RightStart™ Mathematics

by Joan A. Cotter, Ph.D.
with Kathleen Cotter Lawler

THIRD GRADE LESSONS

Second Edition

Activities for Learning, Inc.

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RightStart™ Mathematics Objectives for Third Grade

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Numeration				
Rounds numbers to the nearest 10, 100, and 1000	N/A			
Reads, writes, and compares numbers to the millions	N/A			
Addition				
Adds 2-digit numbers mentally				
Adds 4-digit numbers				
Subtraction				
Understands subtraction as a missing addend				
Subtracts 2-digit numbers mentally				
Subtracts 4-digit numbers				
Multiplication				
Understands 5 × 7 as 5 multiplied by 7	N/A			
Knows multiplication facts to 10 × 10	N/A	N/A	N/A	
Applies commutative, associative, and distribute properties	N/A			
Multiplies multiples of 10, e.g. 80 × 7	N/A	N/A		
Multiplies a 4-digit number by a 1-digit number	N/A	N/A		
Division				
Understands division as the number of groups or size of a group	N/A			
Understands division as finding a missing factor	N/A			
Knows division facts	N/A	N/A	N/A	
Problem Solving				
Solves two-step problems involving four operations				
Solves problems in more than one way				
Persists in solving problems				
Identifies and explains patterns				
Time and Money				
Tells time to the minute	N/A	N/A		
Solves elapsed time problems	N/A	N/A		
Adds and subtracts with dollars and cents	N/A	N/A	N/A	
Measurement				
Understands square units, cm^2, sq ft, and sq miles	N/A	N/A		
Finds perimeter and area in customary and metric units	N/A	N/A		
Measures in grams, kilograms, and liters	N/A	N/A	N/A	
Fractions				
Understands fraction a/b as a divided by b	N/A			
Understands a/b as $1/b$ multiplied by a	N/A			
Understands $n\frac{a}{b}$ as a whole number plus a fraction	N/A			
Compares and finds equivalences on the fraction chart	N/A	N/A		
Data				
Gathers and interprets data with charts and graphs	N/A	N/A		
Geometry				
Knows angles 30°, 45°, 60°, 90°, 180°, and 360°	N/A	N/A	N/A	
Categorizes shapes by attributes, e.g., square is a rectangle	N/A	N/A	N/A	
Partitions shapes into simple fractions	N/A	N/A	N/A	
Constructs equilateral triangle and other shapes with drawing tools	N/A	N/A	N/A	

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Lesson 18: The Commutative Property

OBJECTIVES:

1. To learn the term *factor*
2. To introduce the commutative property
3. To learn the term *commutative*

MATERIALS:

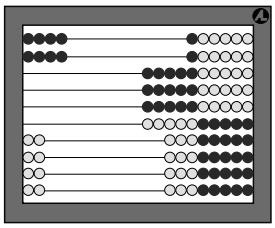
1. Cotter Abacuses
2. Dry erase boards
3. *Math Card Games* book, P10

ACTIVITIES FOR TEACHING:

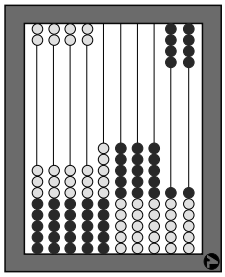
Warm-up. Ask: What is 4 times 1? [4] What is 8 times 1? [8] What is 4 times 2? [8] What is 8 times 2? [16] What is 4 times 3? [12] 8 times 3? [24] What is 4 times 4? [16] 8 times 4? [32] What is 4 times 5? [20] 8 times 5? [40]

Ask: What is 4 times 6? [24] 8 times 6? [48] What is 4 times 7? [28] 8 times 7? [56] What is 4 times 8? [32] 8 times 8? [64] What is 4 times 9? [36] 8 times 9? [72] What is 4 times 10? [40] 8 times 10? [80]

The commutative property on the abacus. Distribute the abacuses and dry erase boards. Tell the children: Enter 4 multiplied by 2 on the top two rows of your abacus. Also enter 2 multiplied by 4 on the bottom four rows of your abacus. See the left figure below. Ask: What are the equations? [4 × 2 = 8 and 2 × 4 = 8]



4 × 2 and 2 × 4



4 × 2 and 2 × 4

Now tell them to turn their abacus clockwise, that is, in the same direction the hands turn on a clock. See the right figure above. Tell them to write the equations on their white boards. [4 × 2 = 8 and 2 × 4 = 8]

Say: The number we multiply and the number we multiplied by are called *factors*. In the equations just written, 2 and 4 are the factors.

Tell them to enter 8 multiplied by 4 on their abacus and to write the equation. [8 × 4 = 32] Then tell them to turn their abacus clockwise and write that equation. [4 × 8 = 32] Did the order of the factors make a difference? [no]

Commutative examples. Make two columns for all to see. Label the left column "Makes a Difference" and the

EXPLANATIONS:

Some children may need to use the abacus for some of these warm-up questions.

The commutative property was formerly called the commutative *law*. A property is an attribute or quality.

ACTIVITIES FOR TEACHING:

EXPLANATIONS:

right side "Makes No Difference." See the figure below.

Ask: Does it make any difference at a meal whether you eat beans or corn first? [no] Write it in the left column.

Ask: Does it matter if you mix the batter or bake the cake first? [yes] Write it in the right column.

Makes No Difference	Makes a Difference
Eat beans or corn	Mix the batter or bake the cake
Put on left or right shoe	Eat or peel banana

Ask: Does the order matter for peeling and eating a banana? [yes]

Ask: Do you get the same results if you first put on your left shoe or your right shoe? [yes]

Tell them to think of some examples to be recorded.

Ask: Is 89 + 3 equal to 3 + 89? [yes] Does the order make a difference in adding? [no] Write it in the left column.

Ask: In subtraction, is 5 – 3 equal to 3 – 5? [no] Put it in the right column.

See page iii, number 18 of "Some General Thoughts on Teaching Mathematics," for additional information.

Ask: For multiplication, is 5 multiplied by 2 the same as 2 multiplied by 5? [yes] Does the order make a difference in multiplying? [no] Put in the left column.

Tell them: The mathematical word for getting the same results when the order of the numbers is changed is *commutative*. Write "Commutative" above the left column and "Not commutative" above the right column as shown below.

Commutative	Not commutative
Makes No Difference	Makes a Difference
Eat beans or corn	Mix the batter or bake the cake
Put on left or right shoe	Eat or peel banana
Foot to pedal on bike	Put on shoes or socks
Mittens on hands	Dry or wash hair
89 + 3 or 3 + 89	5 – 3 or 3 – 5
2 x 5 or 5 x 2	

Multiplication Memory game. Have the children play the Multiplication Memory game from the *Math Card Games* book, P10, using the 8s.

In conclusion. Ask: What is 8 times 3? [24] What is 3 times 8? [24] What is 8 times 7? [56] What is 7 times 8? [56] What is 9 times 8? [72]

3.OA.B.5

Lesson 29: Area on the Multiplication Table

OBJECTIVES:

1. To review *perimeter* and *area*
2. To see area on the multiplication table
3. To introduce exponents
4. To see the symmetry of the multiplication table

MATERIALS:

1. Worksheet 15, Area on the Multiplication Table
2. Tiles
3. *Math Card Games* book, P21

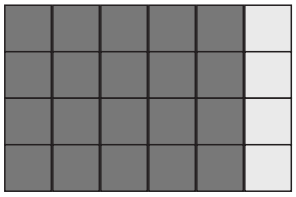
ACTIVITIES FOR TEACHING:

Warm-up. Ask: How many numbers are on the addition table? [100] How many numbers are on the multiplication table? [100] What is the size of the arrays? [10 by 10] Can you use the multiplication table for adding? [no] Can you use it for multiplying? [yes]

Worksheet 15. Distribute the worksheets and the tiles.

Reviewing perimeter. Show a tile and say: The length of an edge of a tile is 1 inch. The distance around an object is called the *perimeter*. Ask: What is the perimeter of a tile? [4 in.]

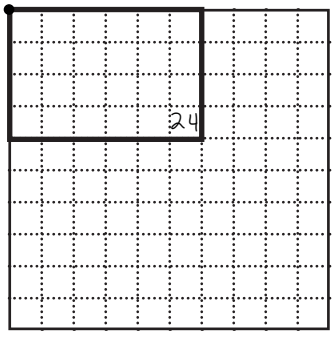
Area. Say: How much space something takes up is called *area*. Show the tile and say: The area of a tile is 1 square inch. Tell them to make a 6 by 4 array with the blue and yellow tiles as shown.



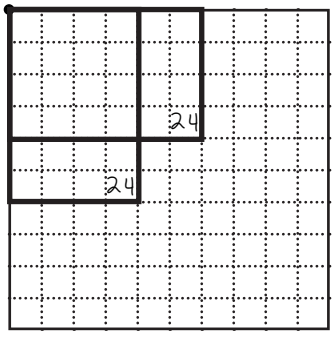
6 × 4 array

Ask: What is the perimeter of your array in inches? [20 in.] What is the area of your array in square inches? [24 sq. in.] Tell the children to start at the dot on their worksheet and draw this rectangle. Tell them to write the area at the opposite corner. See the left figure below.

Tell them to repeat for a 4 × 6 array. See the right figure below.



6 × 4 array



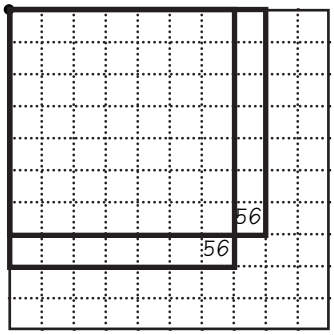
4 × 6 array added

EXPLANATIONS:

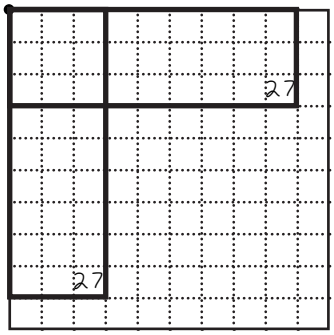
By using the two colors of tiles, a row of five is easily subitized. Also notice how it follows the same pattern as the abacus.

ACTIVITIES FOR TEACHING:

Tell them to do the arrays for the second and third tables on their worksheet. The solutions are shown below.

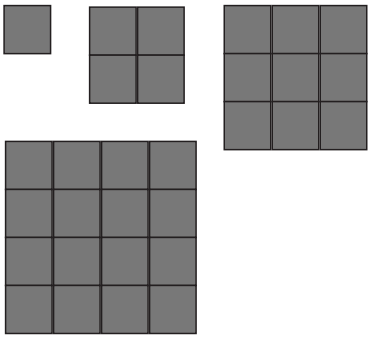


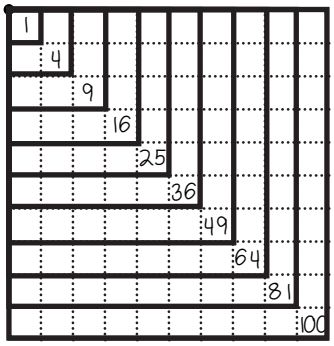
8 × 7 and 7 × 8 arrays



9 × 3 and 3 × 9 arrays

Squares on the multiplication table. For the last table on the worksheet, ask the children to construct several squares with the tiles and draw all the squares on the fourth multiplication table. See below.





The square arrays.

Writing squares with exponents. Write:

$$3 \times 3 = 3^2$$

and explain this is a shortcut for writing squares. Say: We write 3 times 3 by writing only one 3 with a little 2 after it. The little 2 means we are multiplying 3 by itself twice. Read it as "3 squared".

Write: $5^2 =$ ___

and ask: What does this mean? [5 × 5] How much is it? [25] Repeat for 8^2 [8 × 8 = 64] and 1^2. [1 × 1 = 1]

Square Memory game. Tell the children that they will play the Square Memory game, which is found in the *Math Card Games* book, P21. Say: You will need one card from each envelope. Take the 1-card from 1s envelope, the 4-card from the 2s envelope, and so forth up to the 100-card from the 10s envelope. Tell them to play the game twice and return the cards to the correct envelopes.

In conclusion. Ask: What numbers are on the diagonal in the multiplication table? [squares] Why is 56 on the multiplication table twice? [56 is 8 × 7 and 7 × 8]

EXPLANATIONS:

By removing these cards from the envelopes, the children may become more aware of the square numbers that are indicated on the outside of the envelopes.

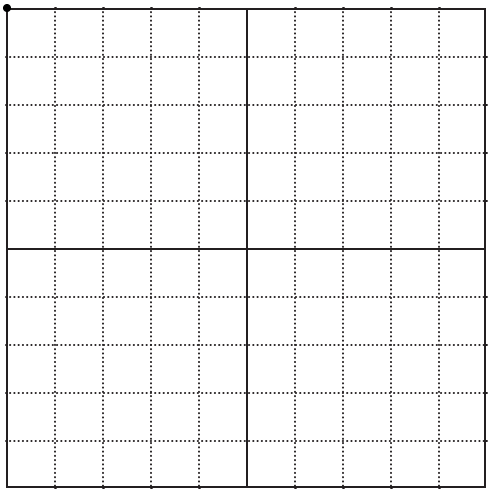
3.MD.C.7, 3.MD.C.7.A, 3.MD.C.7.B, 3.OA.D.9

Name: _____

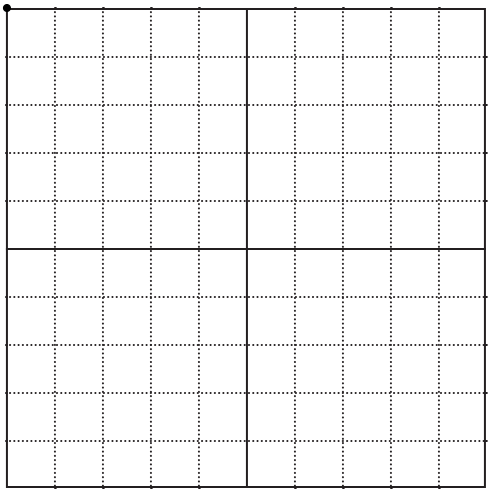
Date: _____

Start at the dot and draw rectangles for arrays. Write the area in the cell opposite the dot.

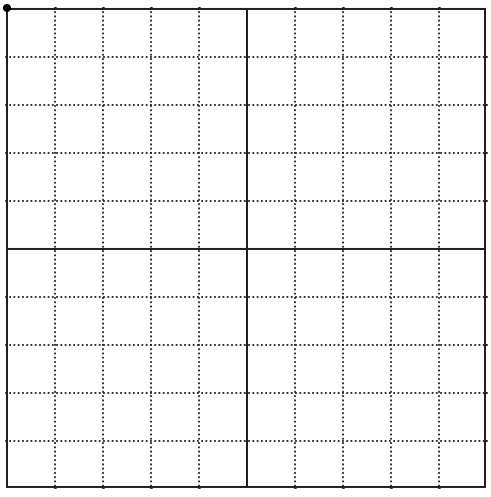
6 × 4 and 4 × 6



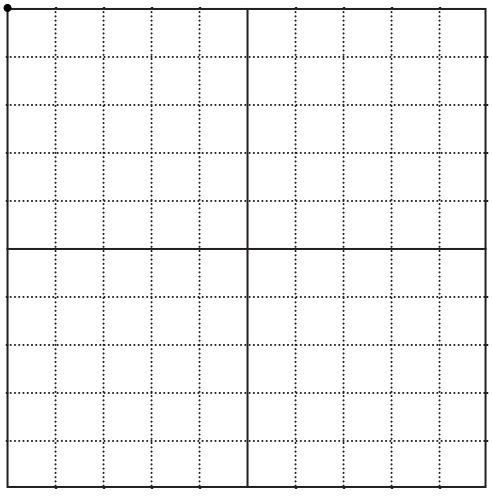
8 × 7 and 7 × 8



9 × 3 and 3 × 9



1 × 1, 2 × 2, 3 × 3, and up to 10 × 10



Lesson 32: The Short Multiplication Table

OBJECTIVES:

1. To construct the short multiplication table
2. To use the short multiplication table

MATERIALS:

1. *Math Card Games* book, P28
2. Math journals
3. Worksheet 18, The Short Multiplication Table

ACTIVITIES FOR TEACHING:

Warm-up. Ask: What is 8 × 8? [64] What is 7 × 9? [63] What is 9 × 7? [63]

Ask: What is 7 × 7? [49] What is 8 × 6? [48] 6 × 8? [48]

Ask: What is 6 × 6? [36] What is 7 × 5? [35] 5 × 7? [35]

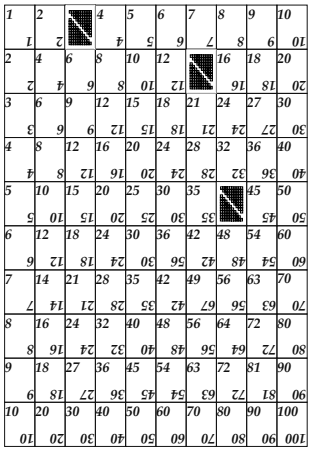
Ask: What is 9 × 9? [81] What is 8 × 10? [80] 10 × 8? [80]

Weighted Multi-Fun game. Have the children play the Weighted Multi-Fun game, found in *Math Card Games* book, P28. Tell them to write their scores in their math journal, in the same way they did for the Sum Rummy game, P3. See the example on the right. The first equation, 5 × 4, shows 5 cards played in the fourth row or column; the second equation, 4 cards in the eighth row or column. They can write several equations before summing as shown.

5 × 4 = 20
4 × 8 = 32
7 × 5 = 35
87
3 × 6 = 18
3 × 10 = 30
135

Maintain the card layout for the next activity.

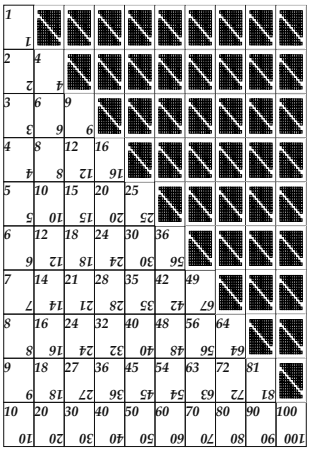
The short multiplication table. Say: There is one more activity to do with the cards at the end of the game. Tell the children to find 2 × 7 and 7 × 2. Find the duplicate products. [14] Turn face down the 14-card in the column with the higher factor. Continue with 3 × 1 and 1 × 3, also with 5 × 8 and 8 × 5. See the figure below.



The duplicate products of 7 × 2, 3 × 1, and 8 × 5 turned face down.

Tell them to repeat for all duplicate products. See figure on the next page. Tell them this is the *short multiplication table.*

ACTIVITIES FOR TEACHING:



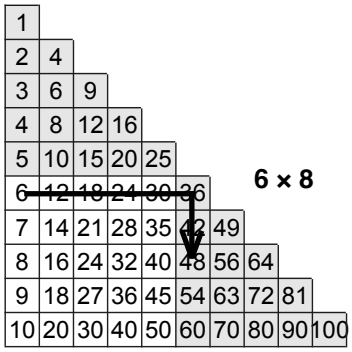
The multiplication table with the duplicates face down, resulting in the short multiplication table.

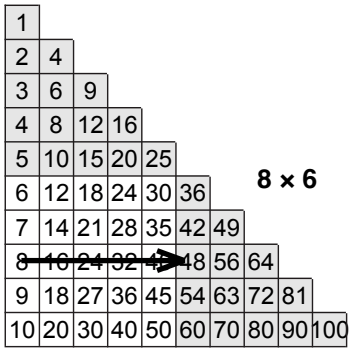
The short multiplication table is shown in the first printed arithmetic book, *Treviso Arithmetic*, printed in 1478.

Gather the cards that are face down into one pile and the face-up cards into another pile. Then combine the two piles so that all the cards are face up. There is no need to put the cards in the envelopes as the next games need all the cards.

Worksheet 18. Distribute the worksheets. Tell them to find the 6 row. Say: The first six multiples are in the 6 row. Ask: Where are the rest of the 6s? [They continue down in the 36 column to 60.] See the left figure below.

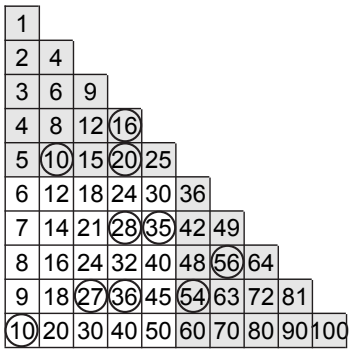
Tell them to find 6 × 8. See the left figure below. Then tell them to find 8 × 6. See the right figure. Ask: What do you notice? [The product is in the same cell.]





No counting is necessary because the cells are grouped by fives.

Tell them to complete the worksheet. The solutions are below.



4 × 4 = **16**
9 × 4 = **36**
8 × 7 = **56**
5 × 7 = **35**
9 × 6 = **54**
7 × 4 = **28**

4 × 5 = **20**
2 × 5 = **10**
7 × 8 = **56**
3 × 9 = **27**
6 × 9 = **54**
10 × 1 = **10**

3	8	6	4	9	2	10	7	5	9	8
× 4	× 9	× 8	× 6	× 7	× 7	× 4	× 6	× 8	× 9	× 8
12	**72**	**48**	**24**	**63**	**14**	**40**	**42**	**40**	**81**	**64**

The last number in a row **is a square number.**
Number of cells in row 7 is **7**; 8 is **8**; 5 is **5;** 10 is **10.**

In conclusion. Tell them to say the facts for the square numbers: [1 × 1 = 1, 2 × 2 = 4, . . . , 10 × 10 = 100]

3.OA.D.9, 3.OA.C.7

Name: _____

Date: _____

Short Multiplication Table

1									
2	4								
3	6	9							
4	8	12	16						
5	10	15	20	25					
6	12	18	24	30	36				
7	14	21	28	35	42	49			
8	16	24	32	40	48	56	64		
9	18	27	36	45	54	63	72	81	
10	20	30	40	50	60	70	80	90	100

Use the short multiplication table to find the following products. Then circle the products on the short multiplication table.

4 × 4 = _____ 4 × 5 = _____

9 × 4 = _____ 2 × 5 = _____

8 × 7 = _____ 7 × 8 = _____

5 × 7 = _____ 3 × 9 = _____

9 × 6 = _____ 6 × 9 = _____

7 × 4 = _____ 10 × 1 = _____

Find the following products any way you like.

3	8	6	4	9	2	10	7	5	9	8
× 4	× 9	× 8	× 6	× 7	× 7	× 4	× 6	× 8	× 9	× 8

On the short multiplication table, what is special about the last number in each row?

_____

How many cells are in row 7? _____ in row 8? _____ in row 5? _____ in row 10? _____

Lesson 104: Area of Tangram Pieces

OBJECTIVE:

1. To find the total area by adding the areas of its parts

MATERIALS:

1. Worksheet 84, Area of Tangram Pieces
2. Demonstration clock
3. A set of tangrams for each child
4. Rulers (for drawing straight lines), optional

ACTIVITIES FOR TEACHING:

Warm-up. Distribute the worksheets to the children. Tell them to do just the warm-up section. Solutions are:

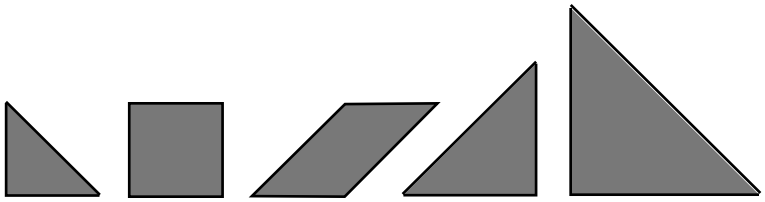
6834 **(3)**	6834 **(3)**	6834 **(3)**
× 7 **(7)**	− 4386 **(3)**	+ 4386 **(3)**
28	**2448 (0)**	**11220 (6)**
210		
5600		
42000		
47838 (3)		

Tell the children to say the time set on the demonstration clock. Include time to the minute, such as 6:03, 2:54, 8:29, and 10:41.

The tangram pieces. Distribute a set of tangrams to each child.

Tell the children: Find the smallest triangle. We will call its area 1 unit^2. Ask: What is the area of the other small triangle? [1 unit^2] What is the area of the square? [2 unit^2] How do you know? [Two small triangles fill the square.]

Ask: What is the area of the parallelogram? [2 unit^2] What is the area of the medium triangle? [2 unit^2] What is the area of the large triangle? [4 unit^2] See below.



Ask: What is the total area of all seven pieces? [16 unit^2]

Worksheet 84. Tell them to write the area of the tangram pieces on the worksheet.

Tell them to look at the 10 outlines. Ask: Which ones do you think have the largest area? Tell them: Put a little x near the ones that you think are the largest. You will see how close your guess was when you finish the worksheet.

EXPLANATIONS:

Remember to read "1 unit^2" as "one square unit."

Although area is referred to as "square" units, it is not necessary that it be in the shape of a square. Any two-dimensional shape will work.

Actually, the area of the smallest triangle in the tangram set is very close to 1 in^2 – it is 0.97 in^2.

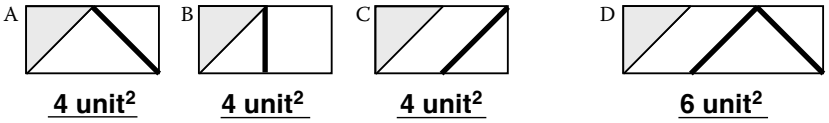
See page iii, number 15 of "Some General Thoughts on Teaching Mathematics," for additional information.

ACTIVITIES FOR TEACHING:

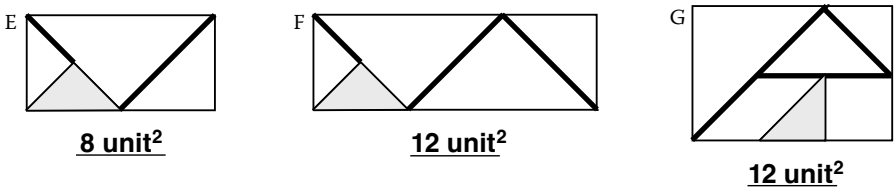
Tell them: You are to make the shape shown on the worksheet with the tangram pieces. The first three, A, B, and C, have the same shape, but can be made three different ways. Make the shapes and draw them on your worksheet. Notice the position of the small triangle in each figure. You may use a ruler if you want.

Tell the children to share their answers with their neighbor and then the class. Ask: What is the area of each figure? [4 unit^2] How did you figure it out? [The two small triangles each has 1 unit^2 and the other piece has 2 unit^2 giving a total of 4 unit^2.]

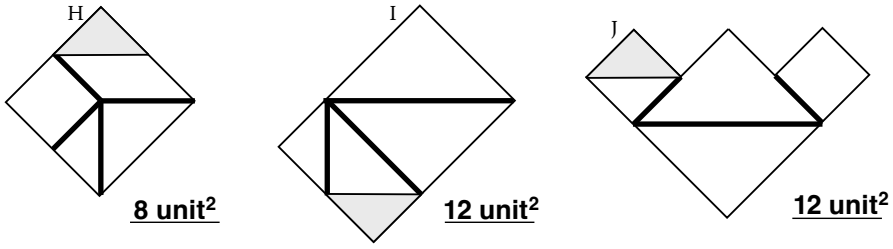
Tell them to complete the worksheet. Remind them to make each shape with their tangram pieces before copying to the worksheet. Solutions are shown below.



4 unit^2 **4 unit^2** **4 unit^2** **6 unit^2**



8 unit^2 **12 unit^2** **12 unit^2**



8 unit^2 **12 unit^2** **12 unit^2**

EXPLANATIONS:

Many of these outlines have more than one solution.

After they have completed the worksheet, ask: Did you guess correctly which shapes had the largest areas?

In conclusion. Ask: Did you notice that the areas of all the figures on the worksheet are even numbers? What would you have to do to make a tangram shape with an odd number of square units? [Use only one of the small triangles.]

If there is additional time following this lesson, have the children choose a game to play.

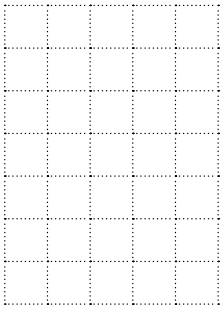
3.MD.C.5, 3.MD.C.5.B, 3.MD.C.6

Name: _____

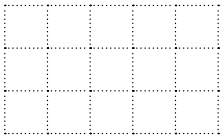
Date: _____

Warm-Up

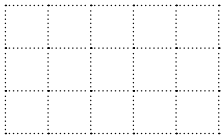
Multiply 6834 × 7.



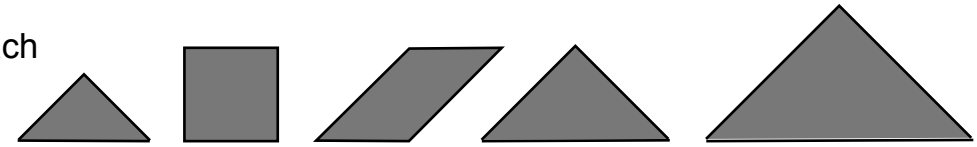
Find 6834 – 4386.



Find 6834 + 4386.



Write the area of each tangram piece.

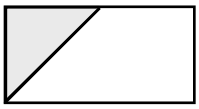


1 unit^2

_____ _____ _____ _____

Use tangram pieces and draw lines to show the position of the tangram pieces in each figure below. Also give its area in unit^2. Do the first three in different ways.

A



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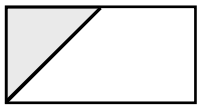
B



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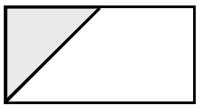
C



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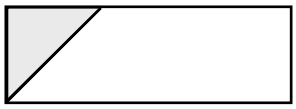
D



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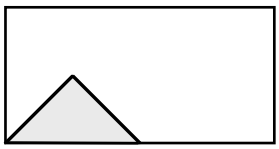
E



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F

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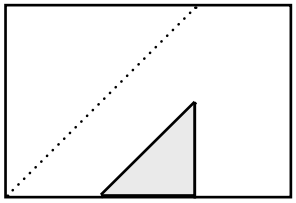
G



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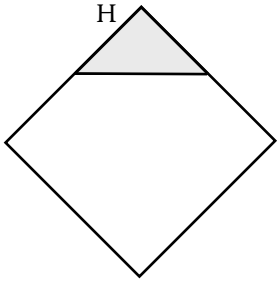
H



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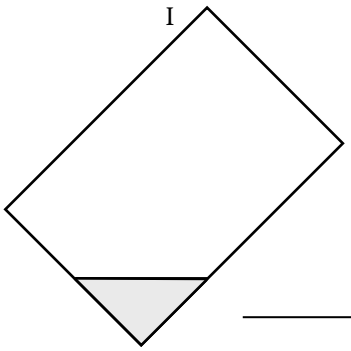
I



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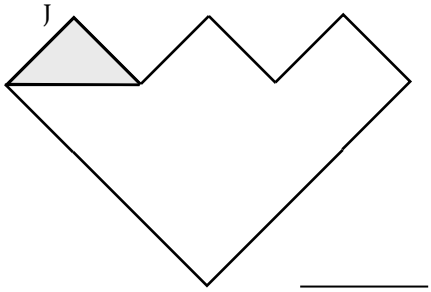
J



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