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X Marks the Spot!

Developing Skills in All Operations
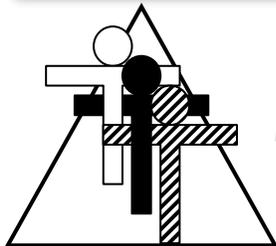
$+$ $-$ $\times$ $\div$

By Brad Fulton
Educator of the Year, 2005
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Teacher to Teacher Press
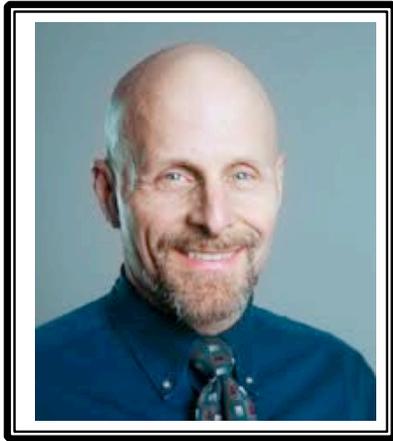
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Brad Fulton
E d u c a t o r   o f   t h e   Y e a r

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◆ **Educator**
◆ **Author**
◆ **Keynote presenter**
◆ **Teacher trainer**
◆ **Conference speaker**

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b r a d @ t t t p r e s s . c o m

Known throughout the country for motivating and engaging teachers and students, Brad has co-authored over a dozen books that provide easy-to-teach yet mathematically rich activities for busy teachers while teaching full time for over 30 years. In addition, he has co-authored over 40 teacher training manuals full of activities and ideas that help teachers who believe mathematics must be both meaningful and powerful.

Seminar leader and trainer of mathematics teachers

♦ 2005 California League of Middle Schools Educator of the Year
♦ California Math Council and NCTM national featured presenter
♦ Lead trainer for summer teacher training institutes
♦ Trainer/consultant for district, county, regional, and national workshops

Author and co-author of mathematics curriculum

♦ Simply Great Math Activities series: six books covering all major strands
♦ Angle On Geometry Program: over 400 pages of research-based geometry instruction
♦ 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 conferences

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Brad's math activities are the best I've seen in 38 years of teaching!
    Wayne Dequer, 7th grade math teacher, Arcadia, CA
"I can't begin to tell you how much you have inspired me!"
    Sue Bonesteel, Math Dept. Chair, Phoenix, AZ
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    Brenda McGaffigan, principal, Santa Ana, CA
"Absolutely engaging. I can teach algebra to second graders!"
    Lisa Fellers, teacher

References available upon request

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Thanks and happy teaching,

Brad ☺

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X Marks the Spot
Developing Skill in All Operations

Overview:

The rules are so simple you can teach them without saying a word! Yet the math is rich and abundant. You can use these simple drills to reinforce basic addition, subtraction, multiplication, and division facts and develop number sense without boring your students. Fractions, decimals, and negative numbers can also be used. You can even factor polynomials using this simple method!

Required Materials:

☒ Pencil and paper

Optional Materials:

☐ Calculators

Procedure:

1. Tell the class that this game has only two simple rules...but you won't tell them what they are. They will have to figure out the rules by themselves. As soon as a student knows how to play, he or she can come up to the board and write down the answer.

2. Have them copy these five problems onto a piece of paper as you write them on the board.

   Then begin writing in the answers by adding the numbers on the left and right to get the bottom number and multiplying them to get the top number.

3. If you work slowly, pausing as if to ponder before writing each answer, some of the students will soon catch on. After a majority of the class has discovered the rules of the game, allow a student to explain them.

4. Then you can continue to play the game by varying the format.

   - Placing numbers in sections A and B will require

$$^{10}/_5 = 2$$

$$5 + 2 = 7$$

students to divide first and then add.

- Placing numbers in sections A and D or C and D will require students to subtract first and then multiply.

$$12 - 8 = 4$$
$$4 \times 8 = 32$$

with 8 and 12 marked on the cross.

- Placing numbers in sections B and D will require students to study the various combinations of sums and products that satisfy the given answers.

with 20 and 9 marked on the cross.

$$1 \times 20 = 20 \qquad 1 + 20 = 21$$
$$2 \times 10 = 20 \qquad 2 + 10 = 12$$
$$4 \times 5 = 20 \qquad 4 + 5 = 20$$

5. Eventually, you may wish to increase the difficulty through examples like these.

15 ✕ -9   1.5 ✕ .25   1/2 ✕ 7/8   6.25 ✕ 5

-16 ✕ 0   xy ✕ x+y   0 ✕ 6   16 ✕ 0

6. You can also use the guess and check method to solve complex puzzles. Research has shown that the guess and check method is not only a valuable skill, it helps children transition to solving equations in algebra. Here is how to solve problems like the one on the right using this method.

2491 ✕ 100

Pick a pair of numbers that add up to 100 such as 50 and 50. Write them in columns *a* and *b*.

Then multiply them to find the product. In this case, it is 2500, which is too high. We mark our check with an "H" to signify that this is too high. This tells us that the number in column *a* is too high.

Let's adjust our guess by trying 40 and 60. Remember that our guesses must add to 100. *It is also very important to note that the smaller of the two numbers should go in column a.*

The product of these two numbers is 2400, which is too low. This can be marked with an "L" because it is too low.

Our next guess for column a must be greater than 40 but less than 50. Let's try 45. This makes b = 55. Our new product, 2475 is too low also.

a	b	check
50	50	2500 H
40	60	2400 L
45	55	2475 L
48	52	2496 H
47	53	2491 ☺

Our fourth guess will be 48. Now b = 52, and our product is 2496. Although this is too high, it is very close.

For our next guess, we try 47 for *a*, and 53 for *b*. This gives us the product we wanted.
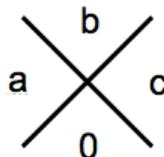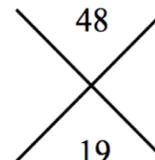
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Journal Prompts:

Explain to a student how you would find the solution to the problem on the right.

What could you tell about the value of a and c in the example below? What can you tell about the value of b? Explain

Homework:

Assign one of the accompanying activity masters.

You can make a homework worksheet by placing numbers in a copy of the blank activity master. Alternately, the students can copy down problems as you write them on the board.

Taking a Closer Look:

The difficulty of these drills can be varied by the numbers chosen and their placement. Using decimals, fractions, or negative numbers can also increase the complexity.

Algebra students can practice factoring polynomials this way too. For the polynomial $x^2 + 7x + 10 = 0$, students would construct the problem shown to find the solutions 2 and 5. The expression factors into the following binomials:

$$x^2 + 7x + 10 = (x + 2)(x + 5)$$

The solution to the equation then is $x = \{-2, -5\}$.

To help them remember which term goes on the top and which goes on the bottom, I tell them that the *c* term goes in the *ceiling* and the *b* term goes in the *basement*. This technique works well when the *a* term is 1. A fuller treatment of factoring

polynomials when the *a* term does not equal 1 can be found in my DVD *Multiplying and Factoring Polynomials.*

Assessment: ☑

These drills can be spot checked for accuracy or students can exchange papers to check them.

You may also use the answer keys for the accompanying activity masters.

Good Tip! 👍

These drills are a great way to practice number concepts throughout the year. Worksheets can be created on the spot to be used as homework or warm-ups. If you are studying fraction multiplication, simply have the students copy a set of these problems as you write them on the board.
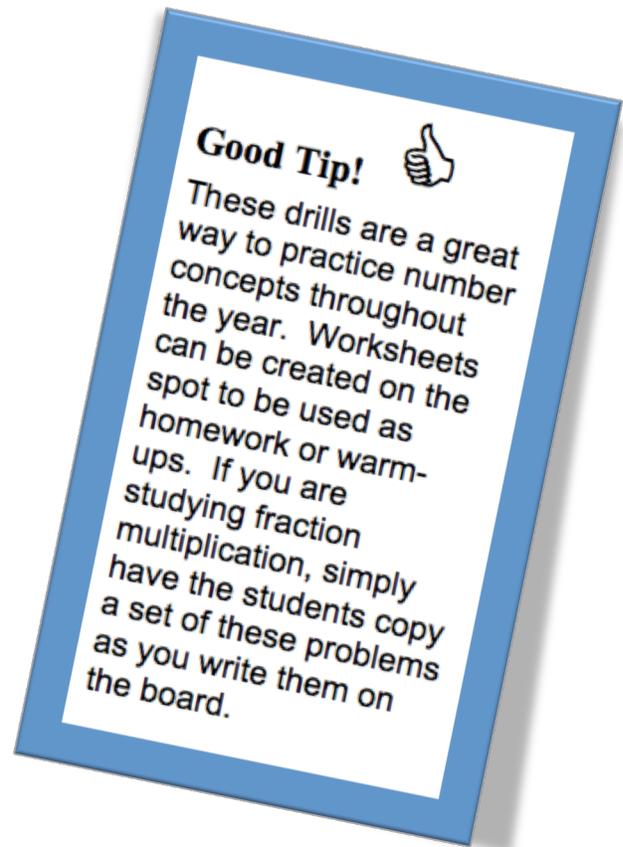
Answer Key:

Set 1	top	bottom		Set 2	side	top		Set 3	side	bottom		Set 4	side	side
a	14	9		a	5	35		a	8	10		a	4	7
b	45	14		b	6	24		b	7	14		b	4	8
c	12	7		c	0	0		c	6	14		c	3	12
d	8	9		d	7	49		d	7	13		d	6	8
e	36	12		e	12	60		e	9	13		e	6	6
f	36	13		f	9	54		f	12	15		f	0	12
g	48	14		g	11	22		g	6	12		g	4	9
h	12	8		h	9	108		h	4	16		h	7	9
i	0	7		i	12	96		i	6	10		i	8	8
j	9	6		j	10	10		j	8	15		j	6	10
k	20	9		k	12	48		k	7	11		k	5	12
l	25	10		l	12	120		l	0	9		l	8	11
m	33	14		m	2	12		m	3	8		m	10	12
n	60	16		n	12	132		n	2	11		n	11	12
o	24	14		o	0	0		o	7	10		o	7	12
p	77	18		p	6	42		p	12	21		p	12	12
q	72	20		q	9	72		q	11	21		q	8	9
r	60	16		r	12	0		r	12	23		r	9	11
s	60	17		s	12	144		s	1	9		s	9	9

Set 5	top	bottom		Set 6	top	bottom		Set 7	side	side		Set 8	side	side
a	1	7.2		a	-14	-5		a	-36	-1		a	47	53
b	0.45	1.4		b	45	-14		b	-1	36		b	23	63
c	1.2	4.3		c	-12	1		c	-6	6		c	50	60
d	0.008	0.18		d	8	-9		d	2	14		d	211	289
e	3.6	6.6		e	-36	0		e	-14	-2				
f	0.36	1.3		f	36	-13		f	-7	4				
g	0.048	0.68		g	-48	2		g	-4	7				
h	0.12	0.8		h	-12	4		h	-9	-2				
i	0	0.7		i	0	-7		i	-6	3				
j	0.9	3.3		j	9	-6		j	-6	-3				
k	0.002	0.09		k	-20	1		k	-18	-1				
l	0.025	0.55		l	-25	0		l	-9	-5				
m	0.33	1.4		m	33	-14		m	-15	-3				
n	6	10.6		n	-60	-4		n	-15	3				
o	0.24	2.12		o	24	-14		o	-1	45				
p	0.077	0.81		p	77	-18		p	-8	-6				
q	0.96	1.28		q	-96	-4		q	-6	8				
r	0.6	10.06		r	60	-16		r	-12	4				
s	6	12.5		s	-60	-7		s	-2	24				

Name_____

"X" Marks the Spot

Multiply the two side numbers and put the product on the top. Add the two side numbers and put the sum on the bottom.
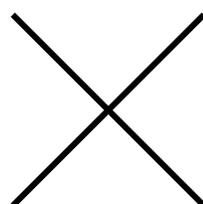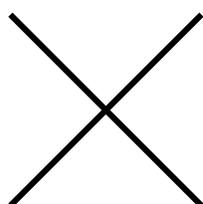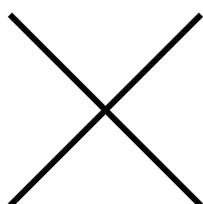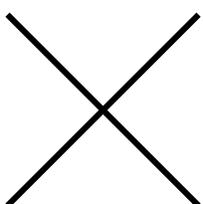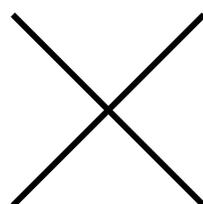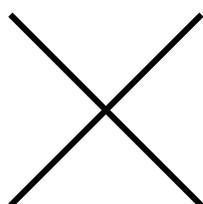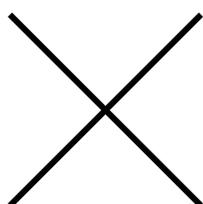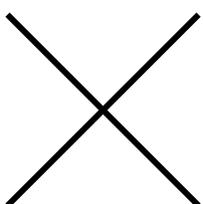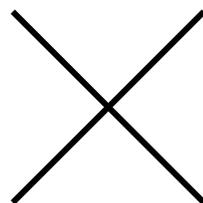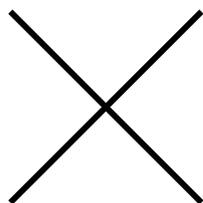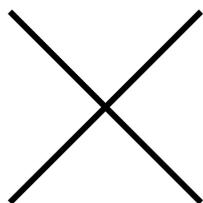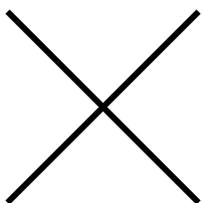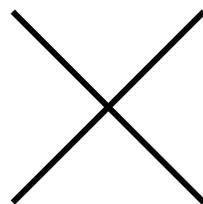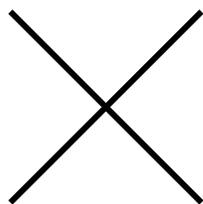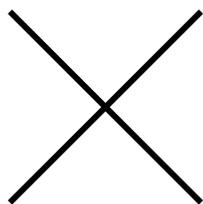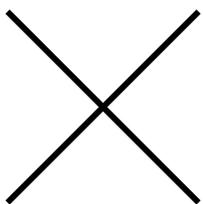
"X" Marks the Spot 1

Name_____

Multiply the two side numbers and put the product on the top. Add the two side numbers and put the sum on the bottom as shown.

56

7 ✕ 8   2 ✕ 7   5 ✕ 9   3 ✕ 4

4

8 ✕ 1   6 ✕ 6   9 ✕ 4   6 ✕ 8

2 ✕ 6   7 ✕ 0   3 ✕ 3   5 ✕ 4

5 ✕ 5   11 ✕ 3   6 ✕ 10   12 ✕ 2

7 ✕ 11   12 ✕ 8   10 ✕ 6   5 ✕ 12

"X" Marks the Spot 2

Name_____

The number on the bottom is the sum of the two numbers on the sides. Find the missing side number. Then multiply the two side numbers and write the product on the top.

56

7   *8*
  15

7
  12

4
  10

9
  9

  7
14

5
  17

  6
15

2
  13

  12
21

  8
20

1
  11

  4
16

10
  22

  6
8

  11
23

8
  8

  7
13

8
  17

0
  12

  12
24

"X" Marks the Spot 3   Name_____

The top number is the product of the two numbers on the sides. Find the missing side number. Then add the two side numbers and write the sum on the bottom.

56	16	49	48
7 8	2	7	8
15			

42	36	36	36
6	4	3	6

48	24	56	28
12	4	7	4

0	15	18	21
9	5	9	3

108	110	132	8
9	10	11	8

"X" Marks the Spot 4

Name_____

The top number is the product of the two missing side numbers. The bottom number is the sum of the two missing side numbers. Find the missing side numbers.

56
7 8
15

28
11

32
12

36
15

48
14

36
12

0
12

36
13

63
16

64
16

60
16

60
17

88
19

120
22

132
23

84
19

144
24

72
17

99
20

81
18

"X" Marks the Spot 5

Name_____

Multiply the two side numbers and put the product on the top. Add the two side numbers and put the sum on the bottom as shown.

Row 1:
- 7 × .8, top = 5.6, bottom = 7.8
- .2 × 7
- .5 × .9
- .3 × 4

Row 2:
- .08 × .1
- 6 × .6
- .9 × .4
- .6 × .08

Row 3:
- .2 × .6
- .7 × 0
- 3 × .3
- .05 × .04

Row 4:
- .05 × .5
- 1.1 × .3
- .6 × 10
- .12 × 2

Row 5:
- .7 × .11
- 1.2 × .08
- 10 × .06
- .5 × 12

"X" Marks the Spot 6   Name_____

Multiply the two side numbers and put the product on the top. Add the
two side numbers and put the sum on the bottom as shown.

-56
7 ✕ -8   2 ✕ -7   -5 ✕ -9   -3 ✕ 4
-1

-8 ✕ -1   -6 ✕ 6   -9 ✕ -4   -6 ✕ 8

-2 ✕ 6   -7 ✕ 0   -3 ✕ -3   5 ✕ -4

-5 ✕ 5   -11 ✕ -3   6 ✕ -10   -12 ✕ -2

-7 ✕ -11   -12 ✕ 8   -10 ✕ -6   5 ✕ -12

"X" Marks the Spot 7

Name_____

The top number is the product of the two missing side numbers. The bottom number is the sum of the two missing side numbers. Find the missing side numbers.

Row 1:
- 36 / 36 (left side) X 1 (right side) / 37
- 36 / -37
- -36 / 35
- -36 / 0

Row 2:
- 28 / 16
- 28 / -16
- -28 / -3
- -28 / 3

Row 3:
- 18 / -11
- -18 / -3
- 18 / -9
- 18 / -19

Row 4:
- 45 / -14
- 45 / -18
- -45 / -12
- -45 / 44

Row 5:
- 48 / -14
- -48 / 2
- -48 / -8
- -48 / 22

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"X" Marks the Spot 8

Name_____

Use a guess and check table to find the missing side numbers. Always put your lower number in column a.

2491

100

a	b	check

1449

86

a	b	check

3000

110

a	b	check

60979

500

a	b	check

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- *Math Maps: Developing the Mathematical Practices*
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- *Four Square Addition: A clever way to practice addition and subtraction of positive whole numbers, decimals, and integers*
- *Take Your Places: Developing rich number sense*

Feel free to contact me if you have questions or comments or would like to discuss a staff development training or keynote address at your site.

Happy teaching,

Brad