

# Mathematics!



**"A Story of Units"**

**Parent Handbook**

**Grade 5  
Module 2**

# Multi-Digit Whole Number and Decimal Fraction Operations

## OVERVIEW

In Module 1, students explored the relationships of adjacent units on the place value chart to generalize whole number algorithms to decimal fraction operations. In Module 2, students apply the patterns of the base ten system to mental strategies and the multiplication and division algorithms.

Topics A through D provide a sequential study of multiplication. To link to prior learning and set the foundation for understanding the standard multiplication algorithm, students begin at the concrete–pictorial level in Topic A. They use number disks to model multi-digit multiplication of place value units, e.g.,  $42 \times 10$ ,  $42 \times 100$ ,  $42 \times 1,000$ , leading to problems such as  $42 \times 30$ ,  $42 \times 300$  and  $42 \times 3,000$ . They then round factors in Lesson 2 and discuss the reasonableness of their products. Throughout Topic A, students evaluate and write simple expressions to record their calculations using the associative property and parentheses to record the relevant order of calculations.

In Topic B, place value understanding moves toward understanding the distributive property via area diagrams which are used to generate and record the partial products of the standard algorithm. Topic C moves students from whole numbers to multiplication with decimals, again using place value as a guide to reason and make estimations about products. In Topic D, students explore multiplication as a method for expressing equivalent measures. For example, they multiply to convert between meters and centimeters or ounces and cups with measurements in both whole number and decimal form.

Topics E through H provide a similar sequence for division. Topic E begins concretely with number disks as an Introduction to division with multi-digit whole numbers. In the same lesson,  $420 \div 60$  is interpreted as  $420 \div 10 \div 6$ . Next, students round dividends and two-digit divisors to nearby multiples of 10 in order to estimate single-digit quotients (e.g.,  $431 \div 58 \approx 420 \div 60 = 7$ ) and then multi-digit quotients. This work is done horizontally, outside the context of the written vertical method.

The series of lessons in Topic F leads students to divide multi-digit dividends by two-digit divisors using the written vertical method. Each lesson moves to a new level of difficulty with a sequence beginning with divisors that are multiples of 10 to non-multiples of 10. Two instructional days are devoted to single-digit quotients with and without remainders before progressing into two- and three-digit quotients.

In Topic G, students use their understanding to divide decimals by two-digit divisors in a sequence similar to that of Topic F with whole numbers.

In Topic H, students apply the work of the module to solve multi-step word problems using multi-digit division with unknowns representing either the group size or number of groups. In this topic, an emphasis on checking the reasonableness of their answers draws on skills learned throughout the module, including refining their knowledge of place value, rounding, and estimation.

\*\*The sample questions/responses contained in this manual are straight from <http://www.engageny.org/>. They are provided to give some insight into the kinds of skills expected of students as the lesson is taught.

## **Terminology**

### **New or Recently Introduced Terms**

- Decimal Fraction (a proper fraction whose denominator is a power of 10)
- Multiplier (a quantity by which a given number—a multiplicand—is to be multiplied)
- Parentheses (the symbols used to relate order of operations)

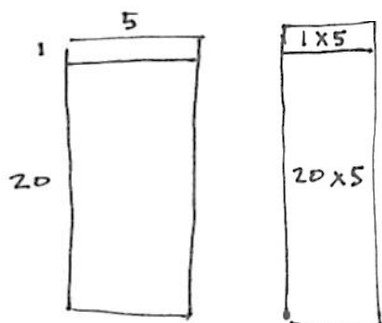
### **Familiar Terms and Symbols**

- Decimal (a fraction whose denominator is a power of ten and whose numerator is expressed by figures placed to the right of a decimal point)
- Digit (a numeral between 0 and 9)
- Divisor (the number by which another number is divided)
- Equation (a statement that the values of two mathematical expressions are equal)
- Equivalence (a state of being equal or equivalent)
- Equivalent measures (e.g., 12 inches = 1 foot; 16 ounces = 1 pound)
- Estimate (approximation of the value of a quantity or number)
- Exponent (the number of times a number is to be used as a factor in a multiplication expression)
- Multiple (a number that can be divided by another number without a remainder like 15, 20, or any multiple of 5)
- Pattern (a systematically consistent and recurring trait within a sequence)
- Product (the result of a multiplication of factors)
- Quotient (the answer of dividing one quantity by another)
- Remainder (the number left over when one integer is divided by another)
- Renaming (making a larger unit)
- Rounding (approximating the value of a given number)
- Unit Form (place value counting, e.g., 34 stated as 3 tens 4 ones)

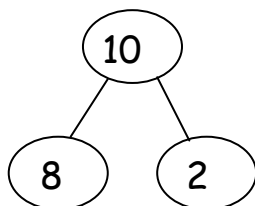
## **Suggested Tools and Representations**

- Area models (e.g., an array)
- Number bond (visual model which shows a larger section as the sum of the smaller sections or parts)
- Number disks (visual representation of a digit's value by place value disks, e.g.,  $34 = 10, 10, 10, 1, 1, 1, 1$  in disks)
- Partial product (an algorithmic method that takes base ten decompositions of factors, makes products of all pairs, and adds all products together)
- Partial quotient (an algorithmic method using successive approximation)

**Area Model:** These area models both show a visual representation of  $21 \times 5$ , breaking apart the 21 by tens and ones (20 and 1).



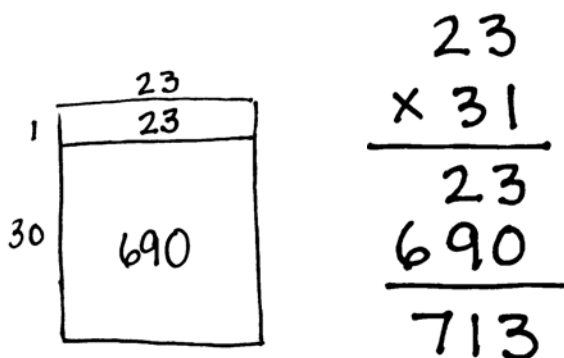
**Number Bond:** This bond is showing that the addends or parts, 8 and 2, together total the sum, 10.



**Number Disks:** The value 726 is shown using number disks.



**Partial Products:** The partial products, 23 and 690, are added to get the final product of 713.



## Lesson 1

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

a.  $23 \times 20$

Think: 23 ones  $\times$  2 tens = 46 tens

$$23 \times 20 = \underline{460}$$

c.  $40 \times 5$

$$= 200$$

$40 \times 50$

$$= 20 \times 100$$

$$= 2,000$$

$40 \times 500$

$$= (4 \times 10) \times (5 \times 100)$$

$$= (4 \times 5) \times 1000$$

$$= 20,000$$

$400 \times 5000$

$$= (4 \times 5) \times (100 \times 1000)$$

$$= 20 \times 100,000$$

$$= 2,000,000$$

## Lesson 2

Objective: Estimate multi-digit products by rounding factors to a basic fact and using place value patterns.

1. Round the factors to estimate the products.

a.  $597 \times 52 = \underline{600} \times \underline{50} = \underline{30,000}$

A reasonable estimate for  $597 \times 52$  is 30,000.

6. Michael saves \$423 dollars a month for college.

- a. About how much money would he have saved after 4 years?

$$4 \times 12 = 48 \text{ months}$$

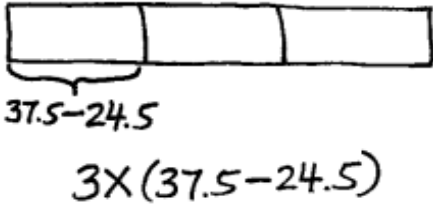
$$\$423 \times 48 \approx \$400 \times 50 = \$20,000$$

He would have saved about \$20,000 after 4 years.

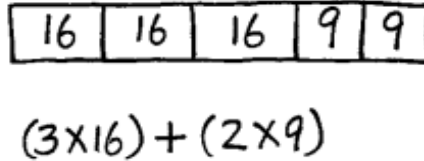
### Lesson 3

Objective: Write and interpret numerical expressions and compare expressions using a visual model.

c. 3 times the difference between 37.5 and 24.5



d. The sum of 3 sixteens and 2 nines



6. A box contains 24 oranges. Mr. Lee ordered 8 boxes for his store and 12 boxes for his restaurant.

a. Write an expression to show how to find the total number of oranges ordered.

$(24 \times 8) + (24 \times 12)$  OR  $24 \times (8 + 12)$  OR  $(24 \times 20)$

b. Next week, Mr. Lee will both double the number of boxes he orders. Write a new expression to represent the number of oranges in next week's order.

$((24 \times 8) + (24 \times 12)) \times 2$  OR  $(24 \times 20) \times 2$

### Lesson 4

Objective: Convert numerical expressions into unit form as a mental strategy for multi-digit multiplication.

5. Solve mentally.

a.  $101 \times 15 = \underline{1515}$   
 $= (100 \times 15) + (1 \times 15)$

b.  $18 \times 99 = \underline{1782}$   
 $= (100 \times 18) - (1 \times 18)$

2. Solve using mental math. Draw a tape diagram and fill in the blanks to show your thinking. The first one was done for you.

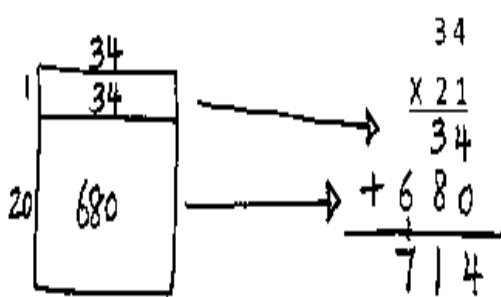
<p>a. <math>19 \times 25 = \underline{19}</math> twenty-fives</p> <table border="1" style="margin: 0 auto; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px 5px;">25</td> <td style="padding: 2px 5px;">25</td> <td style="padding: 2px 5px;">25</td> <td style="padding: 2px 5px;">...</td> <td style="padding: 2px 5px;">25</td> <td style="padding: 2px 5px;"><del>25</del></td> </tr> <tr> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">2</td> <td style="padding: 2px 5px;">3</td> <td style="padding: 2px 5px;">...</td> <td style="padding: 2px 5px;">19</td> <td style="padding: 2px 5px;">20</td> </tr> </table> <p>Think: 20 twenty-fives - 1 twenty-five.</p> <p><math>= (\underline{20} \times 25) - (\underline{1} \times 25)</math></p> <p><math>= \underline{500} - \underline{25} = \underline{475}</math></p>	25	25	25	...	25	<del>25</del>	1	2	3	...	19	20	<p>b. <math>24 \times 11 = \underline{11}</math> twenty-fours</p> <table border="1" style="margin: 0 auto; border-collapse: collapse; text-align: center;"> <tr> <td colspan="5" style="padding: 2px 5px;"><u>11 twenty-fours</u></td> </tr> <tr> <td style="padding: 2px 5px;">24</td> <td style="padding: 2px 5px;">24</td> <td style="padding: 2px 5px;">24</td> <td style="padding: 2px 5px;">...</td> <td style="padding: 2px 5px;">24</td> </tr> <tr> <td colspan="4" style="padding: 2px 5px;">10 twenty-fours</td> <td style="padding: 2px 5px;">1 twenty-four</td> </tr> </table> <p>Think: <math>\underline{10}</math> twenty fours + <math>\underline{1}</math> twenty four</p> <p><math>= (\underline{10} \times 24) + (\underline{1} \times 24)</math></p> <p><math>= \underline{240} + \underline{24} = \underline{264}</math></p>	<u>11 twenty-fours</u>					24	24	24	...	24	10 twenty-fours				1 twenty-four
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10 twenty-fours				1 twenty-four																								

## Lesson 5

Objective: Connect visual models and the distributive property to partial products of the standard algorithm without renaming.

1. Draw an area model and then solve using the standard algorithm. Use arrows to match the partial products from the area model to the partial products of the algorithm.

a.  $34 \times 21$



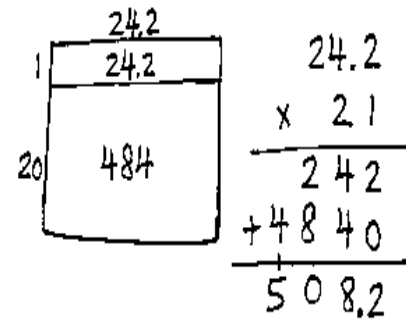
4. Farmer Brown feeds 12.1 kg of alfalfa to each of his 2 horses daily. How many kilograms of alfalfa will all his horses have eaten after 21 days? Draw an area model to solve.

$$12.1 + 12.1 = 24.2 \text{ kg}$$

$$1 \text{ unit} = 24.2 \text{ kg}$$

$$21 \text{ units} = 24.2 \times 21$$

$$= 508.2 \text{ kg}$$

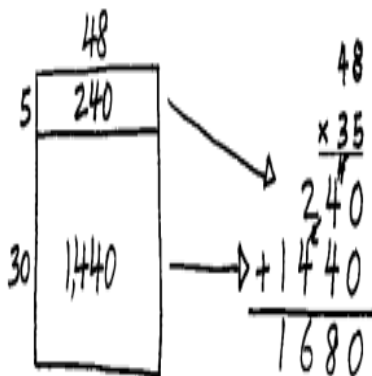


## Lesson 6

Objective: Connect area diagrams and the distributive property to partial products of the standard algorithm without renaming.

1. Draw an area model, and then solve using the standard algorithm. Use arrows to match the partial products from your area model to the partial products in the algorithm.

a.  $48 \times 35$



4. General admission to The American Museum of Natural History is \$19.  
a. If a group of 125 students visits the museum, how much will the group's tickets cost?

$$1 \text{ unit} = \$19$$

$$125 \text{ units} = 125 \times 19 = \$2,375$$

$$\begin{array}{r} 125 \\ \times 19 \\ \hline 1125 \\ + 1250 \\ \hline 2375 \end{array}$$

The group's tickets will cost \$2,375.

b. If the group also purchases IMAX movie tickets for an additional \$4 per student, what is the new total cost of all the tickets? Write an expression that shows how you calculated the new price.

$$(19+4) \times 125$$

$$= 23 \times 125$$

$$= 2,875$$

$$\begin{array}{r} 125 \\ \times 23 \\ \hline 375 \\ + 2500 \\ \hline 2,875 \end{array}$$

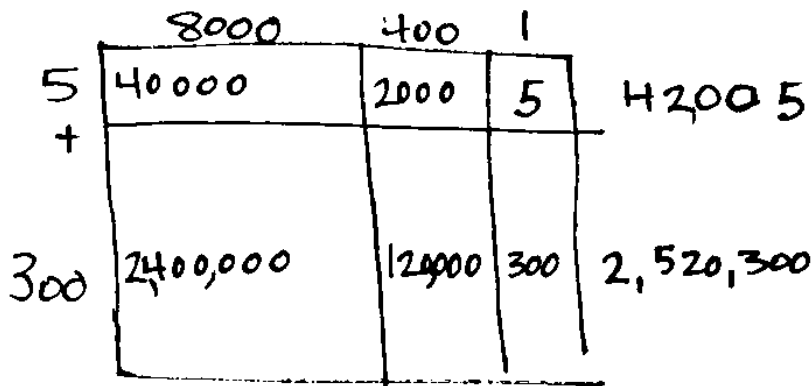
The new total cost of all the tickets will be \$2,875.

## Lesson 7

Objective: Connect area diagrams and the distributive property to partial products of the standard algorithm with renaming.

2. Solve by drawing the area model and using the standard algorithm.

a.  $8401 \times 305$



$$\begin{array}{r}
 8401 \\
 \times 305 \\
 \hline
 42005 \\
 2520300 \\
 \hline
 2562305
 \end{array}$$

## Lesson 8

Objective: Fluently multiply multi-digit whole numbers using the standard algorithm and using estimation to check for reasonableness of the product.

1. Estimate the product first. Solve by using the standard algorithm. Use your estimate to check the reasonableness of the product.

a.  $213 \times 328$

$$\begin{array}{r}
 \approx 200 \times 300 \\
 = 60,000 \\
 213 \\
 \times 328 \\
 \hline
 1704 \\
 4260 \\
 +63900 \\
 \hline
 69,864
 \end{array}$$

b.  $662 \times 372$

$$\begin{array}{r}
 \approx 700 \times 400 \\
 = 280,000 \\
 662 \\
 \times 372 \\
 \hline
 1324 \\
 46340 \\
 +198600 \\
 \hline
 246,264
 \end{array}$$

c.  $739 \times 442$

$$\begin{array}{r}
 \approx 700 \times 400 \\
 = 280,000 \\
 739 \\
 \times 442 \\
 \hline
 1478 \\
 29560 \\
 +295600 \\
 \hline
 326,638
 \end{array}$$

2. Each container holds 1 L 275 mL of water. How much water is in 609 identical containers? Find the difference between your estimated product and precise product.

Estimate:  $1200 \text{ ml} \times 600$   
 $= 720,000 \text{ ml}$   
 $= 720 \text{ L}$

Actual:  $1275 \text{ ml} \times 609$   
 $= 776,475 \text{ ml}$   
 $= 776 \text{ L } 475 \text{ ml}$

$$\begin{array}{r}
 776 \text{ L } 475 \text{ ml} \\
 - 720 \text{ L} \\
 \hline
 56 \text{ L } 475 \text{ ml}
 \end{array}$$

My actual product was 56 L 475 ml larger than the estimated product.



## Lesson 9

Objective: Fluently multiply multi-digit whole numbers using the standard algorithm to solve multi-step word problems.

2. Gemma and Leah are both jewelry makers. Gemma made 106 beaded necklaces. Leah made 39 more necklaces than Gemma.
- a. Each necklace they make has exactly 104 beads on it. How many beads did both girls use altogether while making their necklaces?

Gemma's necklaces  $\boxed{106}$   $\times 104$   
 Leah's necklaces  $\boxed{\phantom{106}}$   $\times 104$  } ? beads

*39*

$$\begin{array}{r} 106 \\ \times 104 \\ \hline 424 \\ 10600 \\ \hline 11024 \end{array}$$

$$\begin{array}{r} 145 \\ \times 104 \\ \hline 580 \\ 14500 \\ \hline 15080 \end{array}$$

$$\begin{array}{r} 11,024 \\ + 15,080 \\ \hline 26,104 \end{array}$$

The girls used 26,104 beads altogether.

- b. At a recent craft fair, Gemma sold each of her necklaces for \$14. Leah sold each of her necklaces for 10 dollars more. Who made more money at the craft fair? How much more?

Leah made \$1,996 more.

$$\begin{array}{r} 106 \\ \times 14 \\ \hline 424 \\ + 1060 \\ \hline 1484 \end{array}$$

$$\begin{array}{r} 145 \\ \times 24 \\ \hline 580 \\ + 2900 \\ \hline 3480 \end{array}$$

$$\begin{array}{r} 2131710 \\ 3480 \\ - 1484 \\ \hline \$1996 \end{array}$$

## Lesson 10

Objective: Multiply decimal fractions with tenths by multi-digit whole numbers using place value understanding to record partial products.

1. Estimate the product. Solve using an area model and the standard algorithm. Remember to express your products in standard form.  $22 \times 2.4 \approx \underline{20 \times 2 = 40}$

2	40	8	48 tenths
+	400	80	480 tenths

$$\begin{array}{r} 24 \text{ (tenths)} \\ \times 22 \\ \hline 48 \\ + 480 \\ \hline 528 \text{ (tenths)} = 52.8 \end{array}$$

1. Estimate, then use the standard algorithm to solve. Express your products in standard form.

$3.2 \times 47 \approx \underline{3 \times 50 = 150}$

$3.2 \times 94 \approx \underline{3 \times 90 = 270}$

3 2 (tenths)

$$\begin{array}{r} \times 47 \\ 224 \\ + 1280 \\ \hline 1504 \text{ (tenths)} = 150.4 \end{array}$$

3 2 (tenths)

$$\begin{array}{r} \times 94 \\ 128 \\ + 2880 \\ \hline 3008 \text{ tenths} = 300.8 \end{array}$$

## Lesson 11

Objective: Multiply decimal fractions by multi-digit whole numbers through conversion to a whole number problem and reasoning about the placement of the decimal.

1. Estimate the product. Solve using the standard algorithm. Use the thought bubbles to show your thinking. (Draw an area model on a separate sheet if it helps you.)

$$1.38 \times 32 \approx \underline{1} \times \underline{30} = \underline{30} \qquad 3.55 \times 89 \approx \underline{4} \times \underline{90} = \underline{360}$$

Think: 138  
( $1.38 \times 100$ )

$$\begin{array}{r} 1.38 \\ \times 32 \\ \hline 276 \\ +4140 \\ \hline 4416 \end{array} \xrightarrow{\div 100} 44.16$$

355

$$\begin{array}{r} 3.55 \\ \times 89 \\ \hline 3195 \\ +28400 \\ \hline 31595 \end{array} \xrightarrow{\div 100} 315.95$$

3. Use the whole number product and place value reasoning to place the decimal point in the second product. Explain how you know.

a. If  $98 \times 768 = 75,264$  then  $98 \times 7.68 = \underline{752.64}$

*7.68 would be like 768 (hundredths) so just divide by 100*

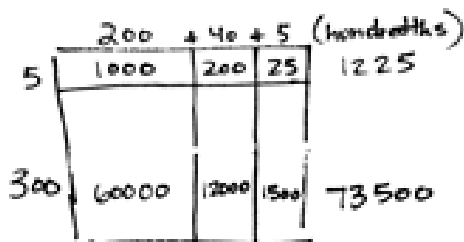
## Lesson 12

Objective: Reason about the product of a whole number and a decimal with hundredths using place value understanding and estimation.

1. Estimate, and then solve using the standard algorithm. You may draw an area model if it helps you.

$$2.45 \times 305 \approx \underline{3} \times \underline{300} = \underline{900}$$

$$\begin{array}{r} 2.45 \\ \times 305 \\ \hline 1225 \\ +73500 \\ \hline 747.25 \end{array}$$



2. Estimate, and then solve using the standard algorithm. You may draw an area model if it helps you.

a.  $1.23 \times 12 \approx 1 \times 12 = 12$

$$\begin{array}{r} 1.23 \\ \times 12 \\ \hline 246 \\ +1230 \\ \hline 14.76 \end{array}$$

c.  $0.23 \times 14 \approx 2 \times 14 = 28$   
 $= 20$  tenths  
 $= 2$

## Lesson 13

Objective: Use whole number multiplication to express equivalent measurements.

4. Convert. Use your Reference Sheet to remind you of the conversion factors. Show your work.

a.  $27 \text{ ft} = \underline{324} \text{ in}$

$$\begin{array}{r} 27 \\ \times 12 \\ \hline 54 \\ + 270 \\ \hline 324 \end{array}$$

d.  $7 \text{ kg} = \underline{7000} \text{ g}$

$$7 \times 1000$$

g.  $3 \text{ km } 85 \text{ m} = \underline{3085} \text{ m}$

$$3000 + 85$$

6. Ben helps his dad make chicken soup. Their recipe makes 15 cups of soup. If they each eat 2 cups and freeze the rest, will the leftovers fit in a 64-ounce container?

$$15c - 4c = 9c \text{ left} \quad 9 \times 8\text{oz} = 72\text{oz}$$

No, the leftovers won't fit.

## Lesson 14

Objective: Use decimal multiplication to express equivalent measurements.

1. Convert. Use your reference sheet to help you remember the conversion factors.

b.  $\underline{22} \text{ fl. oz.} = 2.75 \text{ c}$

$$\begin{array}{r} 2.75 \\ \times 8 \\ \hline 22.00 \end{array}$$

e.  $3.25 \text{ gal.} = \underline{13} \text{ qt.}$

$$\begin{array}{r} 3.25 \\ \times 4 \\ \hline 13.00 \end{array}$$

h.  $7.9 \text{ m} = \underline{790} \text{ cm}$

3. Emma can't believe how huge the Statue of Liberty is. She finds more information about Lady Liberty. Help Emma fill in the rest of the chart and then answer the questions.

The Statue of Liberty's	CUSTOMARY UNITS		METRIC UNITS	
	Feet	Inches	Meters	Centimeters
nose	$\frac{48+6}{4} \text{ ft } 6 \text{ in}$	54 in	1.37 m	137 cm
index finger	8 ft $\times 12$	96 in	2.44 m	244 cm
head	17 ft 3 in	207 in	5.26 m	526 cm
eye	2 ft 6 in	30 in	0.76 m	76 cm

a. Emma is 52 inches tall. Which of Lady Liberty's body parts above is the closest to Emma's height? What is the difference between these two measurements in inches?

The nose is the closest. It is 2 inches longer.

## Lesson 15

Objective: Solve two-step word problems involving measurement and multi-digit multiplication.

3. Josie is 1.4 meters tall. Her sister is 54 cm shorter.

a. Find her sister's height in meters.

$$\begin{array}{r} 1.4\text{m} = 140\text{cm} \\ - 54\text{cm} \\ \hline 86\text{cm} \end{array}$$

$$86\text{cm} = 0.86\text{m}$$

Josie's sister is 0.86m tall.

b. How tall are Josie and her sister combined, in meters?

$$\begin{array}{r} 1.40 \\ + 0.86 \\ \hline 2.26 \end{array}$$

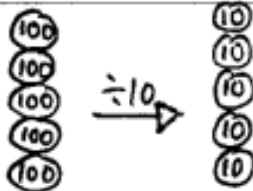
The sisters are 2.26m tall altogether.

## Lesson 16

Objective: Use *divide by 10* patterns for multi-digit whole number division.

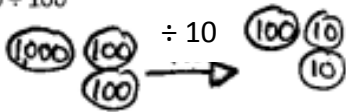
1. Divide. Draw number disks to show your thinking for (a) and (c). You may draw disks on your white board to solve the others if necessary.

a.  $500 \div 10$   
= 50



b.  $360 \div 10$   
=  $36 \div 1$   
= 36

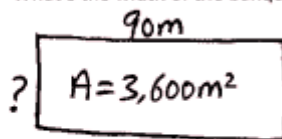
c.  $12,000 \div 100$   
= 120



d.  $450,000 \div 100$   
=  $4,500 \div 1$   
= 4,500

3. The floor of a rectangular banquet hall has an area of  $3600\text{ m}^2$ . The length is 90 m.

a. What's the width of the banquet hall?



$$\begin{aligned} 3,600 \div 90 \\ = 3,600 \div 10 \div 9 \\ = 360 \div 9 \\ = 40\text{m} \end{aligned}$$

The width of the banquet hall was 40m.

## Lesson 17

Objective: Use basic facts to estimate quotients with two-digit divisors.

1. Estimate the quotient for the following problems. Round the divisor first.

a. $609 \div 21$ $\approx 600 \div 20$ $= 30$	b. $913 \div 29$ $\approx \underline{900} \div \underline{30}$ $= \underline{30}$	c. $826 \div 37$ $\approx \underline{800} \div \underline{40}$ $= \underline{20}$
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2. A video game store has a budget of \$825 and would like to purchase new video games. If each video game costs \$41, estimate the total number of video games the store can purchase with their budget. Explain your thinking.

I estimated \$825 divided by \$41 to be  $\$800 \div 40$ , and got 20. This means that the store can purchase a total of 20 video games with their budget.

## Lesson 18

Objective: Use basic facts to estimate quotients with two-digit divisors.

1. Estimate the quotient for the following problems. The first one is done for you.

a. $5,738 \div 21$ $\approx 6,000 \div 20$ $= 300$	b. $2,659 \div 28$ $\approx \underline{3,000} \div \underline{30}$ $= \underline{100}$	c. $9,155 \div 34$ $\approx \underline{9,000} \div \underline{30}$ $= \underline{300}$
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3. Janice bought 28 apps for her phone that, altogether used 1348 MB of space.  
a. If each app used the same amount of space, about how many MB of memory did each app use? Show how you estimated.

$$\begin{aligned} & 1,348 \div 28 \\ & \approx 1,200 \div 30 \\ & = 40 \end{aligned}$$

Each app used about 40 MB of memory.

## Lesson 19

Objective: Divide two- and three-digit dividends by multiples of 10 with single-digit quotients and make connections to a written method.

1. Divide, then check. The first one is done for you.

a.  $41 \div 30$

Check:

$$\begin{array}{r} 1 \text{ R } 11 \\ 30 \overline{) 41} \\ \underline{30} \phantom{0} \\ 11 \phantom{0} \end{array}$$

$$30 \times 1 = 30$$

$$30 + 11 = 41$$

3. A number divided by 80 has a quotient of 7 with 4 as a remainder. Find the number.

$$80 \overline{) ?} \begin{array}{l} 7 \text{ R } 4 \\ \rightarrow 80 \times 7 = 560 \\ 560 + 4 = 564 \end{array}$$

The number was 564.

## Lesson 20

Objective: Divide two- and three-digit dividends by two-digit divisors with single-digit quotients and make connections to a written method.

1. Divide, then check with multiplication. The first one is done for you.

a.  $65 \div 17$

d.  $84 \div 32$

$$\begin{array}{r} 3 \text{ R } 14 \\ 17 \overline{) 65} \\ \underline{51} \phantom{0} \\ 14 \phantom{0} \end{array}$$

Check:

$$17 \times 3 = 51$$

$$51 + 14 = 65$$

$$\begin{array}{r} 2 \text{ R } 20 \\ 32 \overline{) 84} \\ \underline{64} \phantom{0} \\ 20 \phantom{0} \end{array}$$

$$32 \times 2 = 64$$

$$64 + 20 = 84$$

5. Mrs. Silverstein sold 91 cupcakes at a food fair. The cupcakes were sold in boxes of "a baker's dozen," which is 13. She sold all the cupcakes at \$15 per box. How much money did she receive?

$$\begin{array}{r} 7 \\ 13 \overline{) 91} \\ \underline{91} \\ 0 \end{array}$$

$$1 \text{ unit} = \$15$$

$$7 \text{ units} = \$15 \times 7 = \$105$$

She received \$105.

## Lesson 21

Objective: Divide two- and three-digit dividends by two-digit divisors with single-digit quotients and make connections to a written method.

1. Divide, then check using multiplication. The first one is done for you.

a.  $258 \div 47$

$$\begin{array}{r} 5 \text{ R } 23 \\ 47 \overline{) 258} \\ \underline{- 235} \phantom{0} \\ 23 \phantom{0} \end{array}$$

Check:

$$47 \times 5 = 235$$

$$235 + 23 = 258$$

3. Assume that Mrs. Giang's car travels 14 miles on each gallon of gas. If she travels to visit her niece who lives 133 miles away, how many gallons of gas will Mrs. Giang need to make the round trip?

$133 + 133 = 266$  miles  
 $266 \div 14 = 19$  gallons  
Mrs. Giang needs 19 gallons of gas to make the round trip.

$$\begin{array}{r} 19 \\ 14 \overline{) 266} \\ \underline{- 14} \phantom{0} \\ 126 \\ \underline{- 126} \\ 0 \end{array}$$

## Lesson 22

Objective: Divide three- and four-digit dividends by two-digit divisors resulting in two- and three-digit quotients, reasoning about the decomposition of successive remainders in each place value.

2. Halie solved  $664 \div 48$  below, and got a quotient of 13 remainder 40. How could she use her work below to solve  $659 \div 48$  without redoing the work? Explain your thinking.

$$\begin{array}{r} 13 \\ 48 \overline{) 664} \\ \underline{- 48} \phantom{0} \\ 184 \\ \underline{- 144} \\ 40 \end{array}$$

$$\begin{array}{r} 13 \\ 48 \overline{) 659} \\ \underline{- 48} \phantom{0} \\ 179 \\ \underline{- 144} \\ 35 \end{array}$$

Since the whole of 659 is 5 less than the original whole of 664. It means that instead of a remainder of 40, it should be 35. The quotient of 659 divided by 48 is 13 with a remainder of 35.

## Lesson 23

Objective: Divide three- and four-digit dividends by two-digit divisors resulting in two- and three-digit quotients, reasoning about the decomposition of successive remainders in each place value.

1. Divide, then check using multiplication.

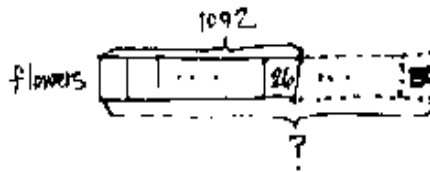
a.  $4,859 \div 23$

$$\begin{array}{r} 211 \text{ R}6 \\ 23 \overline{) 4859} \\ \underline{46} \phantom{0} \\ 25 \phantom{0} \\ \underline{-23} \phantom{0} \\ 29 \phantom{0} \\ \underline{-23} \phantom{0} \\ 6 \phantom{0} \end{array}$$

$$\begin{array}{r} 211 \\ \times 23 \\ \hline 633 \\ + 4220 \\ \hline 4853 \end{array}$$

$$\begin{array}{r} 4853 \\ + \phantom{0}6 \\ \hline 4859 \checkmark \end{array}$$

3. 1,092 flowers are arranged into 26 vases, with the same number of flowers in each vase. How many flowers would be needed to fill 130 such vases?



$$\begin{array}{r} 42 \\ 26 \overline{) 1092} \\ \underline{-104} \phantom{0} \\ 52 \phantom{0} \\ \underline{-52} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$$\begin{array}{r} 130 \\ \times 42 \\ \hline 260 \\ + 5200 \\ \hline 5460 \end{array}$$

5,460 flowers would be needed to fill 130 vases.

## Lesson 24

Objective: Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.

1. Divide. Show the division in the right hand column in two steps. The first two have been done for you.

a.  $1.2 \div 6 = 0.2$

b.  $1.2 \div 60 = (1.2 \div 6) \div 10 = 0.2 \div 10 = 0.02$

c.  $2.4 \div 4 = \underline{0.6}$

$2.4 \div 40 = \underline{(2.4 \div 4) \div 10 = 0.6 \div 10 = 0.06}$

2. Use place value reasoning and the first quotient to compute the second quotient. Explain your thought process.

a.  $46.5 \div 5 = 9.3$

$46.5 \div 50 = \underline{0.93}$

$\div 50$  is the same as  $\div 5$  then  $\div 10$ . So if you divide the first answer by 10 you get the second one.



## Lesson 25

Objective: Use basic facts to approximate decimal quotients with two-digit divisors, reasoning about the placement of the decimal point.

2. Estimate the quotient in (a). Use your estimated quotient to estimate (b) and (c). 3. Edward bikes the same route to and from school each day. After 28 school days, he bikes a total distance of 389.2 miles.

a.  $7.16 \div 36 \approx 8 \div 40 = (8 \div 4) \div 10 = 2 \div 10 = 0.2$

- a. Estimate how many miles he bikes in one day.

$$390 \div 30 = (390 \div 10) \div 3 = 39 \div 3 = 13$$

b.  $7.16 \div 36 \approx 800 \div 40 = 20$

Edward bikes about 13 miles a day

c.  $7.16 \div 36 \approx 80 \div 40 = 2$

- b. If Edward continues his routine of biking to school, about how days altogether will it take him to reach a total distance of 500 miles?

$$500 \div 13$$

$$\approx 450 \div 15 = 30$$

It will take about 40 days

$$\approx 480 \div 12 = 40$$

to reach 500 miles

## Lesson 26

Objective: Divide decimal dividends by two-digit divisors, estimating quotients, reasoning about the placement of the decimal point, and making connections to a written method.

1.  $156 \div 24$  and  $102 \div 15$  both have a quotient of 6 and a remainder of 12. a. Are the division expressions equivalent to each other? Use your knowledge of decimal division to justify your answer.

$$\begin{array}{r} 6.5 \\ 24 \overline{)156.0} \\ \underline{-144} \phantom{0} \\ 120 \\ \underline{-120} \\ 0 \end{array}$$

$$\begin{array}{r} 6.8 \\ 15 \overline{)102.0} \\ \underline{-90} \phantom{0} \\ 120 \\ \underline{-120} \\ 0 \end{array}$$

No, they are not equal

$$6.5 \neq 6.8$$

- b. Construct your own division problem with a two-digit divisor that has a quotient of 6 and a remainder of 12 but is not equivalent to the problems in 1(a).

$$114 \div 17$$

$$17 \times 6 = 60 + 42 = 102 \\ \underline{+ 12} \\ 114$$

3. The weight of 72 identical marbles is 183.6 grams. What is the weight of each marble? Explain how you know the decimal point of your quotient is placed reasonably.

Each marble weighs 2.55 grams.  
This makes sense because  $183.6 \div 72$   
is about  $180 \div 60$  which is 3.

$$\begin{array}{r} 2.55 \\ 72 \overline{)183.60} \\ \underline{-144} \phantom{0} \\ 396 \\ \underline{-360} \\ 360 \\ \underline{-360} \\ 0 \end{array}$$

## Lesson 27

Objective: Divide decimal dividends by two-digit divisors, estimating quotients, reasoning about the placement of the decimal point, and making connections to a written method. 1. Divide. Check your work with multiplication.

$$5.6 \div 16 =$$

$$\begin{array}{r} 0.35 \\ 16 \overline{) 5.60} \\ \underline{-48} \phantom{0} \\ 80 \\ \underline{-80} \\ 0 \end{array}$$

$$\begin{array}{r} 0.35 \\ \times 16 \\ \hline 210 \\ +350 \\ \hline 5.60 \end{array}$$

$$36 \div 24 =$$

$$\begin{array}{r} 1.5 \\ 24 \overline{) 36.0} \\ \underline{-24} \phantom{0} \\ 120 \\ \underline{-120} \\ 0 \end{array}$$

$$\begin{array}{r} 1.5 \\ \times 24 \\ \hline 60 \\ +300 \\ \hline 360 \end{array}$$

4. A soccer coach spent \$162 dollars on 24 pairs of socks for his players. How much did five pairs of socks cost?

$$\begin{array}{r} 6.75 \\ 24 \overline{) 162.00} \\ \underline{-144} \phantom{00} \\ 180 \\ \underline{-168} \\ 120 \\ \underline{-120} \\ 0 \end{array}$$

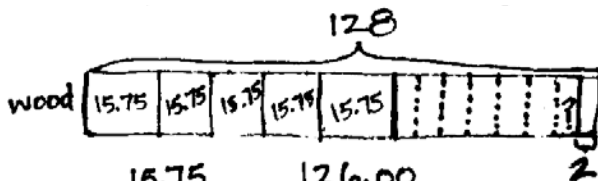
$$\begin{array}{r} 6.75 \\ \times 5 \\ \hline 33.75 \end{array}$$

Five pairs of socks  
cost \$33.75

## Lesson 28

Objective: Solve division word problems involving multi-digit division with group size unknown and the number of groups unknown.

3. Jim Nasium is building a tree house for his two daughters. He cuts 12 pieces of wood from a board that is 128 inches long. He cuts 5 pieces that measure 15.75 inches each, and 7 pieces evenly cut from what is left. Jim calculates that due to the width of his cutting blade, he will lose a total of 2 inches of wood after making all of the cuts. What is the length of each of the seven pieces?



$$\begin{array}{r} 15.75 \\ \times 5 \\ \hline 78.75 \end{array} \quad \begin{array}{r} 126.00 \\ - 78.75 \\ \hline 47.25 \end{array}$$

$$\begin{array}{r} 6.75 \\ 7 \overline{) 47.25} \\ \underline{-42} \phantom{00} \\ 52 \\ \underline{-49} \\ 35 \end{array}$$

$$78.75 + 2 + 7 \text{ units} = 128$$

$$7 \text{ units} = 47.25$$

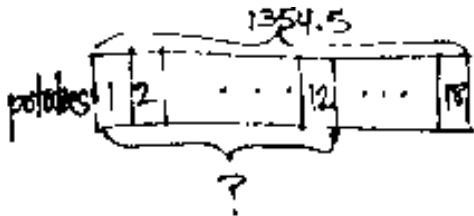
$$1 \text{ unit} = 6.75$$

Each of the 7 pieces  
is 6.75 inches long.

## Lesson 29

Objective: Solve division word problems involving multi-digit division with group size unknown and the number of groups unknown.

1. Lamar has 1,354.5 kilograms of potatoes to deliver equally to 18 stores. 12 of the stores are in the Bronx. How many kilograms of potatoes will be delivered to stores in the Bronx?



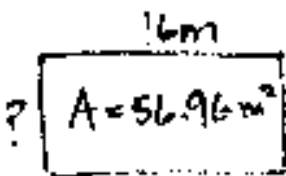
$$\begin{aligned} 18 \text{ units} &= 1354.5 \\ 1 \text{ unit} &= 75.25 \\ 12 \text{ units} &= \end{aligned}$$

$$\begin{array}{r} 75.25 \\ 18 \overline{) 1354.50} \\ \underline{126} \phantom{0} \\ 94 \phantom{0} \\ \underline{-90} \phantom{0} \\ 45 \phantom{0} \\ \underline{-36} \phantom{0} \\ 90 \phantom{0} \\ \underline{-90} \phantom{0} \\ 0 \end{array}$$

$$\begin{array}{r} 75.25 \\ \times 12 \\ \hline 15050 \\ +75250 \\ \hline 90300 \end{array}$$

903 pounds of potatoes  
will be delivered to the Bronx.

3. The area of a rectangle is 56.96 m<sup>2</sup>. If the length is 16 m, what is its perimeter?



$$P = ?$$

$$P = (3.56 \times 2) + (16 \times 2)$$

$$= 7.12 + 32$$

$$= 39.12$$

$$\begin{array}{r} 3.56 \\ 16 \overline{) 56.96} \\ \underline{48} \phantom{0} \\ 89 \phantom{0} \\ \underline{-80} \phantom{0} \\ 96 \phantom{0} \\ \underline{-96} \phantom{0} \\ 0 \end{array}$$

The perimeter of the  
rectangle is 39.12 m.