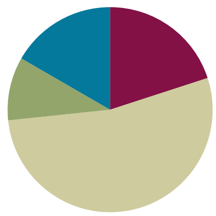
Lesson 1

Objective: Multiply multi-digit whole numbers and multiples of 10 using place value patterns and the distributive and associative properties.

Suggested Lesson Structure

Fluency Practice	(12 minutes)
Application Problem	(6 minutes)
Concept Development	(32 minutes)
Student Debrief	(10 minutes)
Total Time	**(60 minutes)**



Fluency Practice (12 minutes)

- Multiply by 10, 100, and 1,000 **5.NBT.2** (3 minutes)
- Place Value **5.NBT.3** (4 minutes)
- Round to Different Place Values **5.NBT.4** (5 minutes)

Multiply by 10, 100, and 1,000 (3 minutes)

Note: This fluency activity reviews Module 1 skills and lays the groundwork for today's lesson in which both factors are multiples of 10.

T: (Write 3 × 10.) Say the product.
S: 30.

NOTES ON MULTIPLE MEANS FOR ACTION AND EXPRESSION:

Scaffold the Multiply by 10, 100, and 1,000 Fluency activity for students working below grade level and others. Students may benefit from the aid of a place value chart or concrete place value disks, for example. Gradually decrease these scaffolds and encourage independence and strategies through pattern analysis, for example.

Repeat the process using the following possible sequence: 3 × 100; 3 × 1,000; 5 × 1,000; 0.005 × 1,000; 50 × 100; 0.05 × 100; 30 × 100; 30 × 1,000; 32 × 1,000; 0.32 × 1,000; 52 × 100; 5.2 × 100; 4 × 10; 0.4 × 10; 0.45 × 1,000; 30.45 × 1,000; 7 × 100; 72 × 100; and 7.002 × 100.

Place Value (4 minutes)

Note: This fluency exercise reviews composing and decomposing units, crucial to multiplying multiples of 10 in Lesson 2.

Materials: (S) Personal white board, millions through thousandths place value chart (Template)

T: (Project place value chart. Draw 4 tens disks in the tens column.) How many tens do you see?
S: 4 tens.

T: (Write 4 underneath the disks.) There are 4 tens and how many ones?

S: Zero ones.

T: (Write 0 in the ones column. Below it, write 4 tens = ___.) Fill in the blank.

S: 4 tens = 40.

Repeat the process for 4 ten thousands, 4 hundred thousands, 7 millions, and 2 thousands.

T: (Write 5 hundreds = ___.) Show the answer in your place value chart.

S: (Students write 5 in the hundreds column and 0 in the tens and ones columns.)

Repeat the process for 3 tens, 53 tens, 6 ten thousands, 36 ten thousands, 8 hundred thousands 36 ten thousands, 8 millions 24 ten thousands, 8 millions 17 hundred thousands, and 1,034 hundred thousands.

Round to Different Place Values (5 minutes)

Note: Practicing rounding to different place values in isolation helps students when they estimate to find products in Lesson 2.

Materials: (S) Personal white board

T: (Project 8,735.) Say the number.

S: 8,735.

T: Let's round to the thousands, hundreds, and tens places.

T: Draw a vertical number line on your personal white board with two points and a midpoint between them.

T: Between which two thousands is 8,735?

S: 8 thousand and 9 thousand.

T: Label the two outside points with these values.

S: (Label.)

T: What's the midpoint for 8,000 and 9,000?

S: 8,500.

T: Label your number line. 8,500 is the same as how many hundreds?

S: 85 hundreds.

T: How many hundreds are in 8,735?

S: 87 hundreds.

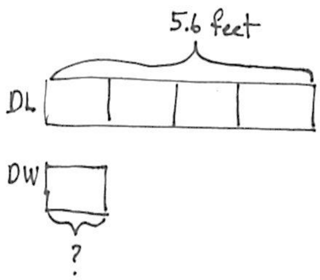
T: (Write 8,735 ≈ ___.) Show 8,735 on your number line and write the number sentence.

S: (Label 8,735 between 8,500 and 9,000 on the number line, and write 8,735 ≈ 9,000.

Students round to the hundreds and tens. Follow the same process and procedure for 7,458.

Application Problem (6 minutes)

The top surface of a desk has a length of 5.6 feet. The length is 4 times its width. What is the width of the desk?



56 tenths ÷ 4 = 14 tenths
14 tenths = 1.4
The width of the desk is 1.4 ft.

Note: This is a review of G5–M1–Topic F, dividing decimals by single-digit whole numbers. Allow students to share their approaches with the class. Accept any valid approach.

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

As the Application Problem is time-based rather than task-based, increase student engagement and decrease possible frustration by making specific goals for students who may need longer than 6 minutes to find their solutions. Monitor student use of Read, Draw, and Write to solve. If students, for example, find drawing accurate and relevant representations challenging, make that a goal. Celebrate every step towards success.

Concept Development (32 minutes)

Materials: (S) Personal white board, millions to thousandths place value chart (Template)

Problems 1–4

4 × 30

40 × 30

40 × 300

4,000 × 30

T: (Write 4 × 30. Below it, write 4 × 3 tens = ____.) To find the product, start by multiplying the whole numbers, remembering to state the unit in your product.

S: 12 tens.

T: Show 12 tens on your place value chart. What is 12 tens in standard form?

S: 120.

T: (Write 4 tens × 3 tens = ____.) Solve with a partner.

S: (Solve.)

T: How did you use the previous problem to help you solve 4 tens × 3 tens?

S: The only difference was the place value unit of the first factor, so it was 12 hundreds. → It's the same as 4 threes times 10 times 10, which is 12 hundreds. → I multiplied 4 × 3, which is 12. I then multiplied tens by tens, so my new units are hundreds. Now, I have 12 hundreds, or 1,200.

T: Let me record what I hear you saying. (Write (4 × 3) × 100.)

T: (Write 4 tens × 3 hundreds = ___ on the board.) How is this problem different than the last problem?

S: We are multiplying tens and hundreds, not ones and hundreds, or tens and tens.

T: 4 tens is the same as 4 times 10. (Write 4 × 10 on the board). 3 hundreds is the same as 3 times what?

S: 100.

T: (Write 3 × 100 next to 4 × 10 on the board.) So, another way to write our problem would be (4 × 10) × (3 × 100). (Now, write (4 × 3) × (10 × 100) on the board.) Are these expressions equal? Why or why not? Turn and talk.

S: Yes, they are the same. → We can multiply in any order, so they are the same.

T: What is 4 × 3?

S: 12.

T: (Record 12 under 4 × 3.) What is 10 × 100?

S: 1,000.

T: (Record 1,000 under 10 × 100.)

T: What is the product of 12 and 1,000?

S: 12,000.

Repeat the sequence with 4,000 × 30.

Problems 5–8

60 × 5

60 × 50

60 × 500

60 × 5,000

MP.7

T: (Write 60 × 5.)

T: (Underneath the expression above, write (6 × 10) × 5 and (6 × 5) × 10.) Are both of these equivalent to 60 × 5? Why or why not? Turn and talk.

T: When we change the order of the factors, we are using the commutative (any-order) property. When we group the factors differently (point to the board), we are using the associative property of multiplication.

T: Let's solve (6 × 5) × 10.

S: (Solve 30 × 10 = 300.)

T: For the next problem, use the properties and what you know about multiplying multiples of 10 to help you solve.

T: (Write 60 × 50 = ___.) Work with a partner to solve, and then explain.

S: I thought of 60 as 6 × 10 and 50 as 5 × 10. I rearranged the factors to see (6 × 5) × (10 × 10). I got 30 × 100 = 3,000. → I first multiplied 6 times 5 and got 30. Then, I multiplied by 10 to get 300, and then multiplied by 10 to get 3,000.

T: I notice that in Problems 5–8 the number of zeros in the product was exactly the same as the number of zeros in our factors. That doesn't seem to be the case here. Why is that?

S: Because 6 × 5 is 30, then we have to multiply by 100. So, 30 ones × 100 is 30 hundreds, or 3,000.

T: Think about that as you solve 60 × 500 and 60 × 5,000 independently.

Problems 9–12

451 × 8

451 × 80

4,510 × 80

4,510 × 800

T: Find the product, 451 × 8, using any method.

S: (Solve to find 3,608.)

T: How did you solve?

S: I used the vertical algorithm. → I used the distributive property. I multiplied 400 × 8, then 50 × 8, and then 1 × 8. I added those products together.

T: What makes the distributive property useful here? Why does it help here when we didn't really use it in our other problems? Turn and talk.

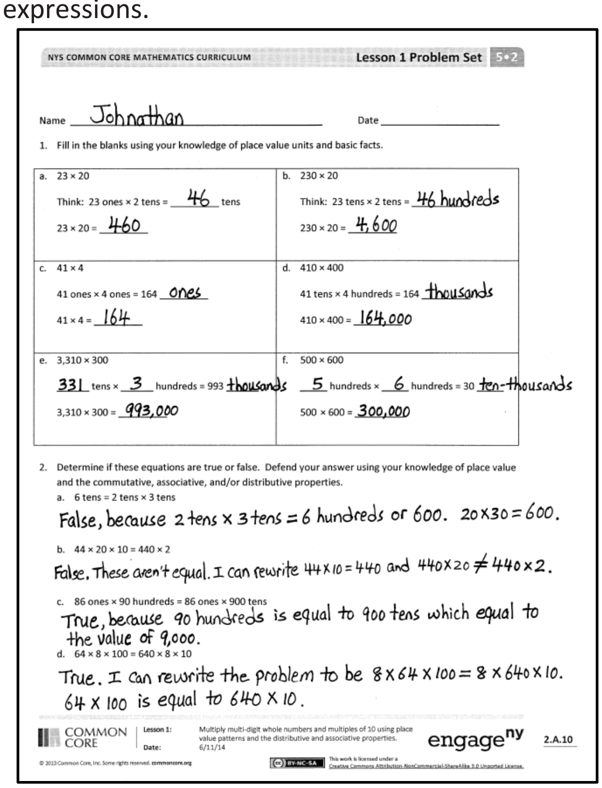
S: There are different digits in three place values instead of all zeros. If I break the number apart by unit, then I can use basic facts to get the products.

T: Turn and talk to your partner about how you can use 451 × 8 to help you solve the 451 × 80, 4,510 × 80, and 4,510 × 800. Then, evaluate these expressions.

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. Some problems do not specify a method for solving. This is an intentional reduction of scaffolding that invokes MP.5, Use Appropriate Tools Strategically. Students should solve these problems using the RDW approach used for Application Problems.

For some classes, it may be appropriate to modify the assignment by specifying which problems students should work on first. With this option, let the purposeful sequencing of the Problem Set guide your selections so that problems continue to be scaffolded. Balance word problems with other problem types to ensure a range of practice. Consider assigning incomplete problems for homework or at another time during the day.


NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 1 Problem Set 5•2

Name Johnathan Date

1. Fill in the blanks using your knowledge of place value units and basic facts.

a. 23 × 20 Think: 23 ones × 2 tens = 46 tens 23 × 20 = 460	b. 230 × 20 Think: 23 tens × 2 tens = 46 hundreds 230 × 20 = 4,600
c. 41 × 4 41 ones × 4 ones = 164 ones 41 × 4 = 164	d. 410 × 400 41 tens × 4 hundreds = 164 thousands 410 × 400 = 164,000
e. 3,310 × 300 331 tens × 3 hundreds = 993 thousands 3,310 × 300 = 993,000	f. 500 × 600 5 hundreds × 6 hundreds = 30 ten-thousands 500 × 600 = 300,000

2. Determine if these equations are true or false. Defend your answer using your knowledge of place value and the commutative, associative, and/or distributive properties.

a. 6 tens = 2 tens × 3 tens

False, because 2 tens × 3 tens = 6 hundreds or 600. 20×30 = 600.

b. 44 × 20 × 10 = 440 × 2

False. These aren't equal. I can rewrite 44×10 = 440 and 440×20 ≠ 440×2.

c. 86 ones × 90 hundreds = 86 ones × 900 tens

True, because 90 hundreds is equal to 900 tens which equal to the value of 9,000.

d. 64 × 8 × 100 = 640 × 8 × 10

True. I can rewrite the problem to be 8 × 64 × 100 = 8 × 640 × 10. 64 × 100 is equal to 640 × 10.

COMMON CORE Lesson 1: Multiply multi-digit whole numbers and multiples of 10 using place value patterns and the distributive and associative properties. Date: 6/11/14 engage^ny 2.A.10

© 2013 Common Core, Inc. Some rights reserved. commoncore.org This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

Student Debrief (10 minutes)

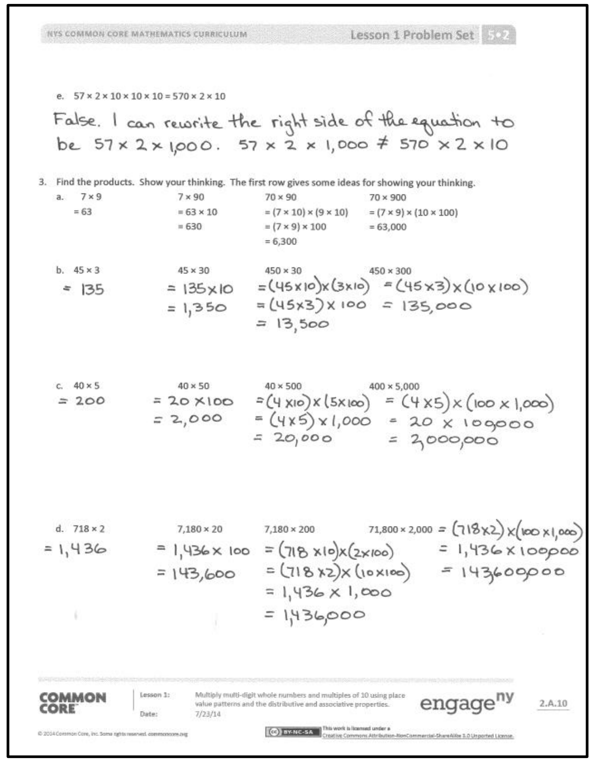
Lesson Objective: Multiply multi-digit whole numbers and multiples of 10 using place value patterns and the distributive and associative properties.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- Take time to compare the various strategies used by students to find the products in Problem 3. Discuss how the parentheses that are used to show thinking directs us toward which part of the equation was grouped and, thus, which part of the expression is evaluated first.
- In Problem 3, for which problem was the distributive property most useful when solving? For which problems is the distributive property unnecessary?
- In Problem 2, was it necessary to solve each expression in order to compare the values? Why or why not? Lead the discussion toward the idea that the commutative, associative, and distributive properties allow us to make those comparisons without calculating.
- Problem 4 raises one of the most common error patterns in multiplying by powers of 10. Take time to explore Ripley's error in thinking by allowing students to share their examples. Is there a pattern to the examples that we have shared? Any example involving 5 times an even number will produce such an example: 4 × 50; 50 × 60; 500 × 80; 2,000 × 50.



NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 1 Problem Set 5•2

e. $57 \times 2 \times 10 \times 10 \times 10 = 570 \times 2 \times 10$

False. I can rewrite the right side of the equation to be $57 \times 2 \times 1{,}000$. $57 \times 2 \times 1{,}000 \neq 570 \times 2 \times 10$

3. Find the products. Show your thinking. The first row gives some ideas for showing your thinking.

a. $7 \times 9 = 63$; $7 \times 90 = 63 \times 10 = 630$; $70 \times 90 = (7 \times 10) \times (9 \times 10) = (7 \times 9) \times 100 = 6{,}300$; $70 \times 900 = (7 \times 9) \times (10 \times 100) = 63{,}000$

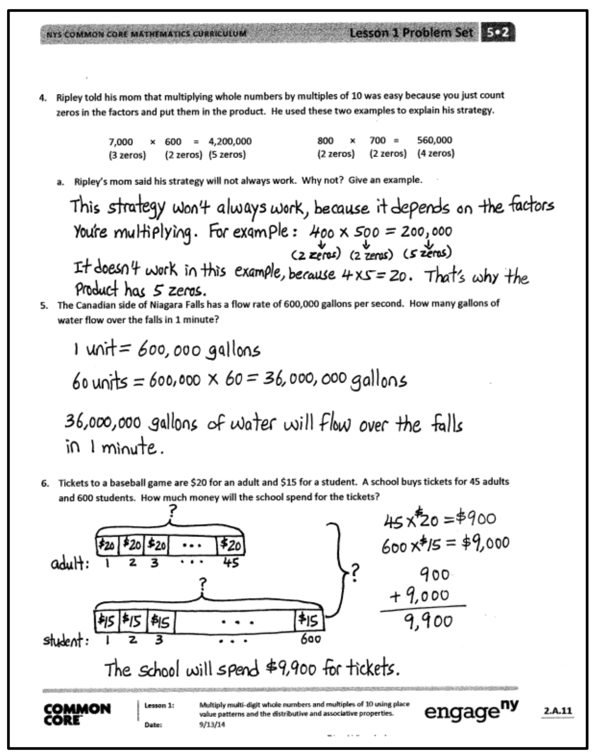
b. $45 \times 3 = 135$; $45 \times 30 = 135 \times 10 = 1{,}350$; $450 \times 30 = (45 \times 10) \times (3 \times 10) = (45 \times 3) \times 100 = 13{,}500$; $450 \times 300 = (45 \times 3) \times (10 \times 100) = 135{,}000$

c. $40 \times 5 = 200$; $40 \times 50 = 20 \times 100 = 2{,}000$; $40 \times 500 = (4 \times 10) \times (5 \times 100) = (4 \times 5) \times 1{,}000 = 20{,}000$; $400 \times 5{,}000 = (4 \times 5) \times (100 \times 1{,}000) = 20 \times 100{,}000 = 2{,}000{,}000$

d. $718 \times 2 = 1{,}436$; $7{,}180 \times 20 = 1{,}436 \times 100 = 143{,}600$; $7{,}180 \times 200 = (718 \times 10) \times (2 \times 100) = (718 \times 2) \times (10 \times 100) = 1{,}436 \times 1{,}000 = 1{,}436{,}000$; $71{,}800 \times 2{,}000 = (718 \times 2) \times (100 \times 1{,}000) = 1{,}436 \times 100{,}000 = 143{,}600{,}000$

COMMON CORE | Lesson 1: Multiply multi-digit whole numbers and multiples of 10 using place value patterns and the distributive and associative properties. | Date: 7/23/14 | engage^ny | 2.A.10

© 2014 Common Core, Inc. Some rights reserved. commoncore.org | This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.



NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 1 Problem Set 5•2

4. Ripley told his mom that multiplying whole numbers by multiples of 10 was easy because you just count zeros in the factors and put them in the product. He used these two examples to explain his strategy.

7,000 (3 zeros) × 600 (2 zeros) = 4,200,000 (5 zeros)   800 (2 zeros) × 700 (2 zeros) = 560,000 (4 zeros)

a. Ripley's mom said his strategy will not always work. Why not? Give an example.

This strategy won't always work, because it depends on the factors you're multiplying. For example: 400 (2 zeros) × 500 (2 zeros) = 200,000 (5 zeros). It doesn't work in this example, because 4 × 5 = 20. That's why the product has 5 zeros.

5. The Canadian side of Niagara Falls has a flow rate of 600,000 gallons per second. How many gallons of water flow over the falls in 1 minute?

1 unit = 600,000 gallons

60 units = 600,000 × 60 = 36,000,000 gallons

36,000,000 gallons of water will flow over the falls in 1 minute.

6. Tickets to a baseball game are $20 for an adult and $15 for a student. A school buys tickets for 45 adults and 600 students. How much money will the school spend for the tickets?

45 × $20 = $900
600 × $15 = $9,000
900 + 9,000 = 9,900

The school will spend $9,900 for tickets.

COMMON CORE | Lesson 1: Multiply multi-digit whole numbers and multiples of 10 using place value patterns and the distributive and associative properties. | Date: 9/13/14 | engage^ny | 2.A.11

- How does understanding place value help you decompose large numbers to make them easier to multiply?
- About 36 million gallons of water leak from the New York City water supply every day. About how many gallons of water leak in one 30-day month? How can the patterns we discovered today about multiplying by 10s, 100s, and 1,000s help us solve this problem?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

Name ____ Date ______________________

1. Fill in the blanks using your knowledge of place value units and basic facts.

a. 23 × 20 Think: 23 ones × 2 tens = __________ tens 23 × 20 = __________	b. 230 × 20 Think: 23 tens × 2 tens = __________ 230 × 20 = __________
c. 41 × 4 41 ones × 4 ones = 164 __________ 41 × 4 = __________	d. 410 × 400 41 tens × 4 hundreds = 164 __________ 410 × 400 = __________
e. 3,310 × 300 ______ tens × ______ hundreds = 993 ______ 3,310 × 300 = __________	f. 500 × 600 ______ hundreds × _____ hundreds = 30 _____ 500 × 600 = __________

2. Determine if these equations are true or false. Defend your answer using your knowledge of place value and the commutative, associative, and/or distributive properties.
   a. 6 tens = 2 tens × 3 tens

   b. 44 × 20 × 10 = 440 × 2

   c. 86 ones × 90 hundreds = 86 ones × 900 tens

   d. 64 × 8 × 100 = 640 × 8 × 10

e. $57 \times 2 \times 10 \times 10 \times 10 = 570 \times 2 \times 10$

3. Find the products. Show your thinking. The first row gives some ideas for showing your thinking.

a.	7×9 $= 63$	7×90 $= 63 \times 10$ $= 630$	70×90 $= (7 \times 10) \times (9 \times 10)$ $= (7 \times 9) \times 100$ $= 6{,}300$	70×900 $= (7 \times 9) \times (10 \times 100)$ $= 63{,}000$
b.	45×3	45×30	450×30	450×300
c.	40×5	40×50	40×500	$400 \times 5{,}000$
d.	718×2	$7{,}180 \times 20$	$7{,}180 \times 200$	$71{,}800 \times 2{,}000$

4. Ripley told his mom that multiplying whole numbers by multiples of 10 was easy because you just count zeros in the factors and put them in the product. He used these two examples to explain his strategy.

7,000	×	600	=	4,200,000	800	×	700	=	560,000
(3 zeros)		(2 zeros)		(5 zeros)	(2 zeros)		(2 zeros)		(4 zeros)

   a. Ripley's mom said his strategy will not always work. Why not? Give an example.

5. The Canadian side of Niagara Falls has a flow rate of 600,000 gallons per second. How many gallons of water flow over the falls in 1 minute?

6. Tickets to a baseball game are \$20 for an adult and \$15 for a student. A school buys tickets for 45 adults and 600 students. How much money will the school spend for the tickets?

Name ____ Date ____________________

1. Find the products.

a. $1{,}900 \times 20$

b. $6{,}000 \times 50$

c. 250×300

2. Explain how knowing $50 \times 4 = 200$ helps you find 500×400.

Name ____ Date _____________________

1. Fill in the blanks using your knowledge of place value units and basic facts.

   a. 43×30

      Think: 43 ones × 3 tens = __________ tens

      43×30 = __________

   b. 430×30

      Think: 43 tens × 3 tens = __________ hundreds

      430×30 = __________

   c. 830×20

      Think: 83 tens × 2 tens = 166 __________

      830×20 = __________

   d. $4,400 \times 400$

      __________ hundreds × __________ hundreds = 176 __________

      $4,400 \times 400$ = __________

   e. $80 \times 5,000$

      __________ tens × __________ thousands = 40 __________

      $80 \times 5,000$ = __________

2. Determine if these equations are true or false. Defend your answer using your knowledge of place value and the commutative, associative, and/or distributive properties.

   a. 35 hundreds = 5 tens × 7 tens

   b. $770 \times 6 = 77 \times 6 \times 100$

   c. 50 tens × 4 hundreds = 40 tens × 5 hundreds

   d. $24 \times 10 \times 90 = 90 \times 2,400$

3. Find the products. Show your thinking. The first row gives some ideas for showing your thinking.

a.

5×5	5×50	50×50	50×500
$= 25$	$= 25 \times 10$	$= (5 \times 10) \times (5 \times 10)$	$= (5 \times 5) \times (10 \times 100)$
	$= 250$	$= (5 \times 5) \times 100$	$= 25{,}000$
		$= 2{,}500$	

b. 80×5 $\quad$ 80×50 $\quad$ 800×500 $\quad$ $8{,}000 \times 50$

c. 637×3 $\quad$ $6{,}370 \times 30$ $\quad$ $6{,}370 \times 300$ $\quad$ $63{,}700 \times 300$

4. A concrete stepping-stone measures 20 square inches. What is the area of 30 such stones?

5. A number is 42,300 when multiplied by 10. Find the product of this number and 500.

1,000,000	100,000	10,000	1,000	100	10	1	•	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1,000}$
Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	•	Tenths	Hundredths	Thousandths
							•			
							•			
							•			
							•			
							•			

millions to thousandths place value chart