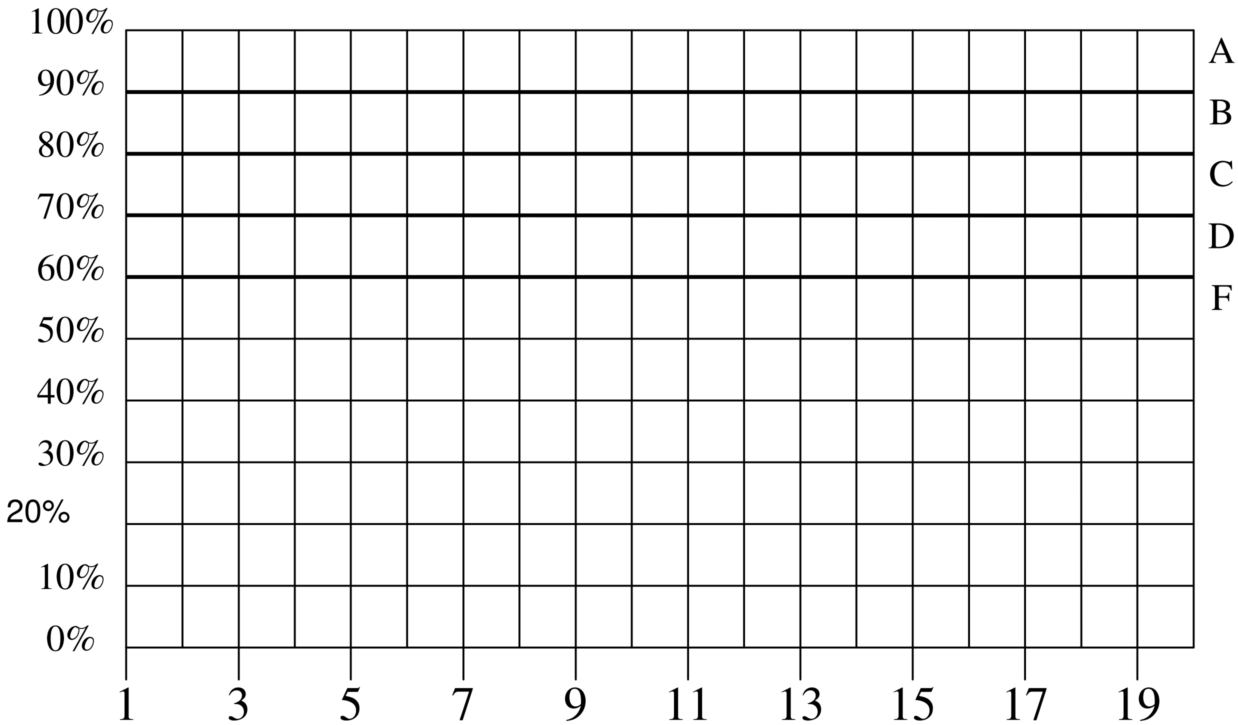


Name________________________

Playing Catch Up

Assign:	Total	Percent	Grade
1	50		
2			
3			
4			
5			
6			
7			
8			
9			
10			

Assign:	Total	Percent	Grade
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			



Name________________________

Playing Catch Up

1. Andy typically gets 96 points out of 100 each week. On week one, he got a zero. How long will it take Andy to get an A (90%)?
2. Brenda typically gets 96 points each week also. However, she did the first assignment late and got 50 out of the 100 points. How long will it take her to get to at least a 90%?
3. Carlos gets 100 points every week. On week one, he got a zero. How long will it take him to get to 90%?
4. Denise gets 89 points every week, but on week one, she got zero points. How long will it take her to get a B (80%)?

WEEK	TOTAL	AVERAGE	GRADE

WEEK	TOTAL	AVERAGE	GRADE

WEEK	TOTAL	AVERAGE	GRADE

WEEK	TOTAL	AVERAGE	GRADE

5. Who got his or her desired grade the fastest? ______________________

6. Who was the slowest at reaching his or her goal? ______________________

7. How did the time it took Brenda to reach her goal compare to Andy's time? Why is that?

____

____

8. Which student can never earn an A at the current rate? ______________________

Why is that? ____

9. What might a student be able to do to accelerate their progress toward their goal?

____

____

10. How is this assignment similar to or different from the grading system in your own class?

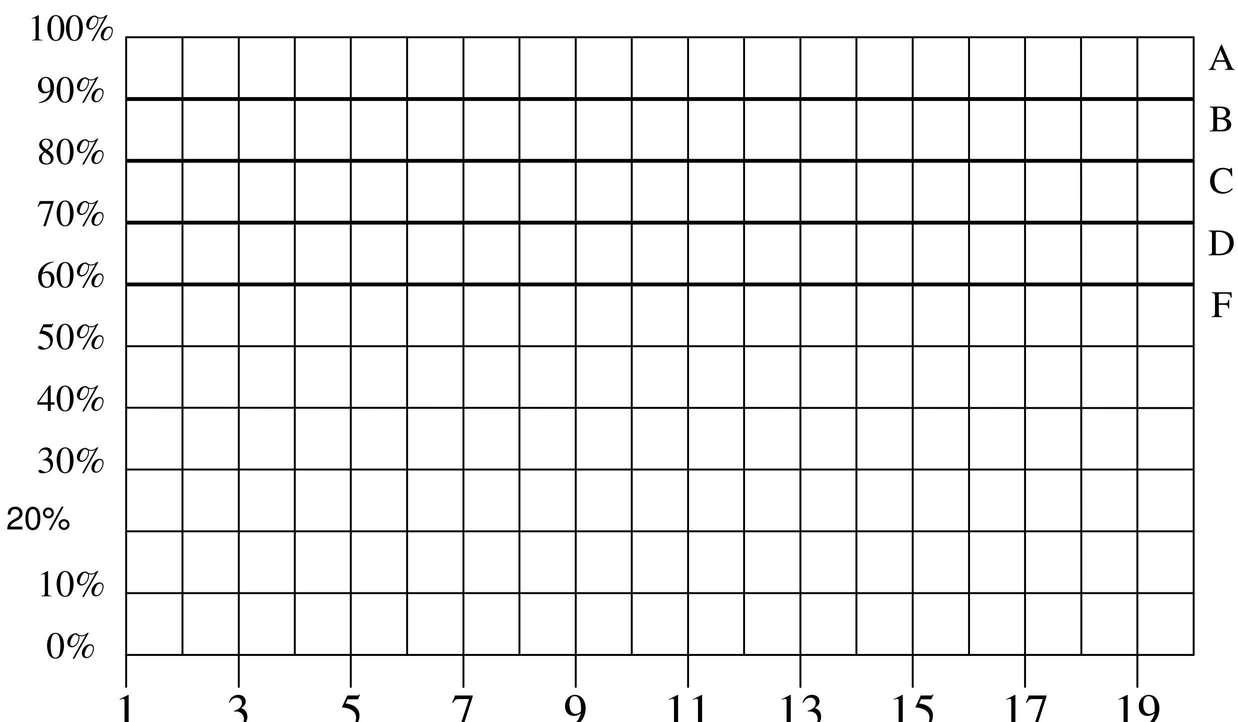
____

____

11. What surprised you the most about this assignment?

____

____



ACTIVITY 11

Hundreds Magic

Materials:

- ☒ student copies of hundreds chart
- ☐ transparency of hundreds chart

Overview:
Students will be so amazed at the patterns they find in the hundreds chart they will think you are a "mathemagician". Once hooked, they will use algebra to understand the magic.

Vocabulary: variable, formula, proof

PROCEDURE

Skills:

- Multiplying monomials and binomials
- Finding patterns
- Using algebraic proofs

1. The students will need to make a hundreds chart like the activity master. Alternately, you may wish to provide grid paper for this or simply distribute copies of the transparency master while you use the transparency on the overhead projector.

2. Ask the students to circle any four adjacent numbers which form a square. We will use 7, 8, 17, and 18 as an example. Tell them to add the two diagonals of the square and compare the results. they will notice that 7 + 18 = 8 + 17. Have them try the same process with a different set of four numbers.

3. Younger students will enjoy simply exploring the patterns in the chart without generalizing the relationships with formulas. More advanced students may be able to explain why the patterns occur, without using formal algebra. If your students are ready for the proof, this is the time to demonstrate it. Most students should be able to follow the explanation after their exploration of the chart. Notice that for any beginning number, the next number is n + 1. The numbers below these are n + 10 and n + 11. Thus the sums of the diagonals are:
$(n) + (n + 11)$ and $(n + 1) + (n + 10)$
Combining terms gives us:
$2n + 11 = 2n + 11$.

4. Next, ask students to multiply diagonals and compare the results. They will see that the products are not equal. In our example, we get 7 x 18 = 126 and 8 x 17 = 136. However, when they try other locations, they will see that the second answer is always ten more than the first.

5. Once again, the reason can be explained fairly simply:
$n(n + 11) = n^2 + 11n$ $(n + 1)(n + 10) = n^2 + 11n + 10$

Good Tip!
If students are seated in groups, the effectiveness of this activity is increased. They will see that their neighbors achieve the same results and patterns by circling different numbers.

Journal Prompts:
Are the differences of the diagonals always equal? Explain why this is or is not true.

Make up an arrangement of numbers other than the four number square. Describe any patterns or relationships that you find.

Homework:

Ask students to explore patterns found in other arrangements of numbers other than the four number square explained above. Some examples are shown in the pattern key on the following page. However, there are many more patterns and proofs for the students to discover.

Good Tip!
Ask students to find their own patterns in the chart and present them to the class. For example, a student may wish to prove why the sum of any row is ten times the last number minus 45.

Taking a Closer Look:

Ask students to explore these same relationships and others on any calendar page. An activity master is provided for this. What similarities and differences occur?

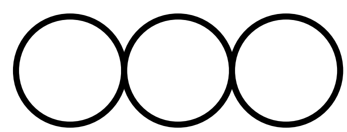
Advanced students can incorporate practice with negative numbers using the second activity master.

Assessment:

Allowing students to work in small groups will provide the opportunity for self assessment. Since all the patterns can be generalized, a single formula should result when students explore a given arrangement of numbers. Some sample patterns and proofs are offered on the following page.

Pattern Key:

Three-in-a-Row:



Pattern 1: The sum of the three numbers equals three times the middle number.

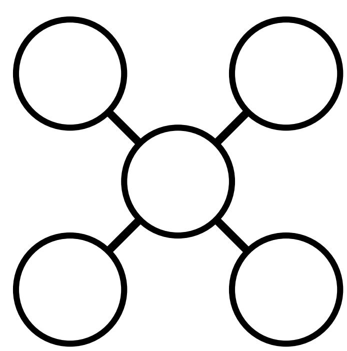
Proof: If “n” is the center then the left number is $n - 1$, and the right number is $n + 1$. Thus their sum is:

$(n - 1) + n + (n + 1) = 3n - 1 + 1 = 3n$

Pattern 2: The product of the left and right number is one less than the square of the center..

Proof: Their product can be written:

$(n - 1)(n + 1) = n2 + n - n + 1 = n2 - 1$

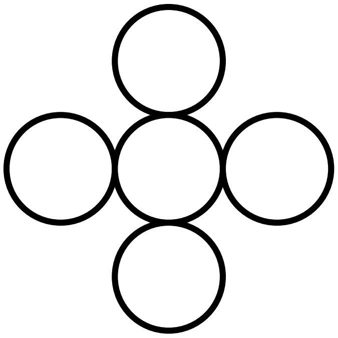


Five-Point: The average of the four corners is equal to the center.

Proof: If “n” is the center then the corners are $n - 11$, $n - 9$, $n + 9$, and $n + 11$. Thus the average is:

$[(n - 11) + (n - 9) + (n + 9) + (n + 11)] \div 4 =$

$(4n) \div 4 = n$



Cross: The product of the top and bottom number is 99 less than the product of the left and right numbers.

Proof: If "n" is the center number, then the product of the top and bottom numbers is:

$(n - 10)(n + 10) = n^2 - 100$

The product of the left and right numbers is:

$(n - 1)(n + 1) = n^2 - 1$

and $(n^2 - 100) = (n^2 - 1) - 99$

Hundreds Magic: 1-100

Name______________________________

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Hundreds Magic: -49-50

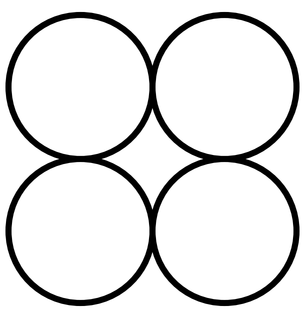
Name______________________________

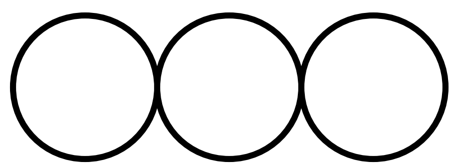
-49	-48	-47	-46	-45	-44	-43	-42	-41	-40
-39	-38	-37	-36	-35	-34	-33	-32	-31	-30
-29	-28	-27	-26	-25	-24	-23	-22	-21	-20
-19	-18	-17	-16	-15	-14	-13	-12	-11	-10
-9	-8	-7	-6	-5	-4	-3	-2	-1	0
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

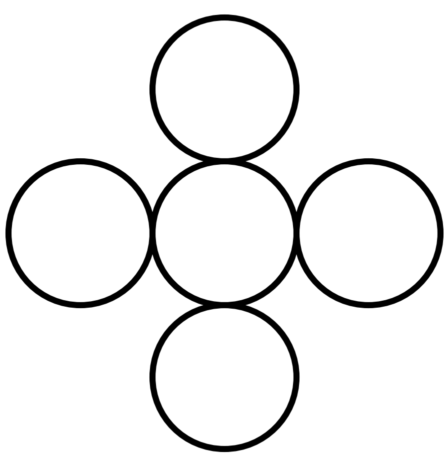
Hundreds Magic Calendar

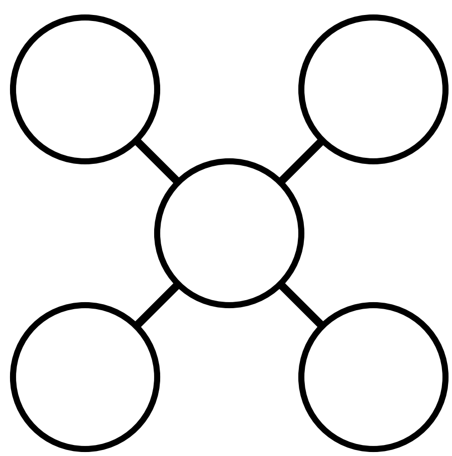
Name______________________________

SUN	MON	TUE	WED	THU	FRI	SAT





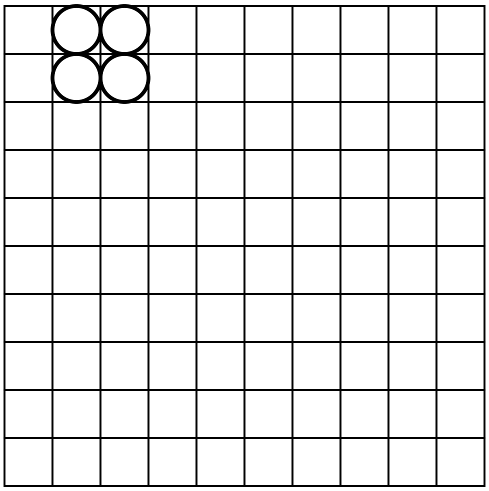




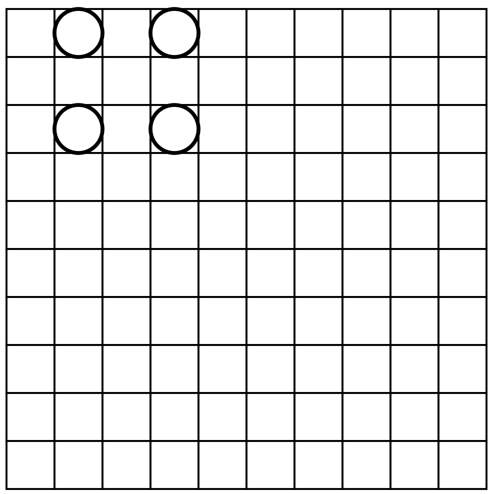
Hundreds Magic Investigations

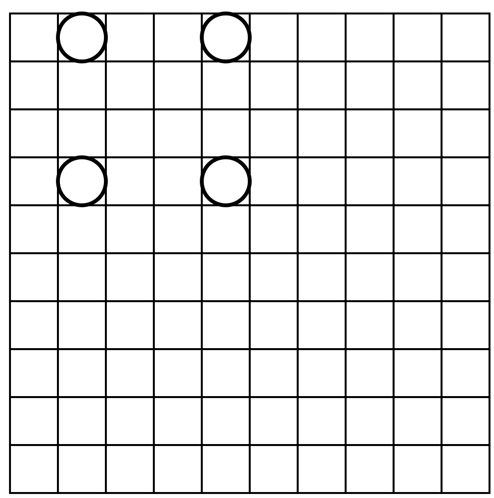
Name________________________

For each grid, compare the sum of each diagonal pair with the product of each diagonal pair.



What pattern do you notice?





Hundreds Magic Investigations

Name______________________

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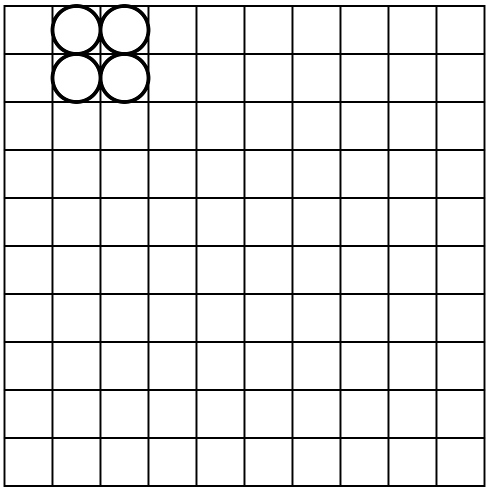

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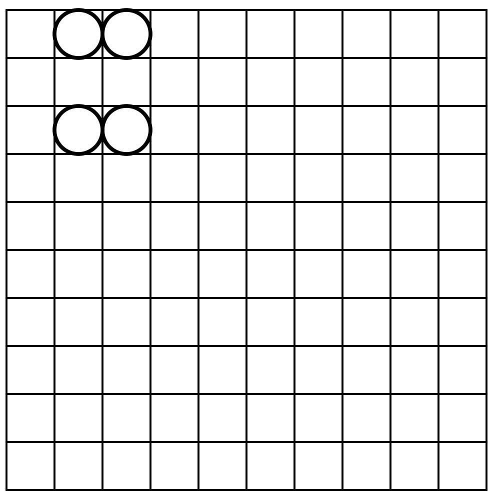

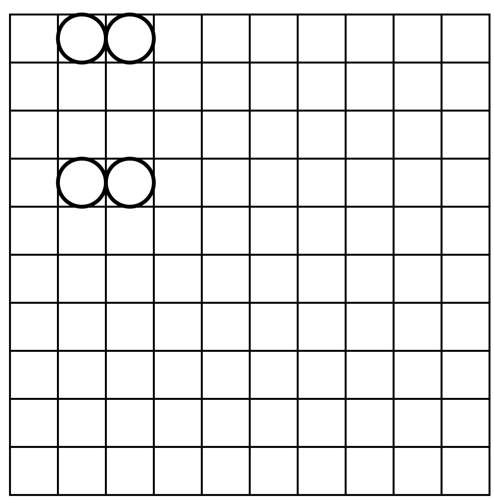

Hundreds Magic Investigations

Name______________________

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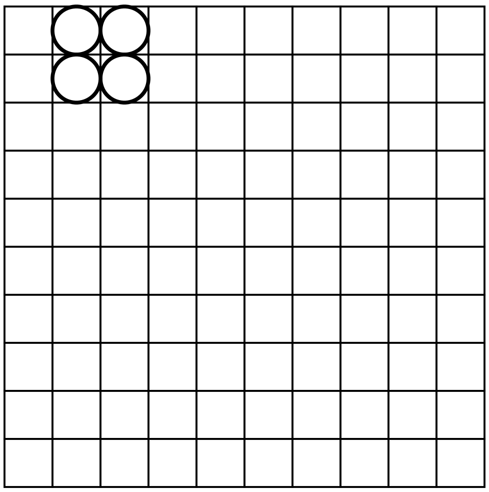

What pattern do you notice?

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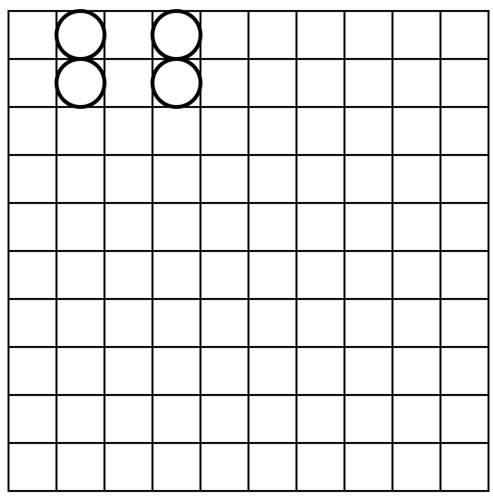

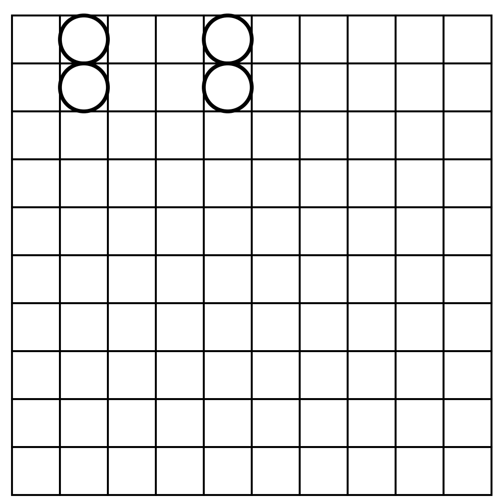

Backwards and Upside Down

An Article for the California League of Middle Schools newsletter

February, 2005

By Brad Fulton, brad@tttpress.com

It's just like coaching high jump–teaching mathematics that is. Like math students, high jumpers try to reach new heights and clear the bar. The posts that support the bar are called the standards. If you want to raise the bar, you raise the standards. Good jumping requires an optimistic mindset as well as physical skill. *The worst thing a coach can do to a struggling jumper is raise the bar.* Yet that is just what has happened here in California and much of the rest of the nation. Experience has convince me that we can reach new heights however, but we need to take a lesson from jumping coaches.

In the 1968 Olympics in Mexico City, the high jumpers approached the bar at an angle from the left side. Prior to their vault, the jumper would swing up the right leg and go over the bar sideways facing down in what was known as the "Western Roll." One young college kid from the University of Oregon approached the bar in a semi-circle from the right side. On his last step, he kicked his left knee up and across his chest, turning his body in midair. This made him go over the bar upside down and backwards. On that day, Dick Fosberry took home the gold medal and the Fosberry Flop that every modern jumper now uses was born. *If we are going to succeed where others have failed, we need a new approach too*. Let me offer three proven strategies to help coach our students to these new heights

First we need to teach math to students, not to mathematicians. We have decades of research that confirms that students learn differently. In the early 1970's, I was one of ten males in my pre-calculus class. We were the mathematical thinkers. But what of the students who learned kinesthetically, spatially, linguistically, or by any other learning style? They had been sifted out of the mix. The mathematics class of today must invite *all* students. This will require change not on the part of the student but of the mathematics educator. We must take advantage of the diverse instructional strategies available to us.

High jump coaches often use a device called a springboard to help their athletes practice. We must also be willing to use the textbooks offered to us as springboards instead of crutches. A textbook is a reference work. In science it supplements a curriculum that includes hands-on labs. In English class, it supplements rich discussions about great literature. Yet in math, we have been taken captive to the thinking that we shouldn't stray too far from the page. The truth is that our books don't teach students; we do. If we are to offer a more successful curriculum, it must come from us with the help of texts and other materials. This will require districts to provide more training so their staff can develop greater expertise with the subject.

Lastly, we need to know that elementary students do not reason as abstractly as older students. *I am convinced that higher mathematical content is not out of the reach of* *younger minds if we present it concretely*. This belief is based on my experiences with younger students and upon the testimonies of countless teachers I have met. I have seen fourth graders who can look at a linear function and talk about its slope and y-intercept. I have seen fifth graders solve systems of equations algebraically and graphically. Students in special education can solve equations with understanding. In each case, the material was presented concretely allowing the students to have access to the content.

While an article of this length is not sufficient to provide detailed math lessons, it can help us to see our need to change how we coach our students. It can also encourage us to see that we *can* reach new heights. Awareness of learning styles, a more open approach to materials, and concrete instruction will help more students to clear the bar–even those who approach mathematics a little upside-down and backwards.

MORE! MORE! MORE!

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- Order forms for our materials
- A bibliography of great mathematical reading
- Calendars showing where and when you can hear Bill and Brad present

Happy surfing!

In March of 2004, I gave a keynote address at the Los Angeles City Teachers of Mathematics Conference. The title of the presentation was, "Yes, We Can." In this keynote address, you will find seven strategies that promote mathematical excellence. These ideas are classroom tested and are fully explained in the presentation. You can download a copy of this address at our website: www.tttpress.com. Simply go to the "Workshops and Conferences" tab and click on "Conference Materials Archive" tab. Then scroll downward to March, 2004, Los Angeles heading to download the file. It will arrive as an Adobe Acrobat file that will print exactly as you see it. The seven main ideas presented in the keynote address are:

1. Don't Remediate; Accelerate
2. Textbooks are Not Bibles
3. Assess Less, Teach More
4. Multitasking and Review
5. Incorporate Language
6. Staff Development
7. Focus on Sense-making and Accuracy

Brad Fulton and Bill Lombard

Teacher to Teacher Press

"Building Mathematical Skill on a Foundation of Understanding"

Brad Fulton

- Consultants
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- Authors
- Seminar leaders
- Teacher trainers
- Conference speakers

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Known throughout the country for motivating and engaging teachers and students, Brad and Bill have authored over ten books that provide easy-to-teach yet mathematically-rich activities for busy teachers. In addition, they have co-authored six teacher training manuals full of activities and ideas that help teachers who believe mathematics must be both meaningful and powerful.

Seminar leaders and trainers of mathematics teachers

- California Math Council and NCTM presenters
- Lead trainers for summer teacher training institutes
- Trainers/consultants for district, county, regional, and national workshops

Authors and co-authors of mathematics curriculum

- *Simply Great Math Activities* series: five books covering all major strands
- *Math Discoveries* series: bringing math alive for students in middle schools
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All workshops provide participants with complete and ready-to-use activities. These activities require minimal preparation, use materials commonly found in classrooms, and give clear and specific directions and format. Participants will also receive journal prompts, homework suggestions, and ideas for extensions and assessment.

Brad and Bill's math activities are the best I've seen in 30 years of teaching!

Wayne Dequer, 7th grade math teacher

"The high-energy, easy-to-follow handouts were clear. The instructors were great!"

DeLinda Van Dyke, middle school teacher

References available upon request