Warm Up

CST Released Test Question

What number can be multiplied by 5768 to give the answer 5768?

5768 × ☐ = 5768

A 0

B 1

C 2

D 10

Challenge: Find product.

$2 \times 4 \times 9 \times 0 \times 6 =$ _____

Current:

Draw three different models to solve 3 x 5 = ___.

Challenge: Write a story that goes with the equation.

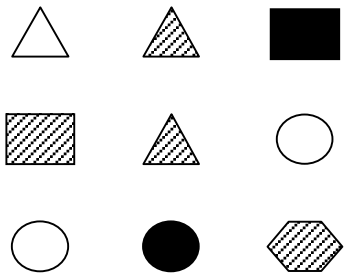
Review:

Part 1: What fraction of the group is….

striped triangles? _____

black rectangles? _____

shapes? _____



Challenge: What other fractions could you use to describe this group?

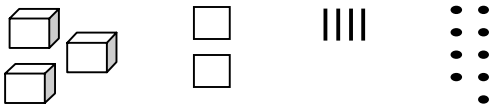
Other

Add 100 each time. Use the models if you need to.

3,249 _____ _____ _____

_____ _____ _____

_____ _____ _____



Challenge: Plot 3,249 on an open number line.

Warm Up *Debrief*

Question:

CST Released Test Question

What number can be multiplied by 5768 to give the answer 5768?

5768 × [*1*] = 5768

A 0

B 1

C 2

D 10

Challenge: Find product.

$2\times4\times9\times0\times6=$ **0**

Debrief:

Write this as an equation:

$\_\_\_\_\times5768=5768$ or $5768\times\_\_\_=5768$

A is 0. What do we know about 0?(Anything multiplied by 0 = 0), so that won't work. 5768 x 0 = 0

B is 1. What do we know about 1? (Anything multiplied by 1 = itself.) That might work. 5768 x 1 = 5768. **B is correct.**

C is 2. That doubles the number. We'd need to add 5768 + 5768. (Sum is 11,536.)

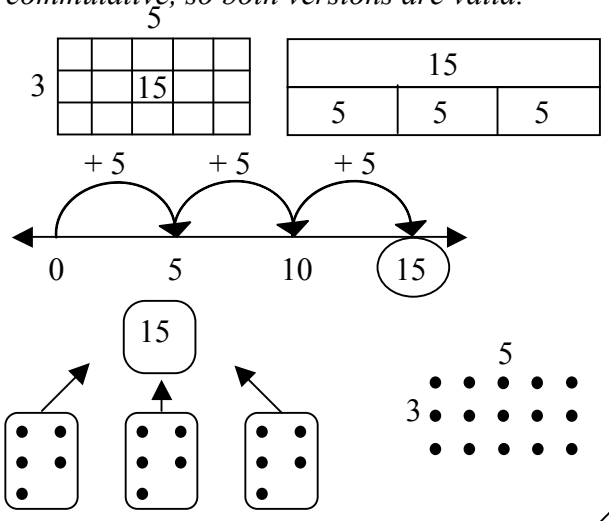
D is tricky. We are going to work with multiplying larger numbers by 10 today in our lesson. (The product is 57,680.)

Challenge: I could work out the whole thing if I wanted, but I can see right away that 0 is one of the factors. Since **anything** multiplied by 0 is 0, I don't have to multiply everything out. The product is 0.

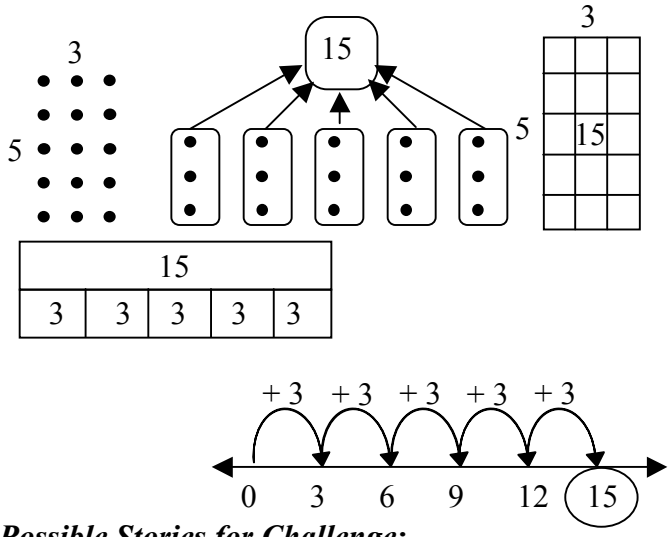
Current:

Draw three different models to solve 3 x 5 = ___.

Have students show the models they made. Remind students that multiplication is commutative, so both versions are valid.



Challenge: Write a story that goes with the equation.

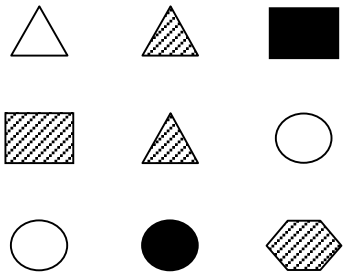
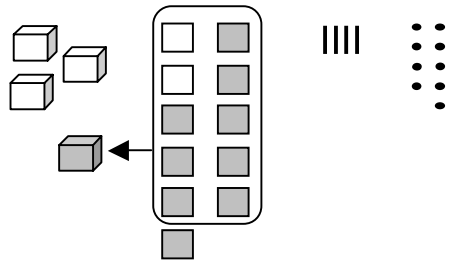
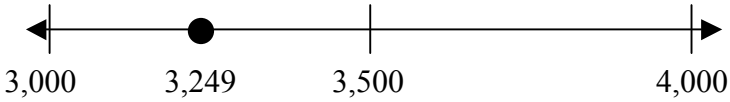


Possible Stories for Challenge:

Joe bought 3 bags of popcorn for $5 each. How much money did he spend altogether?

It takes 5 minutes to walk across the school yard. How long would it take to walk across the yard 3 times?

Warm Up *Debrief*

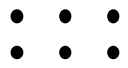
Question:	*Debrief:*
Review: **Part 1:** What fraction of the group is…. striped triangles? $\frac{2}{9}$ black rectangles? $\frac{1}{9}$ shapes? $\frac{9}{9}$  **Challenge:** What other fractions could you use to describe this group?	How many members are in the group? (9) So what will our denominator be? (9) How many ◬ are there? (2) So 2 out of 9 or $\frac{2}{9}$ of the group are ◬. How many ▬ are there? (1) So 1 out of 9 or $\frac{1}{9}$ of the group are ▬. How many **shapes** are there? (9) So 9 out of 9 or $\frac{9}{9}$ of the group are **shapes**. We can draw 1 around $\frac{9}{9}$ because it represents one whole group. ***Possible Fractions for the Challenge:*** $\frac{3}{9}$ are triangles $\frac{2}{9}$ are white circles $\frac{6}{9}$ are not triangles $\frac{3}{9}$ have more than 3 sides
Other Add 100 each time. Use the models if you need to. 3,249 *3,349* *3,449* *3,549* *3,659* *3,749* *3,849* *3,949* *4,049* *4,149*  **Challenge**: Plot 3,249 on an open number line. *(Answers will vary. See example.)* →	If you have students that need support from the models, one hundred ▢ can be added the picture. One way to prompt is… What are we adding? (100) Will we add here? *Point to thousands.* (no) Will we add here? *Point to hundreds.* (yes) Will we add here? *Point to tens.* (no) Will we add here? *Point to ones.* (no) *Draw one ▢ at a time and have the class read the number entirely before writing it down. After a few of these, the students are ready to do without. Double check when moving from 3,949 to 4,049.* ***Possible Number Line for the Challenge:*** 

Multiplying by Multiples of Ten
Grades 3 and 4 (Part 1)

Objectives: Students draw semi -concrete representations of expressions such as 2 × 50 and 3 × 300 and recognize the similarities between those expressions and the corresponding basic facts: This lesson can take a couple days, so it is split into 2 parts.

After the Warm Up….Raise your hand if you know how to multiply 2 × 3. If you know 2 × 3, you know 2 × 30, 2 × 300, and 2 × 3,000. Today we are going to multiply larger numbers.

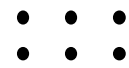
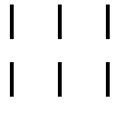
We Do:
In the first section, we are going to draw an array for 2 × 3. I could draw 2 rows of 3 or 3 rows of 2. Thumbs up if this looks correct to you. What is the product? (6)
**It does not matter which way the array is oriented. Both options are shown.*

2 × 3 = 6			
			

----------OR----------

What if I needed to draw an array for 2 x 30? I could draw 2 rows of 30 dots, or I could draw 30 rows of 2 dots. That would take a lot of space and would take a long time. Think to yourselves. Instead of drawing 30 dots, what could I draw instead? (Think Pair Share) Share with your partner your ideas. *Take a quiet hand for ideas. Then…* When we have 10 ones, what do we make? (a rod, a ten). So….we instead of drawing 30 dots, we could draw 3 rods in each row. What's our product? (60) Yes, 60 or 6 tens. Let's write our equation…
2 × 30 = 60.

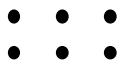
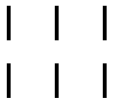
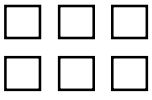
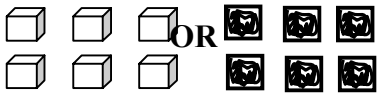
2 × 3 = 6	2 × 30 = 60		
			

Now I'm going to cover up the equations. Take a good look at the **pictures.** Think…. What is the same about the two pictures? What is different? (Think Pair Share) Share with your partner your ideas. *Take quiet hands to share.* In both pictures, there are 6 objects. In both pictures, there are 2 rows of 3 or 3 rows of 2. The difference is **value** of the objects. **Value** is what something is worth.

What is the value of each object in the first picture? (**one)**
What is the value of each object in the second picture? **(ten)**

Now… on your worksheet, write the equations I wrote, leaving extra space above them because are going to write somehting there later. Also draw the arrays.

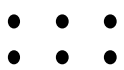
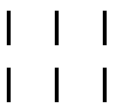
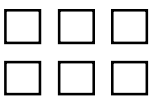
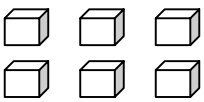
What if each object was worth one hundred? What would that picture look like? Share with your partner. Thumbs up if you have an idea. (2 rows of 3 hundreds). Draw that for me. What would be the equation? (2 × 300 = 600)
What if each object was worth one thousand? (*same prompt)* (If drawing a  is labor intensive for the students, they can represent 1,000 with a filled in square instead  .

2 × 3 = 6	2 × 30 = 60	2 × 300 = 600	2 × 3,000 = 6,000
			

Thumbs up if you're with me so far. Now I think we're ready for some algebra. This is advanced, but I think you're ready. Who's up for it?

Look back at the basic equation: 2 × 3 = 6. How much was each object worth in that picture? (one). Yes, we have 2 rows of 3 **ones**. Our new equation is 2 × 3 **ones** = 6 **ones.**
In the second picture, how much is each object worth? (ten). Yes, we have 2 rows of 3 **tens**. Our new equation is 2 × 3 **T** = 6 **T** *(read 2 × 3 tens = 6 tens).* The **T** stands for ten (T = 10). In algebra, we use letters to stand for numbers.

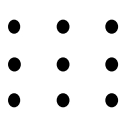
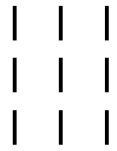
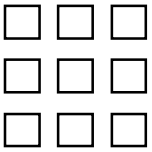
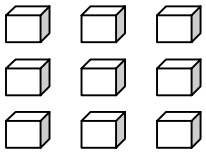
Think…What will we use to stand for hundreds? (Think Pair Share) *Take a quiet hand.* Okay, H will stand for hundred. (H = 100) What will our new equation be in the third section?. Share with your partner? Thumbs up if you know? Everyone: (2 × 3 **H** = 6 **H***)-(Read 2 ×3 hundreds = 6 hundreds).*
What about the last section? What will we use to stand for **thousands**? Students come up with **TH.**
What will our equation be? (2 × 3 **TH** = 6 **TH**).

2 × 3 ones = 6 ones 2 × 3 = 6	2 × 3 T = 6 T 2 × 30 = 60	2 × 3 H = 6 H 2 × 300 = 600	2 × 3 TH = 6 TH 2 × 3,000 = 6,000
			

You Try: Draw the arrays for the following equations. Then write the top equations (algebra equations) like we did before.

3 × 3 = ☐	3 × 30 = ☐	3 × 300 = ☐	3 × 3,000 = ☐

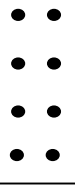
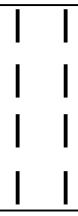
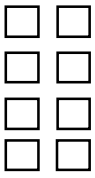
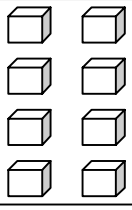
Debrief. *(Include reading both equations in each section to emphasize that the equations are basically the same.)*

3 × 3 ones = 9 ones 3 × 3 = 9	3 × 3 T = 9 T 3 × 30 = 90	3 × 3 H = 9 H 3 × 300 = 900	3 × 3 TH = 9 TH 3 × 3,000 = 9,000
			

You Try #2: Draw the arrays for the following equations. Then write the top equations (algebra equations) like we did before.

2 × 4 = ☐	2 × 40 = ☐	2 × 400 = ☐	2 × 4,000 = ☐

Debrief: *(Include reading both equations in each section to emphasize that the equations are basically the same.)*

2 × 4 ones = 8 ones 2 × 4 = 8	2 × 4 T = 8 T 2 × 40 = 80	2 × 4 H = 8 H 2 × 400 = 800	2 × 4 TH = 8 TH 2 × 4,000 = 8,000
			

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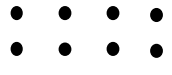
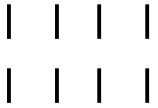
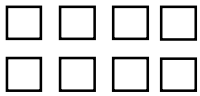
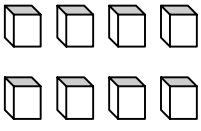
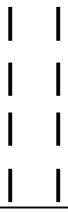
			

The last section can be used as a challenge. Once the students feel successful with the basic skill, a challenge can fun for them. ***One option*** *is to have the students work with equations that you provide that are in a slightly different format.*

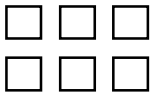
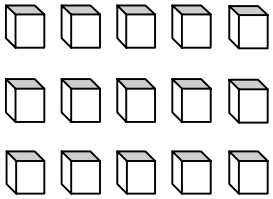
Challenge #1: 20 × 4

Debrief:

2 T × 4 = 8T 20 × 4 = 80			
			

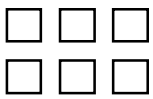
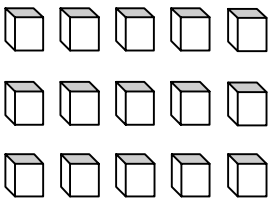
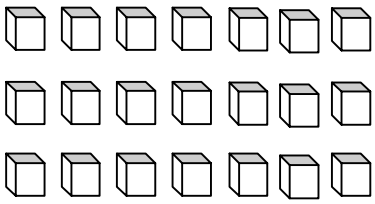
Challenge #2, and #3: 200 × 3 and 5,000 × 3

Debrief:

2 T × 4 = 8T 20 × 4 = 80	2 H × 3 = 6 H 200 × 3 = 600	5 TH × 3 = 15TH 5,000 × 3 = 15,000	
			

Challenge #4: 3,000 × 7

Debrief:

2 T × 4 = 8T 20 × 4 = 80	2 H × 3 = 6 H 200 × 3 = 600	5 TH × 3 = 15TH 5,000 × 3 = 15,000	3 TH × 7 = 21 TH 3,000 × 7 = 21,000
			

Another challenge option *is to have the students come up with their own expressions and draw arrays for them.*

(Part 2)
Multiplying by Multiples of Ten
Grade 3

Warm Up should include a problem from the previous lesson. *Example: Draw an array and write an algebra equation for 2 × 400.*

It's also recommended that the teacher establishes how the class will represent 10,000 as a model. This lesson follows the cube, rod, flat pattern that goes with each period. If students take too long making thousand cubes and ten thousand rods, then a simplified version can be used as suggested below.

Thousand Ten Thousand (or) Thousand Ten Thousand

We Do: ***(Students can do this first part on their own.)*** **Draw an array for each of the following equations. Do not write the algebra equations. We will do that part together**.

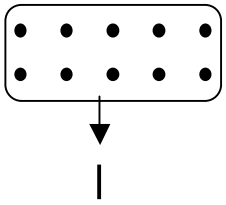
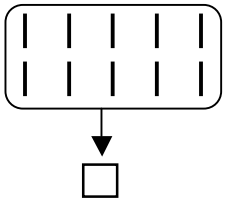
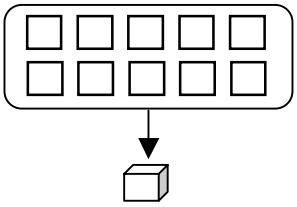
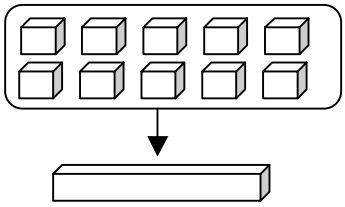
2 × 5 = ☐	2 × 50 = ☐	2 × 500 = ☐	2 × 5,000 = ☐

Debrief.

2 × 5 = 10	2 × 50 = 100	2 × 500 = 1,000	2 × 5,000 = 10,000
• • • • • • • • • •	| | | | | | | | | |	□ □ □ □ □ □ □ □ □ □	

Now we're going to write the algebra equations. In the first picture, we have 2 rows of 5 ones. How many ones does that make? (10) So…our equation is 2 × 5 ones = 10 ones. What do we do when we have 10 ones? (We make a ten.) In our picture, let's circle the 10 ones to make a ten. (10 ones = 10)

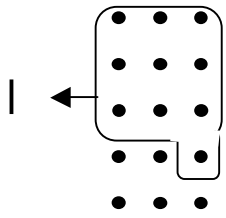
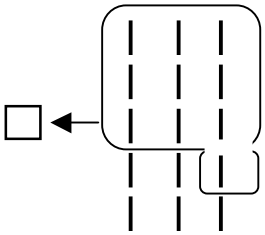
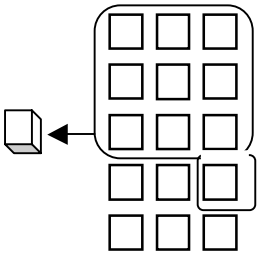
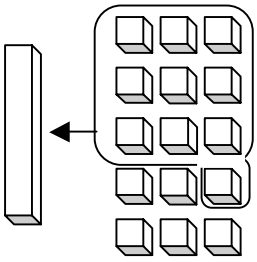
(Continue the same for each section. It's most important to recognize 10 tens = 100 and 10 hundreds = 1,000. Read each set of equations after the chart is completed.)

2 × 5 ones = 10 ones 2 × 5 = 10	2 × 5 T = 10 T 2 × 50 = 100	2 × 5 H = 10 H 2 × 500 = 1,000	2 × 5 TH = 10 TH 2 × 5,000 = 10,000
			

You Try: Draw an array and write the algebra equation for the <u>first 2 sections</u>. ***(After debrief, have them try the next couple sections at a time.)***

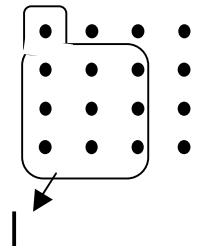
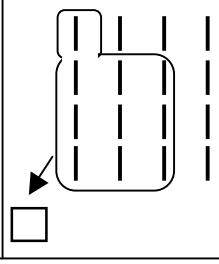
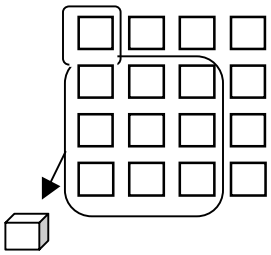
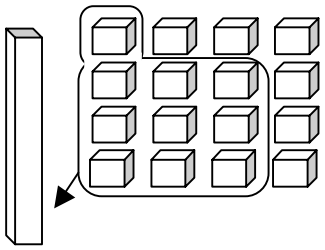
3 × 5 =	3 × 50 =		

Debrief… Read each equation, noting 15 tens = 150, 15 hundreds = 1,500, etc.

3 × 5 ones = 15 ones 3 × 5 = 15	3 × 5 T = 15 T 3 × 50 = 150	3 × 5 H = 15 H 3 × 500 = 1,500	3 × 5 TH = 15 TH 3 × 5,000 = 15,000
			

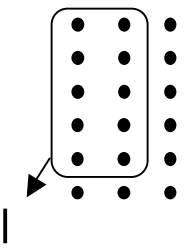
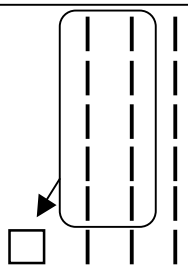
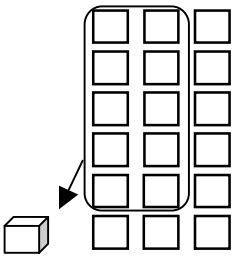
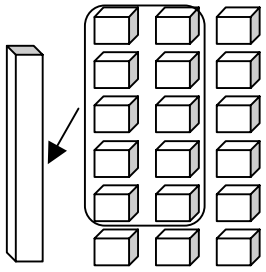
You Try #2: 4 × 4 4 × 40 4 × 400 4 × 4,000

Debrief: Read each equation, noting 16 tens = 160, 16 hundreds = 1,600, etc

4 × 4 ones = 16 ones 4 × 4 = 16	4 × 4 T = 16 T 4 × 40 = 160	4 × 4 H = 16 H 4 × 400 = 1,600	4 × 4 TH = 16 TH 4 × 4,000 = 16,000
			

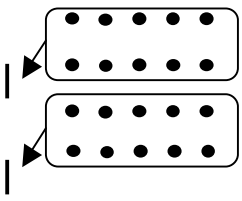
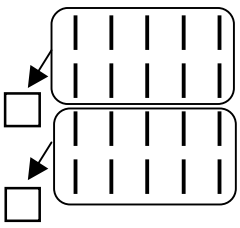
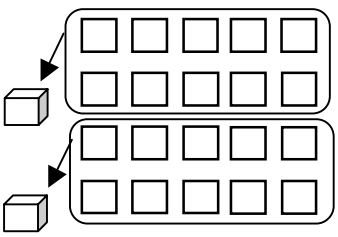
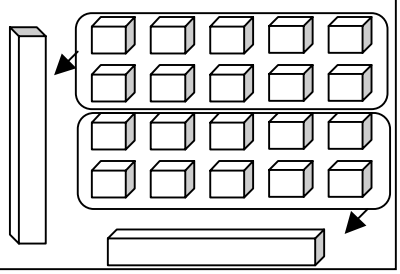
You Try # 3: 6 × 3 6 × 30 6 × 300 6 × 3,000

Debrief: Read each equation, noting 18 tens = 180, 18 hundreds = 1,800, etc.

6 × 3 ones = 18 ones 6 × 3 = 18	6 × 3 T = 18 T 6 × 30 = 180	6 × 3 H = 18 H 6 × 300 = 1,800	6 × 3 TH = 18 TH 6 × 3,000 = 18,000
			

You Try #3 Alternate: 4 × 5 4 × 50 4 × 500 4 × 5,000

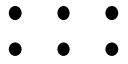
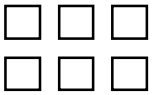
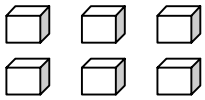
Debrief: Read each equation, noting 20 tens = 200, 20 hundreds = 2,000, etc .

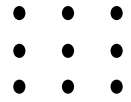
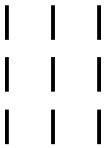
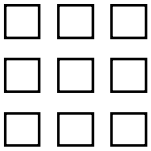
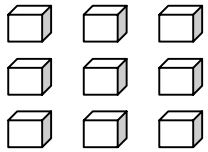
4 × 5 ones = 20 ones 4 × 5 = 20	4 × 5 T = 20 T 4 × 50 = 200	4 × 5 H = 20 H 4 × 500 = 2,000	4 × 5 TH = 20 TH 4 × 5,000 = 20,000
			

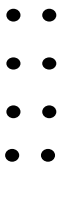
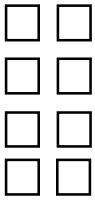
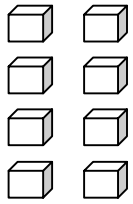
Exit Card Problem: Draw an array for 2 x 700. Write both types of equations.

Multiplying Larger Numbers Worksheet

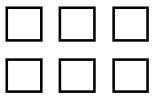
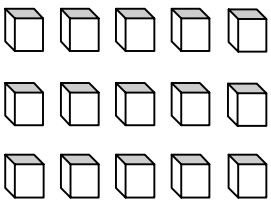
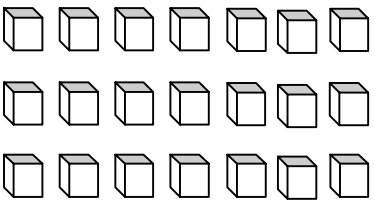
Multiplying Larger Numbers Worksheet
(Part 1 Completed -Orientation of Arrays will Vary)

2 × 3 ones = 6 ones 2 × 3 = 6	2 × 3 T = 6 T 2 × 30 = 60	2 × 3 H = 6 H 2 × 300 = 600	2 × 3 TH = 6 TH 2 × 3,000 = 6,000
			

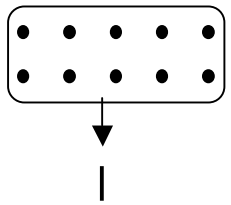
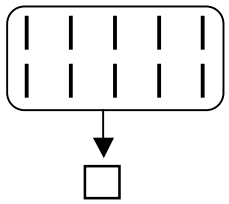
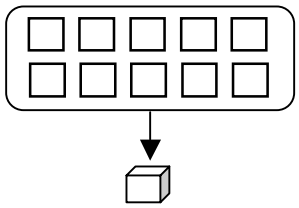
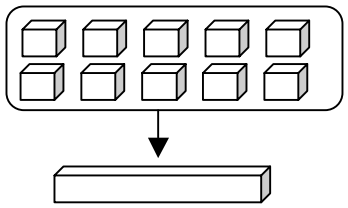
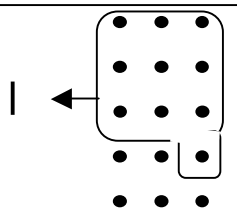
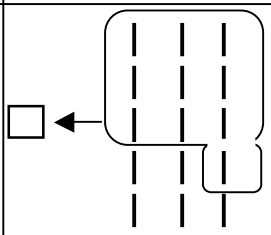
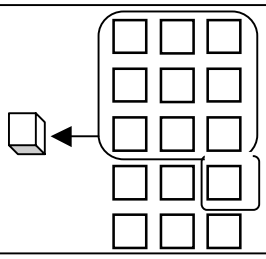
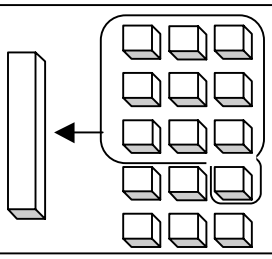
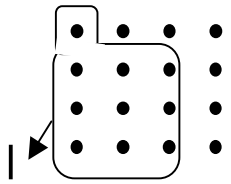
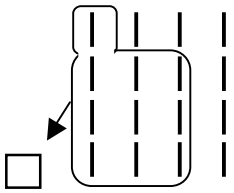
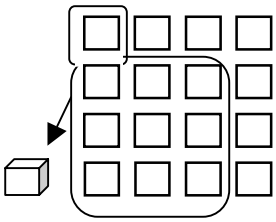
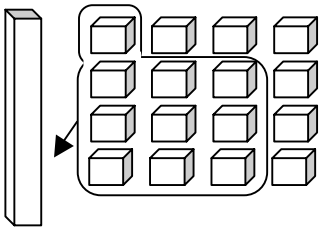
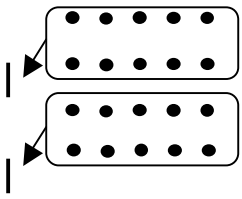
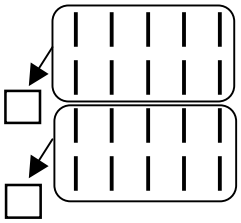
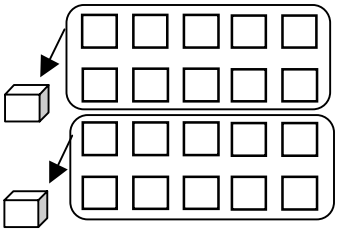
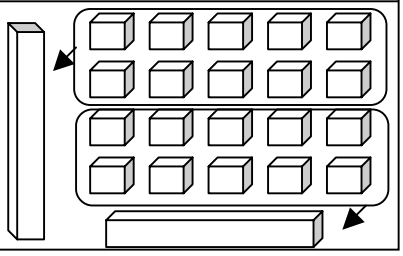
3 × 3 ones = 9 ones 3 × 3 = 9	3 × 3 T = 9 T 3 × 30 = 90	3 × 3 H = 9 H 3 × 300 = 900	3 × 3 TH = 9 TH 3 × 3,000 = 9,000
			

2 × 4 ones = 8 ones 2 × 4 = 8	2 × 4 T = 8 T 2 × 40 = 80	2 × 4 H = 8 H 2 × 400 = 800	2 × 4 TH = 8 TH 2 × 4,000 = 8,000
			

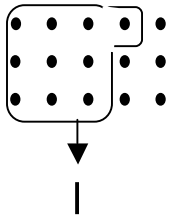
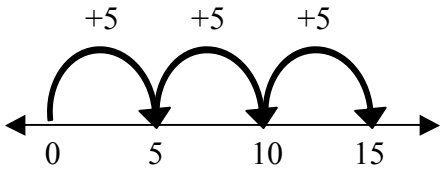
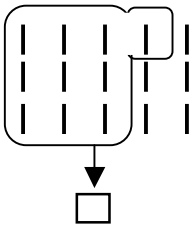
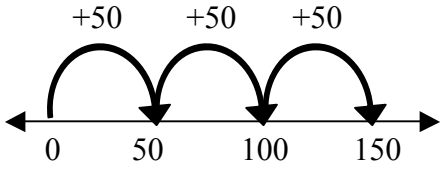
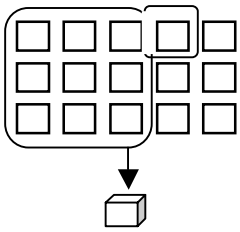
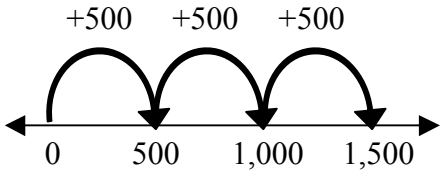
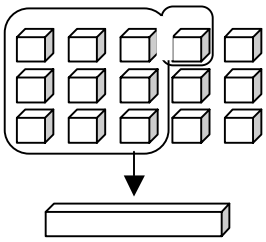
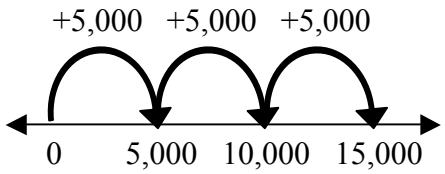
Challenge

2 T × 4 = 8T 20 × 4 = 80	2 H × 3 = 6 H 200 × 3 = 600	5 TH × 3 = 15TH 5,000 × 3 = 15,000	3 TH × 7 = 21 TH 3,000 × 7 = 21,000
			

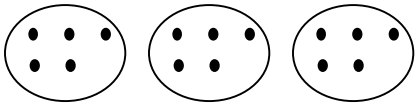
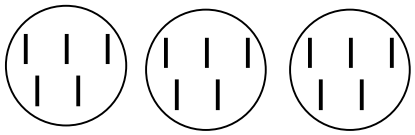
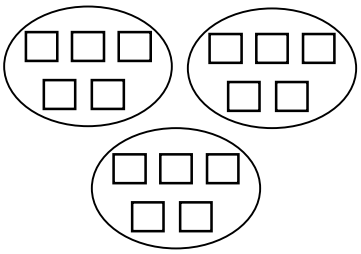
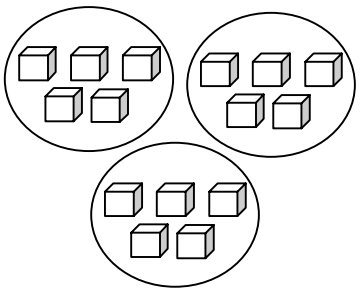
Multiplying Larger Numbers Worksheet
(Part 2 Completed- Orientation of Arrays will Vary)

2 × 5 ones = 10 ones 2 × 5 = 10	2 × 5 T = 10 T 2 × 50 = 100	2 × 5 H = 10 H 2 × 500 = 1,000	2 × 5 TH = 10 TH 2 × 5,000 = 10,000
			
3 × 5 ones = 15 ones 3 × 5 = 15	3 × 5 T = 15 T 3 × 50 = 150	3 × 5 H = 15 H 3 × 500 = 1,500	3 × 5 TH = 15 TH 3 × 5,000 = 15,000
			
4 × 4 ones = 16 ones 4 × 4 = 16	4 × 4 T = 16 T 4 × 40 = 160	4 × 4 H = 16 H 4 × 400 = 1,600	4 × 4 TH = 16 TH 4 × 4,000 = 16,000
			
4 × 5 ones = 20 ones 4 × 5 = 20	4 × 5 T = 20 T 4 × 50 = 200	4 × 5 H = 20 H 4 × 500 = 2,000	4 × 5 TH = 20 TH 4 × 5,000 = 20,000
			

Extensions: Multiple Methods Side by Side (Page 1)

Multiplication Equations	Arrays	Number Line	Repeated Addition
3×5 ones = 15 ones $3 \times 5 = 15$			5 5 + 5 15
3×5 T = 15 T $3 \times 50 = 150$			50 50 + 50 150
3×5 H = 15 H $3 \times 500 = 1,500$			500 500 + 500 1,500
3×5 TH = 15 TH $3 \times 5{,}000 = 15{,}000$			5,000 5,000 + 5,000 15,000

Extensions: Multiple Methods Side by Side (Page 2)

Grouping Model	Algebra Proof	Bar Model
	$3\times5=\boxed{15}$	15 | 5 | 5 | 5
	3×50 $=3\times(5\times10)$ $=(3\times5)\times10$ $=15\times10$ $=\boxed{150}$	150 | 50 | 50 | 50
	3×500 $=3\times(5\times100)$ $=(3\times5)\times100$ $=15\times100$ $=\boxed{1{,}500}$	1,500 | 500 | 500 | 500
	$3\times5{,}000$ $=3\times(5\times1{,}000)$ $=(3\times5)\times1{,}000$ $=15\times1{,}000$ $=\boxed{15{,}000}$	15,000 | 5,000 | 5,000 | 5,000

This extends well to multi-digit by multi-digit. Example:

30×500
$=(3\times10)\times(5\times100)$
$=(3\times5)\times(10\times100)$
$=15\times1{,}000$
$=\boxed{15{,}000}$