

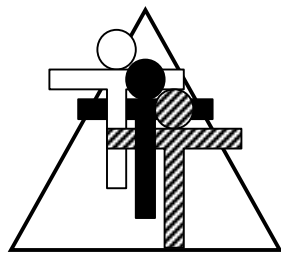
# ALGEBRA FOR EVERYONE: HUNDREDS MAGIC

43	44	45	46	47	48
53	54	55	56	57	58
63	64	65	66	67	68
73	74	75	76	77	78
83	84	85	86	87	88

RESOURCE HANDBOOK

By

Brad Fulton and Bill Lombard



## Teacher to Teacher Press

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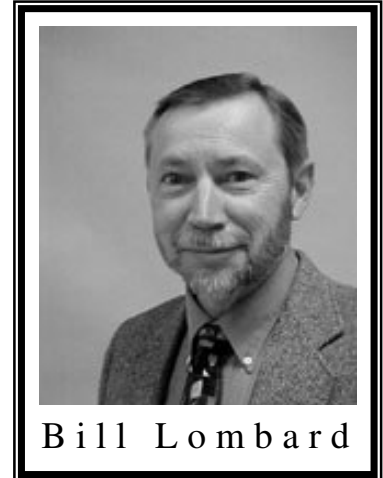
## Brad Fulton and Bill Lombard *Teacher to Teacher Press*

*"Building Mathematical Skill on a Foundation of Understanding"*



Brad Fulton

- ◆ Consultants
- ◆ Educators
- ◆ 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
- ◆ Teacher training seminar materials handbooks for elementary, middle, and secondary school

### **Available for workshops, keynote addresses, and conference sessions.**

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.*

## ACTIVITY 11

# Hundreds Magic

### Materials:

- Paper
- Transparency of Activity Master
- Centimeter grid paper

### 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

### 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.

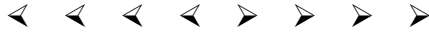
1. The students will need to make a hundreds chart like the activity master. Alternately, you may wish to provide grid paper for this or simply distribute copies of the transparency master while you use the transparency on the overhead projector.
2. Ask the students to circle any four adjacent numbers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

$$(n) + (n + 11) \text{ and } (n + 1) + (n + 10)$$

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  $7 \times 18 = 126$  and  $8 \times 17 = 136$ . 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:  
$$n(n + 11) = n^2 + 11n \quad (n + 1)(n + 10) = n^2 + 11n + 10$$



### 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.

### 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?

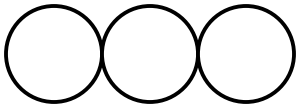
Advanced students can incorporate practice with negative numbers using the second activity master.

### 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.

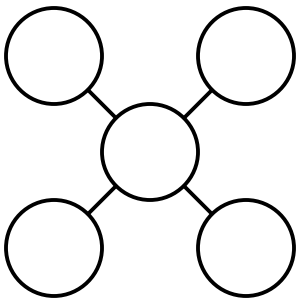
Proof: If “n” is the center then the left number is  $n - 1$ , and the right number is  $n + 1$ . Thus their sum is:

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

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:

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

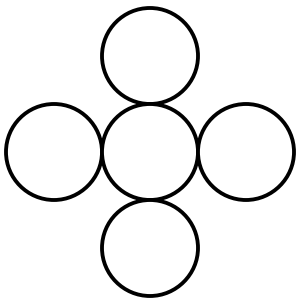


**Five-Point:**

Pattern: 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:**

Pattern: 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:

$$(n - 1)(n + 1) = n^2 - 1$$
$$\text{and } (n^2 - 100) = (n^2 - 1) - 99$$

Transparency master

# Hundreds Magic 1-100

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

Transparency master

# Hundreds Magic -49–50

-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

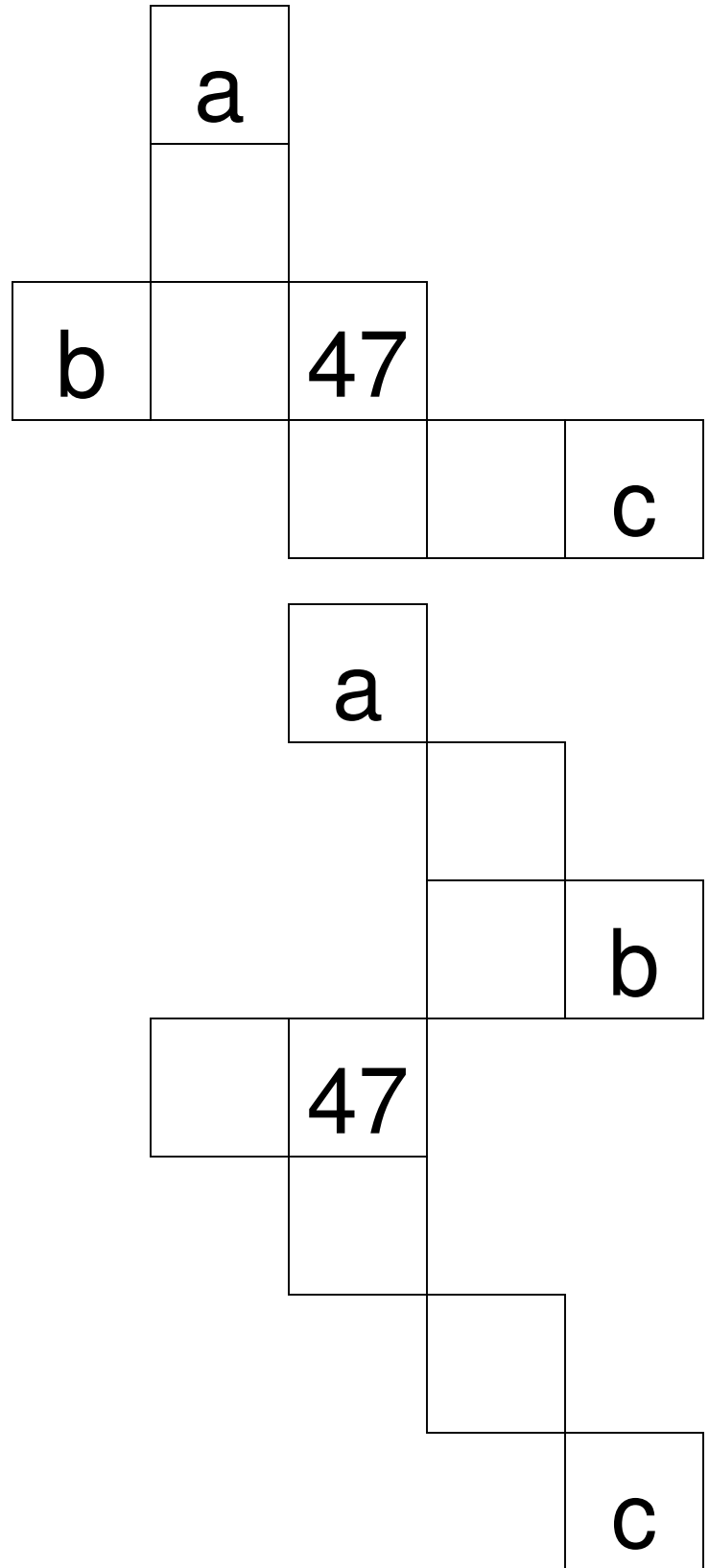
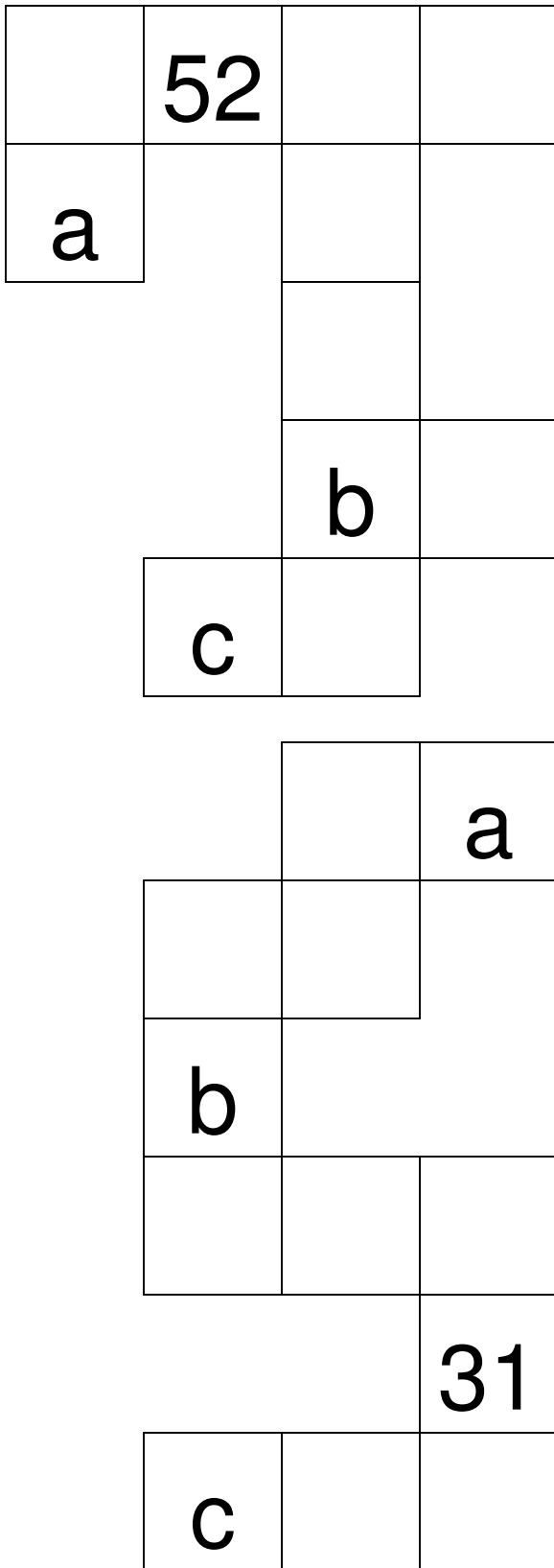
Transparency master

# Hundreds Magic Calendar

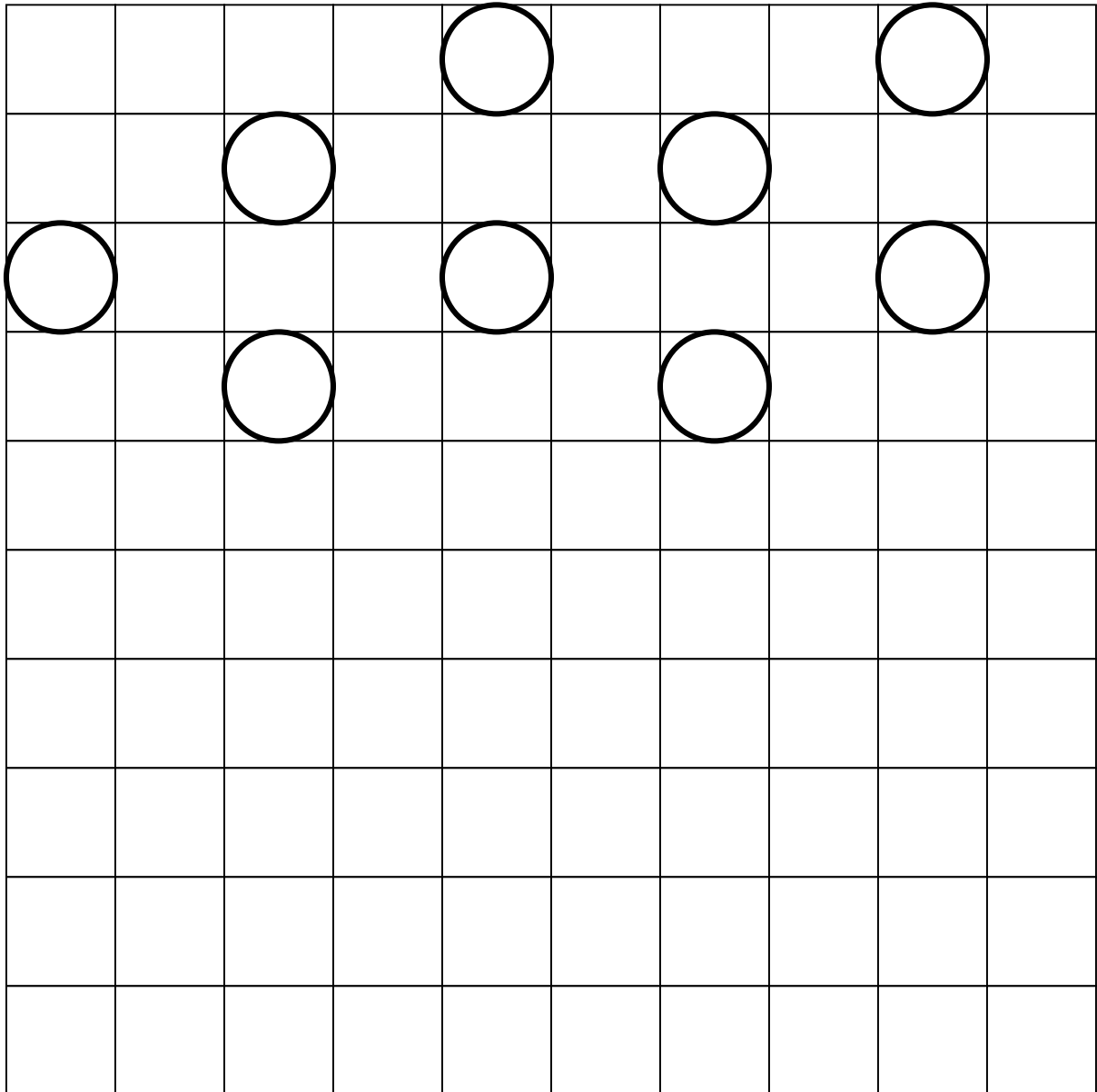
Month \_\_\_\_\_

S M T W T F S

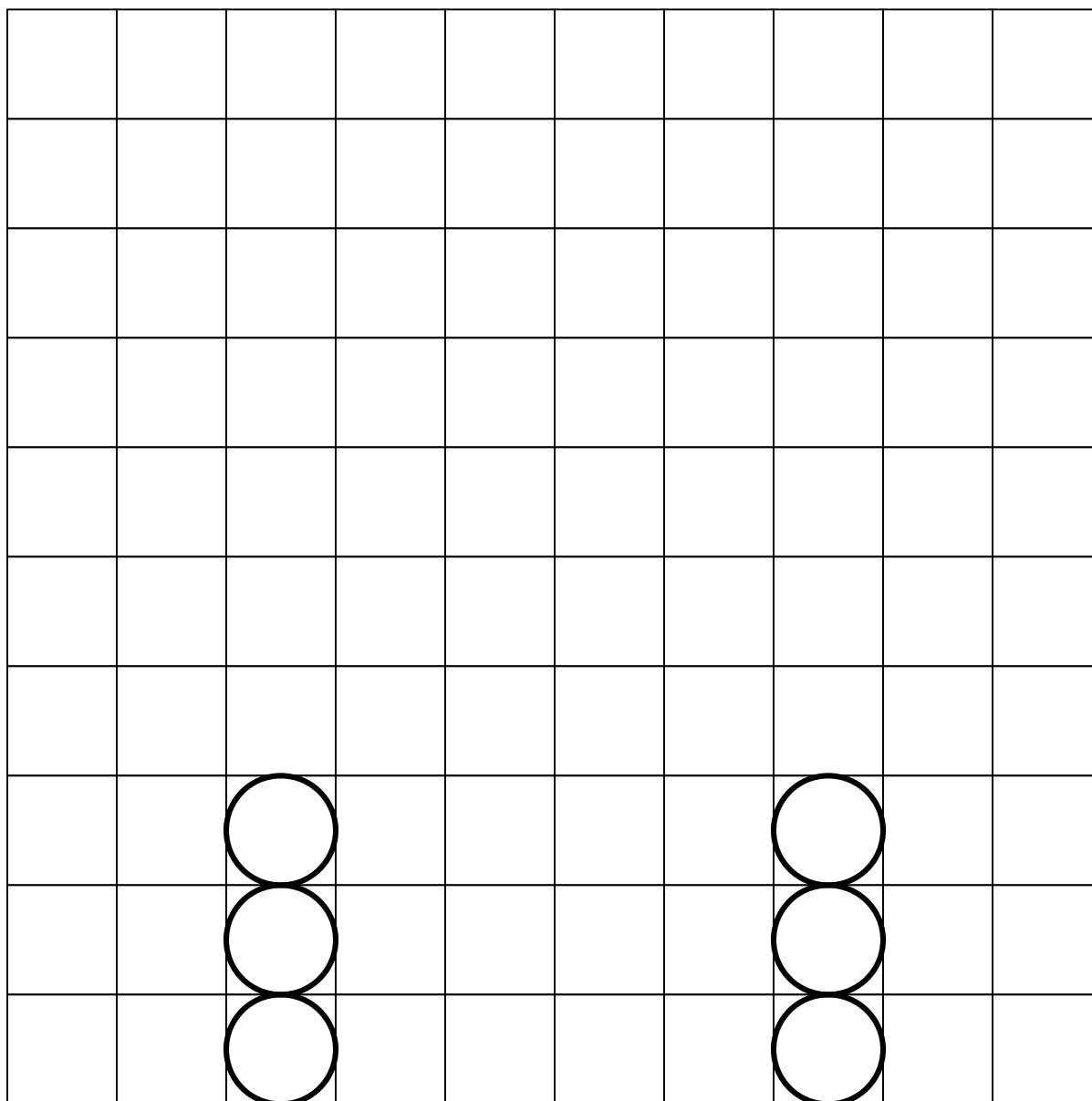

What number would appear in each lettered box on a hundreds chart?



# Guess My Rule



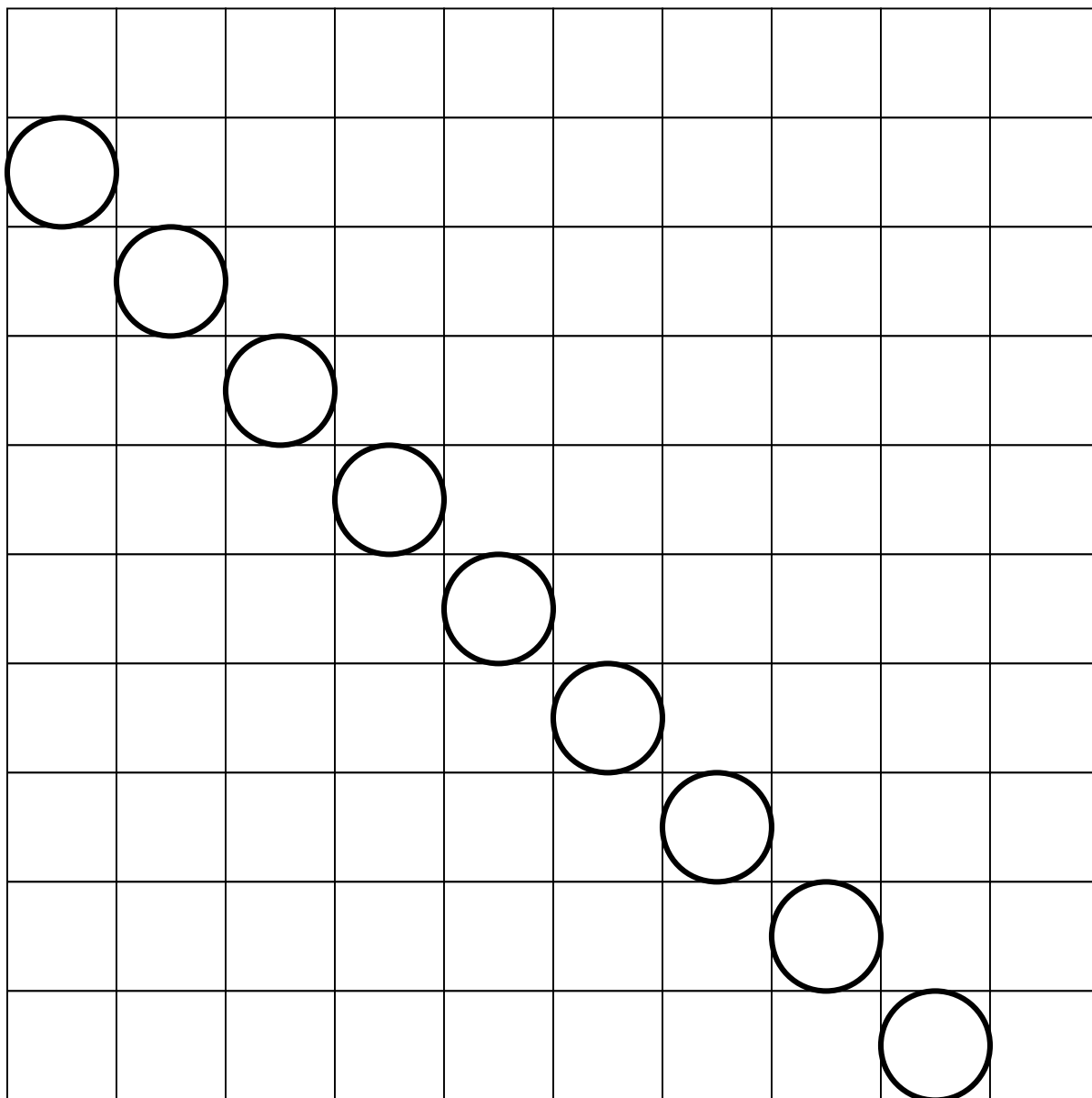
# Guess My Rule



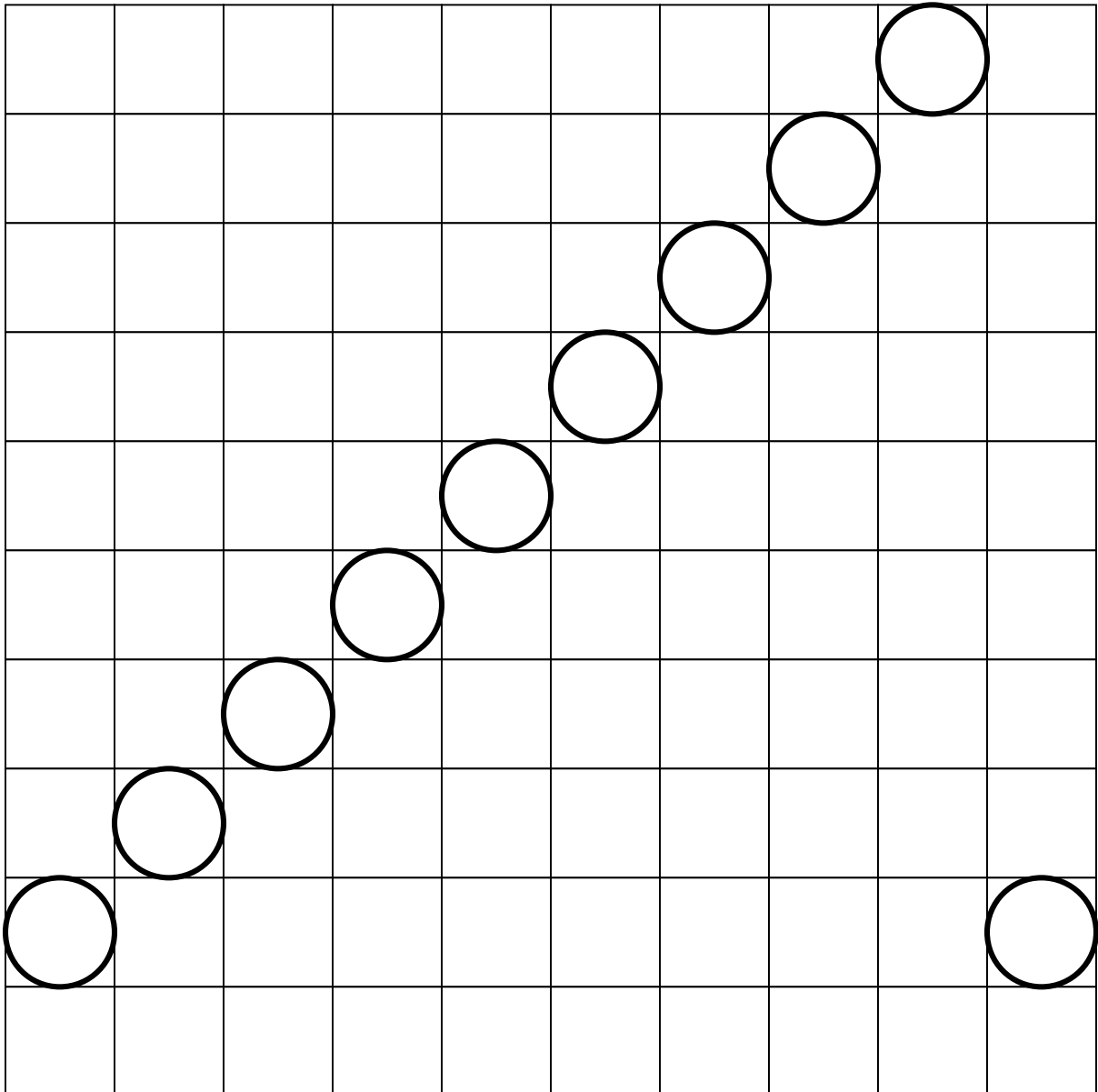
# Guess My Rule

○		○		○		○		○	
○		○		○		○		○	
○		○		○		○			

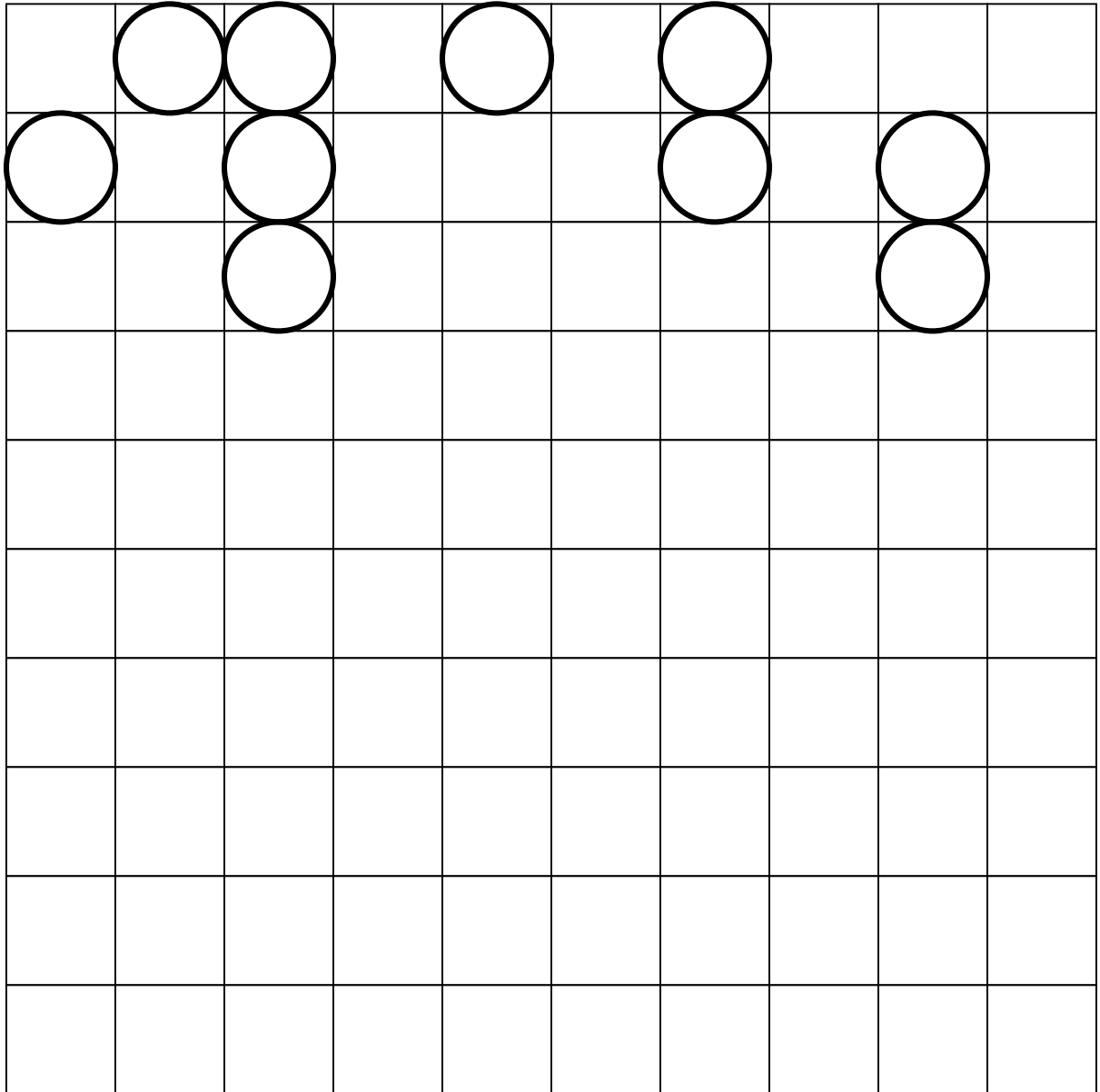
# Guess My Rule

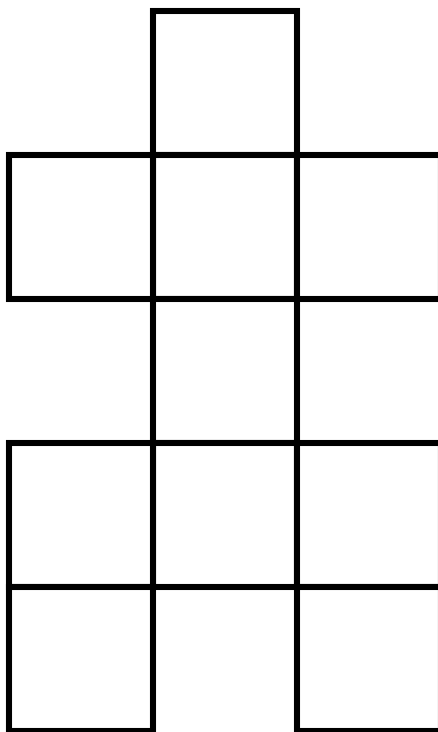


# Guess My Rule



# Guess My Rule





This is algebra man.

Place him on the hundreds chart and find the sum of his interior.

How does this sum compare to the square in his waist?

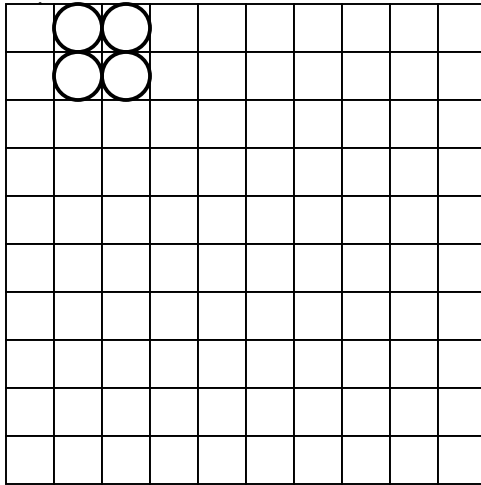
Does this work on the  $-49 - 50$  chart?

Does this work on the calendar?

# Hundreds Magic Investigations

Name \_\_\_\_\_

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



What pattern do you notice?

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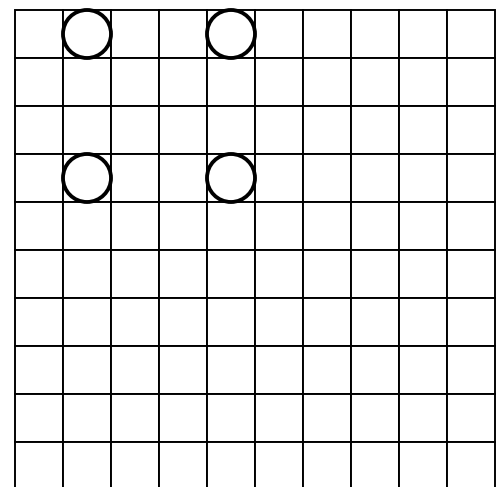
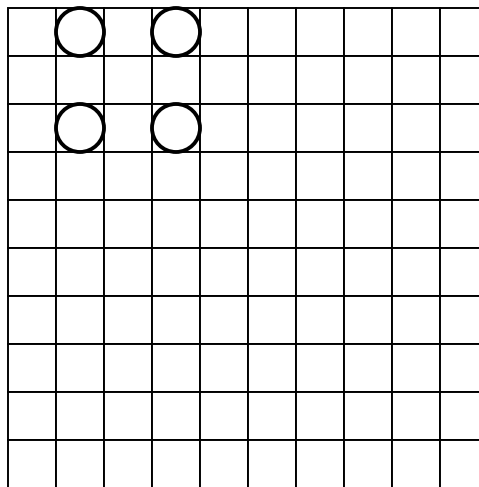
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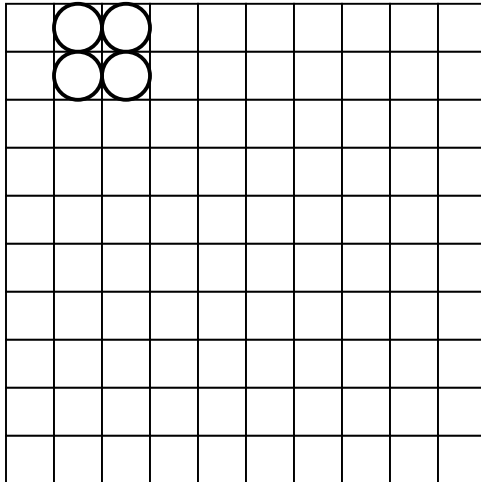
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# Hundreds Magic Investigations

Name \_\_\_\_\_

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



What pattern do you notice?

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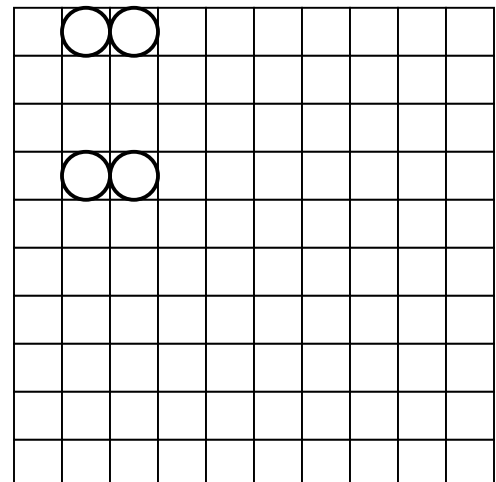
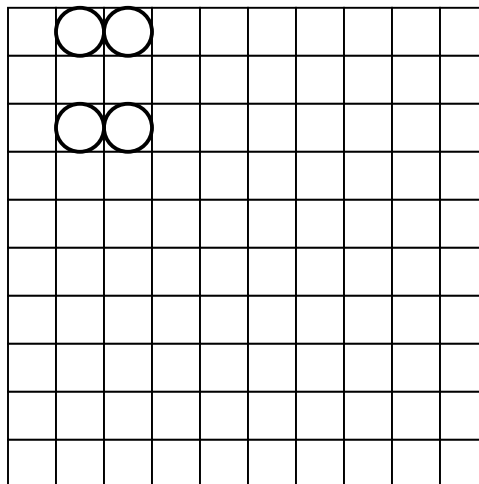
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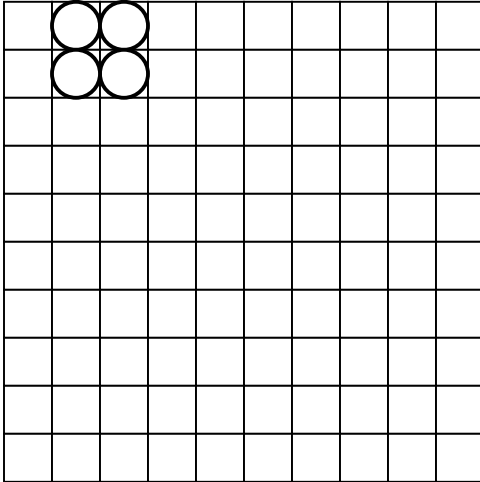
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# Hundreds Magic Investigations

Name \_\_\_\_\_

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



What pattern do you notice?

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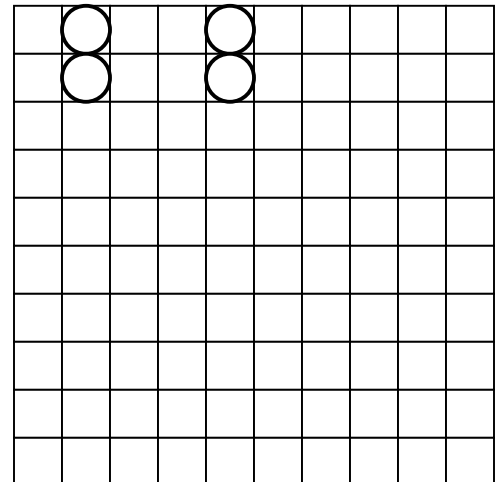
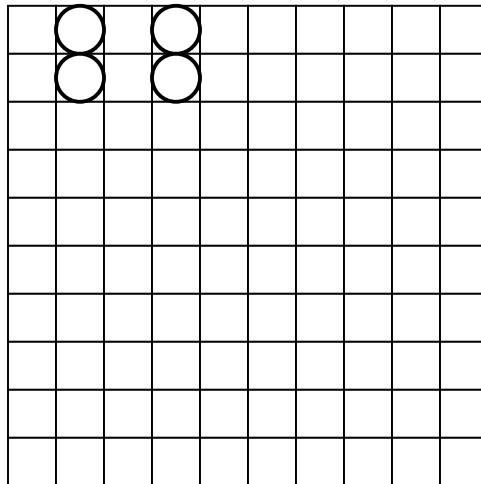
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# MORE! MORE! MORE!

Visit the Teacher to Teacher Press website at...

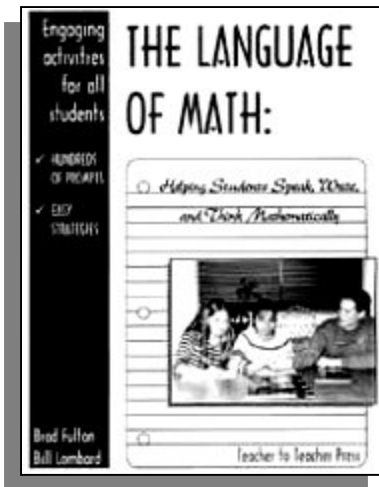
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- ◆ Links to other valuable resource websites
- ◆ Order forms for our materials
- ◆ A bibliography of great mathematical reading
- ◆ Calendars showing where and when you can hear Bill and Brad present

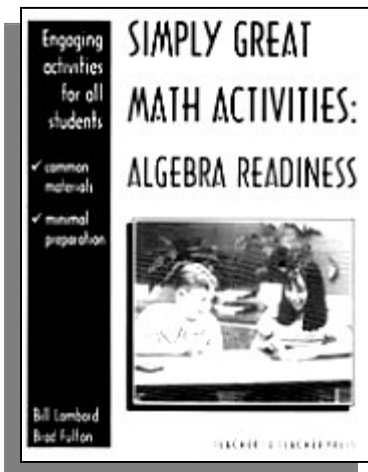
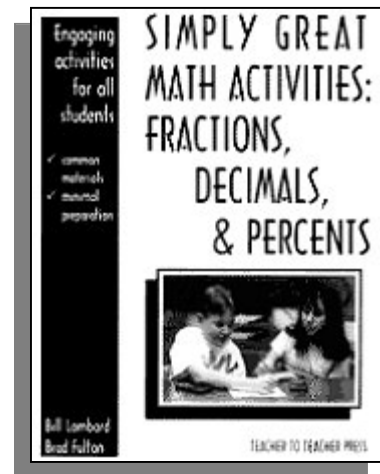
Happy surfing!

## Books by Brad and Bill



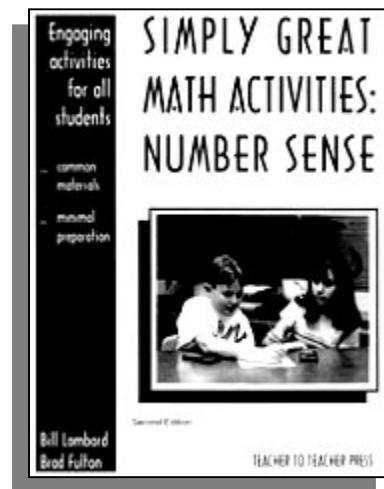
The Language of Math helps teachers create a classroom environment rich in mathematical thinking by showing them how to easily incorporate oral and written language into their math classes. Over 100 journal and discussion starters are included along with extensive instructions for making the most of your math time.

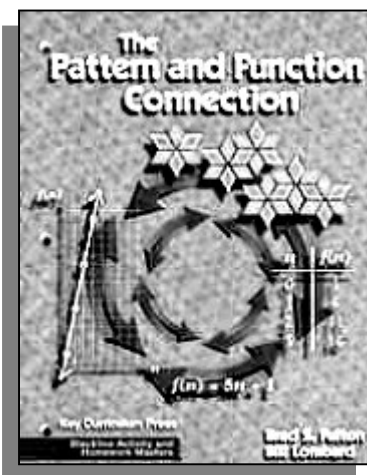
Here are a dozen unique and conceptual activities that will help your students add, subtract, multiply and divide fractions as well as connect them to decimal and percent representations. Both you and your students will love the novel and creative approach.



Teachers are raving about how effective these activities have been in their classrooms. Children as young as fourth grade and college students alike say that algebra is easy and makes sense because of this incredible approach.

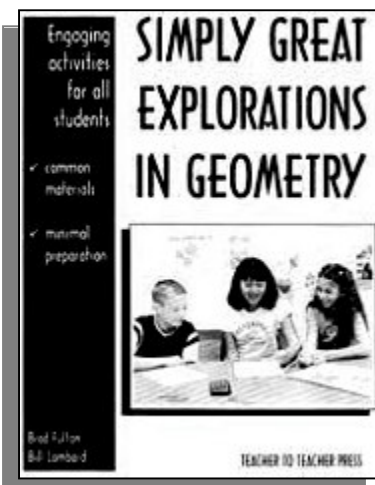
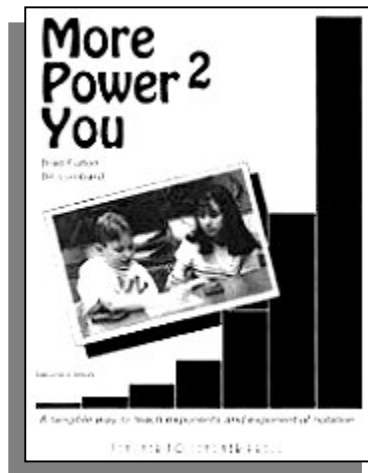
Students don't even think they are doing math sometimes because these activities are so fun and engaging, but they are developing rich and valuable number sense as they explore these eleven creative activities.





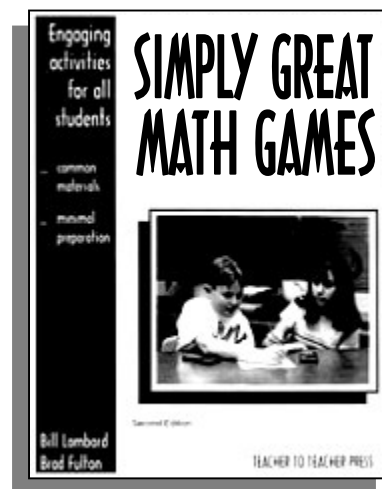
Our first book is still one of our most popular. Every teacher we talk to who has tried this approach to functions has been amazed at what their students have learned and accomplished. Over 150 pages of multiple representations of functions cover such concepts as slope, intercept, and function notation. Even elementary students have developed an understanding of functions with this book.

Exponents will finally make sense to your students after they participate in the unique activities found in this book. Both positive and negative exponents are demonstrated conceptually. Your students will even be able to explain *why*  $n^0 = 1$ .



Over one dozen geometry activities will excite your students as they discover the connections between geometry and fractions, decimals, percents, and even algebra. Area formulas, angle measurement, polygon attributes, vocabulary, and construction are covered.

A dozen engaging and educational games await you and your students in this creative and highly adaptable book. You'll find games that reinforce basic operations with whole numbers, fractions, decimals, and integers as well as algebraic skills. Game masters will serve a spectrum of grade levels and skill levels. Your students will beg for more!



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