

Powerful Ideas with Multiplication

Grades 3-5

RGVCTM

The Rio Grande Valley Council of Teachers of Mathematics



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3.4(E) The students expected to represent multiplication facts by using a variety of approaches such as repeated addition, equal-sized groups, arrays, area models, equal jumps on a number line, and skip counting.

All questions shown below are the sole property of the Texas Education Agency (TEA) and are listed here for informational purposes only.

Question 43 - 2013

9. Janie collected 10 sea stars at the beach. Each sea star had 5 arms, as shown below.



Which expression can be used to find the total number of arms on 10 sea stars?

- A $10 \div 5$
- B $10 - 5$
- C $10 + 5$
- D 10×5

Answer: D



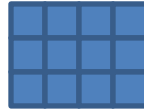
Modeling Multiplication and Division

Explore Activity

Directions: Use color tiles to create arrays representing the products shown. Sketch the arrays and write the number sentence that best represents the array. Answer the debriefing questions.

Example:

Array: 3×4



$3 \times 4 = 12$

<p>Array 1: 4×8</p> <p>Number Sentence: _____</p>	<p>Array 2: 7×3</p> <p>Number Sentence: _____</p>
<p>Array 3: 5×7</p> <p>Number Sentence: _____</p>	<p>Array 4: 6×9</p> <p>Number Sentence: _____</p>
<p>Array 5: 8×7</p> <p>Number Sentence: _____</p>	<p>Array 6: 3×5</p> <p>Number Sentence: _____</p>
<p>Array 7: 2×10</p> <p>Number Sentence: _____</p>	<p>Array 8: 3×10</p> <p>Number Sentence: _____</p>



Debriefing Questions

1. How do the two factors relate to the dimensions of each array?
2. How does the product of the two factors relate to the total number of squares in each array?
3. Which number sentence could be used to record the factors and product of an array with dimensions 8 and 10?
4. How many more squares are contained in Array 5 than in Array 8?





Modeling Multiplication and Division

Elaborate

Directions: Cut out the foldable graphic organizer below. Carefully cut along the dark horizontal lines to create flaps that will fold inward.

Problem Card		Number Sentence Card
Problem Card		Number Sentence Card
Problem Card		Number Sentence Card
Problem Card		Number Sentence Card



Cut out the cards below. Use the cards to complete your foldable by matching each problem situation and number sentence card with the correct array.

A box of candies contains 10 candies. Amanda has 6 boxes of candies. How many candies does Amanda have?	$8 \times 9 = 72$
There are 72 golf balls in a bin. A box holds 9 golf balls. How many boxes are required to contain all of the golf balls?	$6 \times 10 = 60$
There are 8 hot dog buns in a package. Mrs. Cofield purchased 9 packages of hot dog buns. How many hot dog buns did Mrs. Cofield purchase in all?	$60 \div 10 = 6$
10 people are on a fishing trip, and need to evenly share 60 grasshoppers. How many grasshoppers can each person use if they each use the same number of grasshoppers?	$72 \div 9 = 8$





4.4(D) The students expected to use strategies and algorithms, including the standard algorithm, to multiply up to a four-digit number by a one-digit number and to multiply a two-digit number by a two-digit number. Strategies may include mental math, partial products, and the commutative, associative, and distributive properties.

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Question 14– 2014

14. There are 990 football players on high school teams in a city. Each team has the same number of players. Which group of teams could **NOT** describe the teams of football players in this city?
- F** 45 teams with 22 players on each team
 - G** 27 teams with 70 players on each team
 - H** 33 teams with 30 players on each team
 - J** 18 teams with 55 players on each team

Answer: G

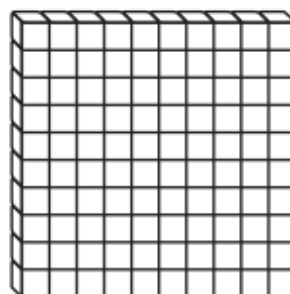
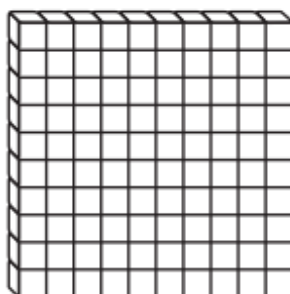
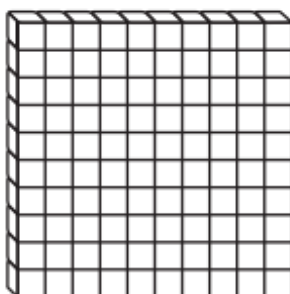
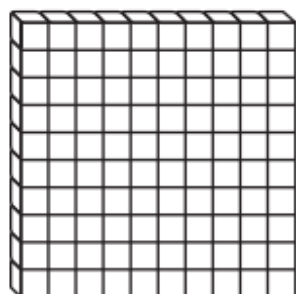
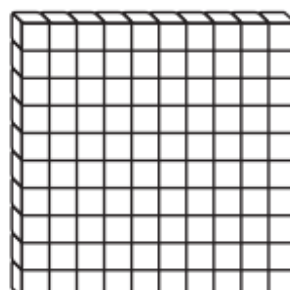
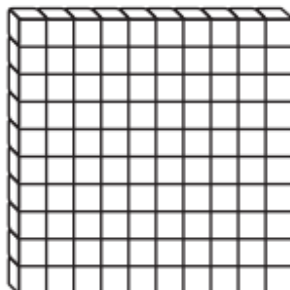
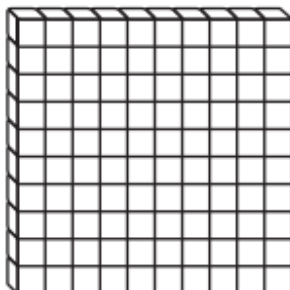
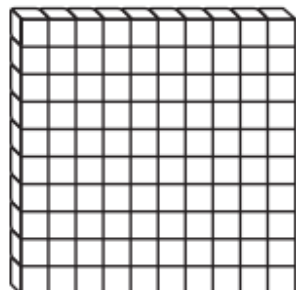
Question 39– 2013

39. There are 39 containers of water for the students at a race. Each container holds 24 quarts of water. How many quarts of water are in the 39 containers?
- A 234 qt
 - B 936 qt
 - C 1,026 qt
 - D 836 qt

Answer: B



Base 10 Blocks





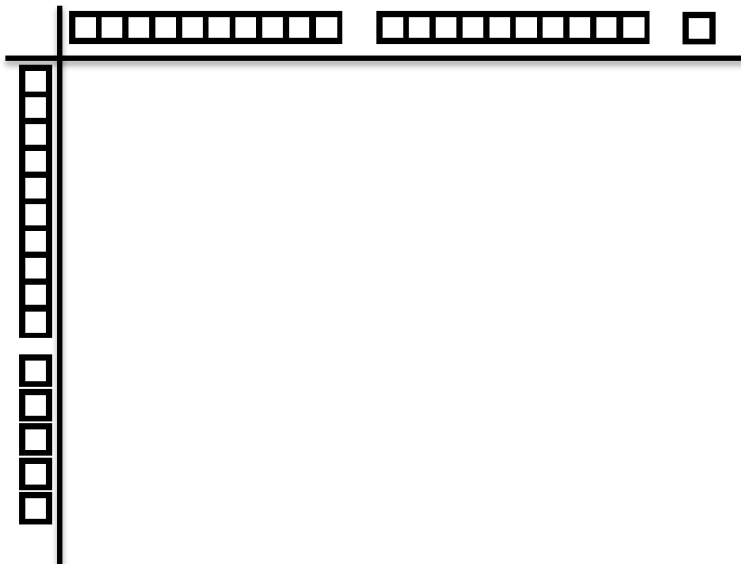
Multiplying Whole Numbers

Explore

Directions: Use base ten blocks to model each multiplication problem below. Use the place value chart to represent the partial products of the multiplication problem. Then, determine the product of the two numbers using either the base ten blocks or the sum of the partial products.

Problem 1: 21×15

Base Ten Blocks



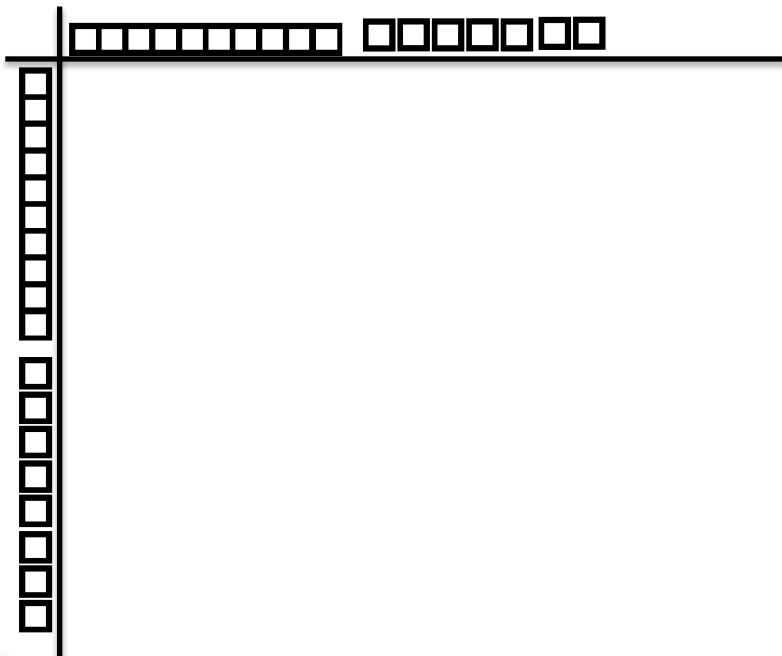
Partial Products

		tens	ones
tens			
ones			

Product:

Problem 2: 17×18

Base Ten Blocks



Partial Products

		tens	ones
tens			
ones			

Product:



Directions: Roll the 4 number cubes. Use the first 2 number cubes to fill in the blanks to create a 2-digit number in the problem. Use the other 2 number cubes to fill in the blanks for the last number in the problem. Once you have numbers, solve the problem using either base ten blocks or a place value chart with partial products.

Problem 3:

There are _____ rows of seats in an auditorium. Each row has _____ seats. How many seats are there in the auditorium?

Problem 4:

There are _____ locations of the Fresh Perk coffee shop. Each store stocks _____ coffee mugs. How many coffee mugs are there altogether?

Debriefing Questions:

1. How does the model you constructed with base ten blocks compare to the partial products?
2. We call the answer to a multiplication problem a *product*. Why is the technique using the place value chart called *partial products*?
3. If you needed to multiply 63×48 , would you rather use base ten blocks or a place value chart? Why?



**Multiplying Whole Numbers***Elaborate*

Directions: Use rounding to estimate the solutions to the problems below. Then, calculate the actual answer. Compare your estimate with the actual answer.

Each day at Sandy Heights Elementary School, 22 buses each pick up 28 students. How many students at Sandy Heights Elementary School ride buses home from school?

Estimate:**Exact Answer:**

One day at Lincoln Park Zoo, 37 frogs each ate 42 crickets. How many crickets were eaten by the frogs on that day at the zoo?

Estimate:**Exact Answer:**

Miriam saved \$68 each month for a total of 4 years. At the end of the 4 years, how much did Miriam save in all?

Estimate:**Exact Answer:**

Zachary measured the distance between two trees in his backyard to be 18 feet. How many inches apart are the two trees in Zachary's backyard?

Estimate:**Exact Answer:**

Name _____ Date _____

Debriefing Questions

1. When you round a number up to the next ten, will your estimate be greater or less than the exact answer? How do you know?
2. When you round a number down to the previous ten, will your estimate be greater or less than the exact answer? How do you know?
3. If you round one factor up and the other factor down, how does your estimate compare to the exact answer? Why do you think that is the case?
4. If you round both factors up, how does your estimate compare to the exact answer? Why do you think that is the case?
5. If you round both factors down, how do you think your estimate would compare to the exact answer? Why do you think that is the case?





5.3 (B) The students expected to multiply with fluency a three-digit number by a two-digit number using the standard algorithm.

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Question 26 - 2014

- 26** An individual computer lab session at a school is 24 minutes long. On Monday 313 students each completed a session at the computer lab. What is the total number of minutes that all these students spent in the computer lab on Monday?
- F** 337 min
- G** 7,402 min
- H** 1,878 min
- J** Not here

Answer: J



Question 47 - 2014

- 47** A conference center has 12 rooms that each have a floor area of 875 square feet and 6 rooms that each have a floor area of 950 square feet. What is the total floor area, in square feet, of these rooms?
- A** 10,500 square feet
 - B** 8,325 square feet
 - C** 16,200 square feet
 - D** 15,900 square feet

Answer: C

Question 15 - 2013

- 15** Brennon has a total of 187 postage stamps.
- He has 48 stamps that are each 14 millimeters wide.
 - He has 139 stamps that are each 12 millimeters wide.

What is the total width of these stamps?

- A** 2,618 mm
- B** 2,230 mm
- C** 2,340 mm
- D** 657 mm

Answer: C



5.3 (I) The students expected to represent and solve multiplication of a whole number and a fraction that refers to the same whole using objects and pictorial models, including area models.

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Question 9 - 2015

- 9** Weather delayed $\frac{4}{6}$ of the 24 flights departing from an airport. All the departing flights are listed in the chart.

Departing Flights

Flight #48	Flight #111	Flight #90	Flight #38
Flight #112	Flight #222	Flight #134	Flight #46
Flight #23	Flight #564	Flight #56	Flight #116
Flight #12	Flight #72	Flight #765	Flight #677
Flight #17	Flight #86	Flight #89	Flight #422
Flight #65	Flight #329	Flight #88	Flight #499

How many flights departing from the airport were delayed by weather?

- A** 18
- B** 4
- C** 16
- D** 8

Answer: C



Multiplying Whole Numbers

Explore

Directions: Roll the 4 number cubes. Use the first 3 number cubes to fill in the blanks to create a 3-digit number in the problem. Use the 4th number cube to fill in the blanks for the last number in the problem. Once you have numbers, solve the problem.

Problem 1:

There are _____ students in Westbury Intermediate School. Each student brings _____ books to school. How many books are there altogether?

Problem 2:

There are _____ locations of the Gotta-Get-A-Bag store. Each store stocks _____ backpacks. How many backpacks are there altogether?

Problem 3:

_____ people attend a football game and pay \$_____ each for a ticket. How much money was generated by the total cost of admission?



Name _____ Date _____

Problem 4:

A coliseum has _____ rows, and each row has _____ seats. How many total seats are there in the coliseum?

Problem 5:

There are _____ 5th grade students in Alamo City Schools. Each student raised \$_____ for the Alamo City Food Pantry. How much money was raised in all?

Debriefing Questions:

1. What clue words in each problem suggest that you need to use multiplication?
2. How did you multiply the two numbers together?
3. How could you use estimation (for example, compatible numbers or rounding) to check your answer?



Multiplying Whole Numbers

Elaborate

Multiplication Matching Puzzle

<div>16,100</div> <div>18,144</div> <div>410×25</div>	<div>6,372</div> <div>18,239</div> <div></div>	<div></div> <div>14,973</div> <div>322×50</div>	<div>11,890</div> <div>9,999</div> <div>354×18</div>
<div>8,086</div> <div>104 \times 91</div> <div>821×46</div>	<div>12,375</div> <div>856 \times 20</div> <div></div>	<div>37,766</div> <div>262 \times 22</div> <div>125×99</div>	<div>11,358</div> <div>14,112</div> <div>410×29</div>
<div>6,204</div> <div>631×18</div> <div></div>	<div>19,604</div> <div>389 \times 12</div> <div>215×24</div>	<div>10,250</div> <div>4,668</div> <div>300×45</div>	<div>5,160</div> <div>17,120</div> <div>441 \times 32</div>
<div></div> <div>122 \times 13</div> <div>622×13</div>	<div>1,586</div> <div>713 \times 21</div> <div>521×20</div>	<div>13,500</div> <div>14,122</div> <div>299 \times 61</div>	<div>10,420</div> <div>9,464</div> <div>754×26</div>





5.3 (L) The students expected to divide whole numbers by unit fractions and unit fractions by whole numbers.

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Question 11 - 2015

11 Malia had 15 lb of birdseed. She fed her birds $\frac{1}{5}$ lb of birdseed every day until all the birdseed was gone. For how many days did Malia feed the birdseed to her birds?

A 20 days

B 3 days

C 90 days

D 75 days

Answer: D



Multiplying and Dividing Fractions

Explore

Directions: Use patty paper and complete three tasks below to obtain three in a row. You may work diagonally, horizontally, or vertically. Sketch the results of the patty paper model in the corresponding boxes on the next page.

Genevieve worked on her math homework for 2 hours last night. If she completed each problem in $\frac{1}{6}$ hour, how many math problems did she finish last night?	Lafayette ran $\frac{3}{4}$ of a race yesterday and walked the rest. If the length of the race was 2 miles, how far did Lafayette run?	Each family member ate $\frac{1}{3}$ of a casserole for dinner. There are 5 people in the family, how much did they eat?
Jackson rode his bicycle 3 miles home. There is a stop sign every $\frac{1}{9}$ of a mile. How many stop signs are there on Jackson's ride home?	Janie is making cookies using a recipe that calls for $\frac{1}{3}$ cup of sugar. If she makes 4 batches, how much sugar should Janie use?	Veronica has $\frac{1}{3}$ yard of fabric to use to make flags. She can make 2 flags with her fabric. How much fabric does each flag take?
Marcus sold 4 super heroes from his collection. This was $\frac{1}{4}$ of his original collection. How many super heroes does Marcus have now?	$\frac{3}{8}$ of a flag is made of blue fabric. The rest of the flag is made with white fabric. The area of the flag is 3 square feet. What is the area of the blue part?	Ronnie lives $\frac{3}{4}$ mile from school. If he walks to and from school 4 days this week, how many miles did he walk?



Sketch your patty paper models here:

Genevieve...	Lafayette...	Ben...
Jackson...	Janie...	Veronica...
Marcus...	Cassidy...	Ronnie...

Debriefing Questions

1. Look at one of the multiplication models and one of the division models. What is the difference between multiplying and dividing with patty paper?
2. Explain the steps you would take to model $\frac{1}{6} \div 3$ using patty paper.
3. How does the model for $\frac{3}{4} \times 2$ relate to the solution?





Multiplying and Dividing Fractions

Elaborate

Directions: Cut apart the cards below. Then, match each problem situation with the appropriate expression and solution. Paste the sets on the following page. Answer the discussion questions that follow.

During a science lab, Marcus measured $\frac{1}{8}$ inch of growth on specimen A and $\frac{3}{4}$ inch on specimen B. What was the total growth of these two specimens?	$\frac{3}{4} - \frac{1}{8}$	$\frac{9}{4}$
16	$\frac{7}{8}$	Brittany's homework assignment is to read $\frac{3}{4}$ of a page of homework for math, science and reading. How much homework does she have to complete?
$\frac{3}{4} \times 3$	Aiden's track practice yesterday consisted of running $\frac{3}{4}$ mile. Today, his practice was to run $\frac{1}{8}$ mile. How much farther did Aiden run yesterday than today?	$3 \div \frac{1}{8}$
$\frac{5}{8}$	Joshua has 3 yards of lumber to use to make birdhouses. If each birdhouse requires $\frac{1}{8}$ yard of lumber, how many birdhouses can Joshua create?	$\frac{1}{8} + \frac{3}{4}$



Name _____ Date _____

Problem Situation	Expression	Solution
Problem Situation	Expression	Solution
Problem Situation	Expression	Solution
Problem Situation	Expression	Solution

Debriefing Questions:

1. How did you determine which operation to use to write each expression?
2. Describe how to determine if your solution is reasonable for the number of birdhouses Joshua can create.

