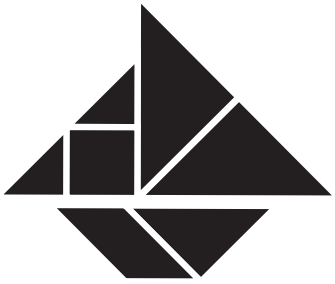


Teachers Guide

GRADE 5 – UNIT 4 – MODULE 1

BRIDGES™
IN MATHEMATICS

Module 1

Multiplication & Division Strategies

Teacher Masters

Pages renumber with each module.

Student Book Pages

Page numbers correspond to those in the consumable books.

Home Connections Pages

Page numbers correspond to those in the consumable books.

Module 1

Multiplication & Division Strategies

Overview

Module 1 focuses on learning and applying various strategies for solving multiplication and division problems, and gives students opportunities to wrestle with the idea of multiplying decimals, as well as whole numbers, in the form of money amounts. Students participate in problem strings that highlight the relationships between multiplication and division; the Half-Tens facts; doubling & halving; and the connection between decimals, fractions, and whole numbers.

Planner

Session & Work Places Introduced	P&I	PS	MF	WP	A	HC	DP
Session 1 Unit 4 Pre-Assessment This session opens with a problem string that emphasizes the connection between multiplication and division. The teacher then introduces the Unit 4 Pre-Assessment and gives students the remainder of the session to work on it.		●			●	●	●
Session 2 The Product Game, Version 2 The session begins with a problem string emphasizing the Half-Tens facts as a strategy for multiplication. Students reflect on the Unit 4 Pre-Assessment, and then the teacher introduces a new Work Place, The Product Game, Version 2. **Work Place 4A** The Product Game, Version 2 Students try to claim four spaces in a row by finding products of given 1- and 2-digit factors.		●		●	●		●
Session 3 Callie's Cake Pops The session begins with a multiplication problem string that emphasizes the use of the doubling & halving strategy, modeled with arrays. Then student pairs work on a set of problems in which they determine cost and profit for a fundraiser.	●	●				●	●
Session 4 Callie's Cake Pops Forum Student share strategies for solving problems presented in Session 3 in a class math forum. They spend the remainder of the session doing Work Places.			●	●			●

P&I – Problems & Investigations, **PS** – Problem String, **MF** – Math Forum, **WP** – Work Place, **A** – Assessment, **HC** – Home Connection, **DP** – Daily Practice

Materials Preparation

Each session includes a complete list of the materials you'll need to conduct the session, as well as notes about any preparation you'll need to do in advance. If you would like to prepare materials ahead of time for the entire module, you can use this to-do list.

Task		Done
Copies	Run copies of Teacher Masters T1–T7 according to the instructions at the top of each master.	
	Run a single display copy of Student Book page 116.	
	If students do not have their own Student Books, run a class set of Student Book pages 113–118.	
	If students do not have their own Home Connections books, run a class set of the assignments for this module using pages 67–70 in the Home Connections Book.	
Work Place Preparation	Prepare the materials for Work Place 4A using the list of materials on the Work Place Guide (Teachers Masters T5).	
Special Items	Gather a half-class set of chart paper for students prior to Session 4.	

Additional Resources

Please see this module's Resources section of the Bridges Educator site for a collection of resources you can use with students to supplement your instruction.

Session 1
Unit 4 Pre-Assessment

Summary

This session opens with a problem string that emphasizes the connection between multiplication and division. The teacher then introduces the Unit 4 Pre-Assessment, and gives students the remainder of the session to complete it. Finally, the teacher introduces and assigns the Number Review Home Connection.

Skills & Concepts

- Use the standard algorithm with fluency to multiply multi-digit whole numbers (5.NBT.5)
- Divide a 3 or 4-digit whole number by a 2-digit whole number using strategies based on place value, the properties of operations, or the relationship between multiplication and division (5.NBT.6)
- Multiply and divide decimals to hundredths, using concrete models or drawings and strategies based on the place value and properties of operations (5.NBT.7)
- Multiply a whole number by a fraction (5.NF.4a)
- Make sense of problems and persevere in solving them (5.MP.1)
- Model with mathematics (5.MP.4)

Materials

Copies	Kit Materials	Classroom Materials
Problem String Boxes & Pencils		
		• student journals
Assessment Unit 4 Pre-Assessment		
TM T1–T2 Unit 4 Pre-Assessment		
Home Connection		
HC 67–68 Number Review		
Daily Practice		
SB 113 Fraction & Decimal Review		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

column
divide*
multiply*
product*
ratio table*
row
standard algorithm

Preparation

Note that you will need to score the Unit 4 Pre-Assessment before next session. (See the Grade 5 Assessment Guide for scoring and intervention suggestions.) If you cannot mark the Unit 4 Pre-Assessment by Session 2, make room for reflection time during another session in this module.

Problem String

Boxes & Pencils

1 Open the session by letting students know that today they will participate in a problem string and then they'll take the Unit 4 Pre-Assessment.

2 Have students put the date and heading "Boxes & Pencils String" on the next blank page of their journals. Then deliver the problem string.

- Pose each problem one at a time by reading the problem and writing the multiplication or division combination for the problem on the board.
- Give students time to work in their journals.
- Solicit and record all answers to a given problem, and then invite one or two students to share how they solved the problem.
- Model students' strategies on ratio tables at the board or projector.
- Emphasize strategies that make use of multiplication to solve division problems.

Problem String Boxes & Pencils, Part 1

Problems	Sample Strategies & Recording	Connections
My favorite pencils come in boxes of 35, so I know that if I have one box, I have 35 pencils. How many pencils would there be in 4 boxes? 4×35	Some students may solve the problem by skip-counting or using repeated addition. This can be modeled on a ratio table as shown here. Number of Boxes | Number of Pencils +1: 1 → 35; +35: 35 → 70; +35: 70 → 105; +35: 105 → 140 $1 \times 35 = 35$ $2 \times 35 = 70$ $3 \times 35 = 105$ $4 \times 35 = 140$	Because the problems in today's string are posed in context, this is a good opportunity to strengthen students' understandings of ratio tables. You can do this by working with input from the class to write a multiplication equation off to the side to represent each entry on the table. You should also be quite deliberate about marking the transition from one row to the next with a an arrow and the amount by which each entry changes. By now, most students understand that on a ratio table, whatever happens on one side of the table has to be replicated on the other. For example, if you multiply the number of boxes by 2, you have to multiply the number of pencils by 2 as well, as illustrated on the second ratio table. Some students may have over-generalized this to situations that involve addition, perhaps believing that if you add one box to the left side of the chart, you should add one pencil to the other side of the chart. This is not the case, of course; adding 1 box of pencils to the left side of the chart is actually equivalent to adding 35 pencils to the other side of the chart. If such confusion exists, you can bring it to light and work to resolve it by pressing students to explain why the numbers with which you've labeled the arrows on the first ratio table are not the same on both sides, whereas they are on the second ratio table.
	Other students may have used a Double-Doubles strategy, first doubling 35 to get 70, and then doubling 70 to determine that $4 \times 35 = 140$. Number of Boxes | Number of Pencils ×2: 1 → 35; ×2: 2 → 70; ×2: 4 → 140 $1 \times 35 = 35$ $2 \times 35 = 70$ $4 \times 35 = 140$	
How many pencils in 40 boxes? 40×35	Some students may first multiply the number of boxes and pencils by 10, and then replicate the Double-Doubles strategy used in the previous problem. Number of Boxes | Number of Pencils ×10: 1 → 35; ×2: 10 → 350; ×2: 20 → 700; ×2: 40 → 1,400 $1 \times 35 = 35$ $10 \times 35 = 350$ $20 \times 35 = 700$ $40 \times 35 = 1,400$	
	Others may simply multiply the answer to the first problem by 10, reasoning that 40 is ten times as much as 4. Number of Boxes | Number of Pencils 1 → 35 ×10: 4 → 140; ×10: 40 → 1,400 $1 \times 35 = 35$ $4 \times 35 = 140$ $40 \times 35 = 1,400$	
How many pencils in 39 boxes? 39×35	Look for a student who made use of the answer to the previous problem to solve this one. Number of Boxes | Number of Pencils 1 → 35 ×10: 4 → 140; ×10: 40 → 1,400; −35: 39 → 1,365 $1 \times 35 = 35$ $4 \times 35 = 140$ $40 \times 35 = 1,400$ $39 \times 35 = 1,365$	In order to use the information from the previous problem, one has to subtract 1 box of 35 pencils from the collection. Again, work with students to understand why the numbers on both sides of the table are multiplied by 10, but only 1 is subtracted from the left side of the table, while 35 are subtracted from the right side. (1 represents the number of boxes; 35 represents the number of pencils.) **Big Idea** In a ratio table, the relationship between the numbers on both sides of the table has to stay the same. When you multiply one side by 10, you have to do the same to the other side. However, the numbers on the right side of these tables are all 35 times their corresponding numbers on the left side because each box contains 35 pencils. So when you take away 1 box from the left side, you have to take away 35 pencils from the other side of the table. When you add 4 boxes of pencils to the left side, you have to add 4×35, or 140 pencils to the right side.
How many pencils in 44 boxes? 44×35	Look for a student who used previous problems to solve this one. Number of Boxes | Number of Pencils 1 → 35 ×10: 4 → 140; ×10: 40 → 1,400; +140: 44 → 1,540 $1 \times 35 = 35$ $4 \times 35 = 140$ $40 \times 35 = 1,400$ $44 \times 35 = 1,540$	

3 The next 5 problems in this string involve division, providing an opportunity to discuss the connection between multiplication and division.

- Continue to pose the problems one by one, modeling students' explanations on ratio tables.
- Use the same context—pencils in boxes—but have students work to figure out how many boxes it would take to hold certain numbers of pencils.
- Look for and reinforce strategies that highlight the connection between multiplication and division.

Problem String Boxes & Pencils, Part 2

Problems	Sample Strategies & Recording	Connections
How many boxes would it take to hold 140 pencils if each box holds 35 pencils? 140 ÷ 35	Some students will almost certainly use multiplication to solve this problem, reasoning that 35 pencils would require 1 box, and building up from there. Number of Pencils | Number of Boxes ×2: 35 → 70 → 140 | 1 → 2 → 4 (×2, ×2) 35 × 1 = 35 35 × 2 = 70 35 × 4 = 140 It takes 4 boxes to hold 140 pencils.	**Big Idea** Division problems can be solved by using what we know about related multiplication combinations; building up, in effect, to the dividend by multiplying the divisor. The number of times we need to multiply the divisor to arrive at the dividend is the quotient, or the answer.
How many boxes would it take to hold 1,400 pencils if each box holds 35 pencils? 1,400 ÷ 35	Number of Pencils | Number of Boxes 35 | 1 ×10: 140 | 4 ×10: 1,400 | 40 35 × 1 = 35 35 × 4 = 140 35 × 40 = 1,400 It takes 40 boxes to hold 1,400 pencils.	
How many boxes would it take to hold 1,435 pencils if each box holds 35 pencils? 1,435 ÷ 35	Look for students who use the fact that it takes 40 boxes to hold 1,400 pencils to help with the last three combinations in the string. Number of Pencils | Number of Boxes ×10: 35 → 1,400 | 1 → 40 (×10) +35: 1,400 → 1,435 | 40 → 41 (+1) 35 × 1 = 35 35 × 40 = 1,400 35 × 41 = 1,435 It takes 41 boxes to hold 1,435 pencils.	To solve the last three problems in the string, at least some students will reason that if it takes 40 boxes to hold 1,400 pencils, it will take 1 more box to hold 1,435 pencils, 2 more boxes to hold 1,470 pencils, and 4 more boxes to hold 1,540 pencils because 1,400 + 140 = 1,540 and it takes 4 boxes to hold 140 pencils.
How many boxes would it take to hold 1,470 pencils if each box holds 35 pencils? 1,470 ÷ 35	Number of Pencils | Number of Boxes ×10: 35 → 1,400 | 1 → 40 (×10) +70: 1,400 → 1,470 | 40 → 42 (+2) 35 × 1 = 35 35 × 40 = 1,400 35 × 42 = 1,470 It takes 42 boxes to hold 1,470 pencils.	
How many boxes would it take to hold 1,470 pencils if each box holds 35 pencils? 1,540 ÷ 35	Number of Pencils | Number of Boxes ×10: 35 → 1,400 | 1 → 40 (×10) +140: 1,400 → 1,540 | 40 → 44 (+4) 35 × 1 = 35 35 × 40 = 1,400 35 × 44 = 1,540 It takes 44 boxes to hold 1,540 pencils.	

4 Wrap up this part of the session by drawing students' attention to the problems they have just solved, finding numbers of boxes and numbers of pencils.

- Where were the answers to the multiplication problems, "How many pencils are in certain numbers of boxes?" (The answers are in the pencil column, because it tells how many pencils.)
- Where were the answers to the division problems, "How many boxes hold certain amounts of pencils?" (The answers were in the boxes column, because it tells the number of boxes.)

Assessment

Unit 4 Pre-Assessment

Assessment Guide

See the Grade 5 Assessment Guide for scoring and intervention suggestions.

5 Set the stage for the Unit 4 Pre-Assessment.

- Tell students that today they will take a pre-assessment to help everyone, both teacher and students, know where they are with the concepts and skills in the unit. With the results, everyone will be better able to prepare for the unit.
- Let them know that once you've introduced the assessment, they will have the rest of the period to work on it. Students who finish before the end of the session can read quietly.

6 Display the first Unit 4 Pre-Assessment Teacher Master as helpers give a copy of the assessment to each student.

- Have students write their names and the date on the first page.
- Remind students to wait to begin working on the assessment.
- Give students a minute to look over the entire assessment.

7 Discuss strategies students can use that will help them during an assessment.

- Let students know that they can use scratch paper to help with any of the problems on the assessment.
  - » Display each of these items as you list them.
  - » Tell students how and where to access these materials.
- Model the following strategies as you describe them to students.
  - » Read the whole assessment before you begin to get a sense of what you need to do.
  - » Notice which problems might be easier or more difficult for you. You might put a small star by easier problems and a question mark by more challenging ones.
  - » Think about how to use your time during the test so you have time and energy to finish all the problems.
  - » If you get really stuck on one problem, skip it for now, work on other problems, and then go back to it later, if you have time.
  - » Pay special attention to math words like those on Word Resource Cards. You may want to underline them, especially if you are having a hard time understanding a question.

8 When students understand what to do, have them begin work.

- Remind students to raise their hands if they need help reading a problem; this is not meant to be a reading test.

SUPPORT If some students are unable to complete the assessment before the end of the session, allow them additional time later in the day or early the next to finish their work.

9 As students finish, have them give you their assessment and then quietly read until everyone else finishes.

10 At the end of the period, collect students' assessments, and reassure the students who were not able to finish that you'll give them additional time later.

Let them know they will get their pre-assessments back soon so they can set their own goals for Unit 4. You will have students reflect on the Unit 4 Pre-Assessment next session. If it is impossible to score the Unit 4 Pre-Assessments before Session 2, mark them when you can and then make time for students to reflect on their own work and set goals as described in Session 2.

11 Close the session by asking students to turn and talk to a neighbor and summarize how multiplication can be used to help to solve division problems.

Home Connection

12 Introduce and assign the Number Review Home Connection, which provides more practice with the following skills:

- Find the value of an unknown in an equation (supports 4.OA)
- Find all factor pairs for a whole number between 1 and 100 (4.OA.4)
- Demonstrate an understanding that a whole number is a multiple of each of its factors (4.OA.4)
- Determine whether a whole number between 1 and 100 is a multiple of a given 1-digit number (4.OA.4)
- Evaluate numerical expressions that contain parenthesis (5.OA.1)
- Write a simple expression to record calculations with numbers; interpret numerical expressions without evaluating them 5.OA.2)
- Write decimals to thousandths with base-ten numerals, with number names, and in expanded form (5.NBT.3a)
- Use >, =, and < symbols to record comparisons of two decimals to thousandths (5.NBT.3b)

Daily Practice

The optional Fraction & Decimal Review Student Book page provides additional opportunities to apply the following skills:

- Demonstrate an understanding that in a multi-digit number, each digit represents one-tenth what it represents in the place to its left (5.NBT.1)
- Read decimals to hundredths represented with number names (5.NBT.3a)
- Round decimals to the nearest one, tenth, and hundredth (5.NBT.4)
- Add and subtract fractions with unlike denominators, including mixed numbers (5.NF.1)
- Solve story problems involving addition and subtraction of fractions referring to the same whole, with like and unlike denominators (5.NF.2)

Session 2
The Product Game, Version 2

Summary

The session begins with a problem string emphasizing the Half-Tens facts as a strategy for multiplication. Students reflect on the Unit 4 Pre-Assessment, and then the teacher introduces a new Work Place, The Product Game, Version 2.

Skills & Concepts

- Demonstrate an understanding that a whole number is a multiple of each of its factors (4.OA.4)
- Determine whether a whole number between 1 and 100 is a multiple of a given 1-digit number (4.OA.4)
- Multiply a 2-digit whole number by a 1-digit whole number and two 2-digit numbers using strategies based on place value and the properties of operations (4.NBT.5)
- Divide a 2, 3, or 4-digit number by a 1-digit number, using strategies based on place value, the properties of operations, or the relationship between multiplication and division (4.NBT.6)
- Divide a 2, 3, or 4-digit whole number by a 2-digit whole number using strategies based on place value, the properties of operations, or the relationship between multiplication and division (5.NBT.6)
- Construct viable arguments and critique the reasoning of others (5.MP.3)
- Look for and make use of structure (5.MP.7)

Materials

Copies	Kit Materials	Classroom Materials
Problem String Half-Tens Facts		
		• student journals
Assessment Reflecting on the Unit 4 Pre-Assessment		
TM T3 Unit 4 Pre-Assessment Student Reflection Sheet		• Scored Unit 4 Pre-Assessment (TM T1–T2, completed in Session 1)
Work Places Introducing Work Place 4A The Product Game, Version 2		
TM T4 Unit 4 Work Place Log **TM T5** Work Place Guide 4A The Product Game, Version 2 **TM T6** 4A The Product Game, Version 2 Record Sheet **SB 114*** Work Place Instructions 4A The Product Game, Version 2	• game markers (1 in each of 2 different colors for demonstration; 1 in each of 2 different colors per student pair)	
Daily Practice		
SB 115 Product Game Problems		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.
** Run 1 copy of this page for use by the teacher and other adult helpers during Work Place time.*

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

divide*
factor*
multiply*
product*
ratio table*

Preparation

- Have the Unit 4 Pre-Assessments marked and ready to hand back to students. If you cannot mark the pre-assessments prior to this session, mark them in the next few days and find time for students to reflect on them before the end of Module 1.
- Run a class set of the Unit 4 Work Place Log Teacher Master, and staple a copy at all four corners to the front of each student's Work Place folder. Leave the Unit 3 Work Place folder stapled to the back of each folder for now.
- In today's session, you'll introduce Work Place 4A The Product Game, Version 2. Before this session, you should review the Work Place Guide, as well as the Work Place Instructions. Make copies of the 4A The Product Game, Version 2 Record Sheet for use today and store the rest in the Work Place 4A The Product Game, Version 2 tray.

Problem String

Half-Tens Facts

1 Open the session by letting students know that today they will participate in another multiplication and division problem string, reflect on the results of their pre-assessments, and learn a new Work Place game.

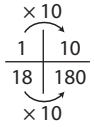
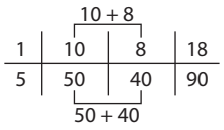
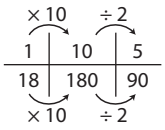
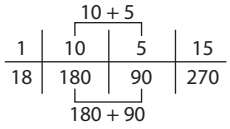
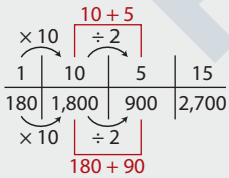
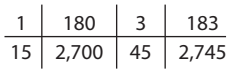
2 Ask students to write today's date on a fresh page in their journals and title it Half-Tens Facts Problem String.

3 Deliver the problem string.

- Pose each problem one at a time by writing the combination on the board.
- Give students time to work in their journals.
- Solicit and record all answers to a given problem, and then invite one or two students to share how they solved the problem.
- Model students' strategies on ratio tables at the board or projector.
- Emphasize the connections between 5 and 15 groups of a given number to 10 groups of that number.
- As explanations of strategies are shared, press students to consider whether they are multiplying by groups of 15 or groups of 18.

SUPPORT Today's string is not set in context. However, if you found the context of pencils in boxes useful in helping students better understand ratio tables during the previous session, you might do the same today with a context of your choice (e.g., a certain brand of fruit strips come packed 18 to a box). You might also continue to use a vertical, rather than a horizontal table, and ask students to generate a multiplication equation to match each row in the table.

Problem String Half-Tens Facts

Problems	Sample Strategies & Recording	Connections
10 × 18	Regardless of the fact that most students just know the answer, use a ratio table to represent the situation in order to set the stage for the next combination in the string. 	Most students will likely know the answer to the first combination, and some will probably explain that they just put a 0 on the end of 18 to get 180. If this is the case, remind students that by putting a zero at the end of 18 they are making a place value shift of one place to the right, increasing the value of the number ten times.
5 × 18	Look first for a student to share who used the partial products 5 × 10 and 5 × 8, and then look for someone who used 10 × 18, dividing 180 by 2 to get the answer, or suggest it yourself. Show each strategy on a ratio table, and then ask students to compare the two.  $5 \times 18 = (5 \times 10) + (5 \times 8)$ $= 50 + 40 = 90$  $18 \times 10 = 180$ $180 \div 2 = 90$	In discussing the difference between the two ratio tables for 5 × 18, ask students to explain why there is an 18 at the end of the top row in the first table, while in the second table, 18 appears at the beginning of the bottom row. Note with them that the first table starts with the information that there are 5 in each set, and works from there to show how many there are in 18 sets of 5, while the second table starts with the information that there are 18 in each set, and shows how many there are in 5 sets of 18.
15 × 18	Look for a student who combined the results of the first two problems to get the answer. 	
10 × 180	10 × 18 is 180, but 180 is ten times as much as 18, so 10 × 180 is 1,800.	Pose these problems one at a time. Look for students who used the Half-Tens facts or multiplied the answers from the first part of the string by 10 each time. **Big Idea** If you know what 10 times a certain number is, you can divide the answer by 2 to find 5 times that number. Furthermore, you can combine the results of 10 times the number and 5 times the number to find 15 times the number.
5 × 180	Five is half of ten, so you can divide the answer to 10 × 180, which is 1800, by 2 to get the answer to 5 × 180. 1,800 ÷ 2 = 900	
15 × 180	Ten 180s and five more 180s are 2,700. 	
2,700 ÷ 15	15 × 180 is 2,700 so 2,700 ÷ 15 must be 180.	Finish the problem string with these two division problems, and look for students who use the results of 15 × 180 to help solve them. **Big Idea** Division problems can be solved by using what we know about related multiplication combinations; building up, in effect, to the dividend by multiplying the divisor. The number of times we need to multiply the divisor (15) to arrive at the dividend (2,745) is the quotient, or the answer.
2,745 ÷ 15	2,745 = 2,700 + 45. We know that 2,700 ÷ 15 = 180. There are 3 sets of 15 in 45, so 45 ÷ 15 = 3. The answer to 2,745 must be 180 + 3, or 183. 	

Assessment

Reflecting on the Unit 4 Pre-Assessment

4 Hand students their scored Unit 4 Pre-Assessments and give them a minute or so to look over their papers.

Looking at the pre-assessment results can help students recognize the learning expectations for the unit, identify which skills and concepts they currently understand, and concentrate their efforts more effectively.

- Review with students how they can use the results of the Unit 4 Pre-Assessment to help them throughout the rest of the unit.
- Encourage students to ask questions, but do not explain how to do problems at this time. Similar problems will be introduced throughout the unit.
  - » Advise students not to be discouraged if their results were disappointing. They have several weeks to develop their skills, and they will retake the assessment at the end of the unit.
  - » Advise students to not be complacent if their results were excellent. The pre-assessment is just a quick snapshot to guide your teaching, and students will have opportunities to improve their mathematical understanding during the unit.

5 Then display a copy of the Unit 4 Pre-Assessment Student Reflection Teacher Master. Give students each a copy, and work with them to fill it in.

- Go over the sheet, one row at a time, with the class.
- For each row, read the skill and make sure students understand it. Ask volunteers to explain, or use one of the associated items on the pre-assessment to explain the skill to the class.
- Have students look at the assessment item(s) associated with that particular skill, talk in pairs about how they did with the skill, and then mark their reflection sheets accordingly.

6 When you and the students have finished working through all the skills listed on the reflection sheet, have students star the two they feel they need to work on most in the next few weeks.

7 Finally, give students a couple of minutes to describe in writing any other goals, needs, requests, or questions at the bottom of the sheet.

When students are finished, collect the Unit 4 Pre-Assessment and student reflection sheets. Staple them together and file them so they can be shared with students at the conclusion of the unit should you choose to do so.

Work Places

Introducing Work Place 4A The Product Game, Version 2

8 Introduce The Product Game, Version 2 using the 4A The Product Game, Version 2 Record Sheet and two game markers.

- Display the Work Place 4A The Product Game, Version 2 Record Sheet.
- Note with students that this game is very similar to the first version of The Product Game they learned in Unit 1.
- Explain that the game will help them become more fluent with double-digit multiplication and division.

9 Briefly summarize the game before playing against the class. (You might also invite students to review the Work Place Instructions 4A The Product Game, Version 2 in their Student Books at this time.)

Students try to claim four spaces in a row by finding products of given 1- and 2-digit factors. On each turn, a player can change one of the two factors to try to get four products in a row. As they play, students consider the factor pairs of several products to determine the best move. The winner is the first player to claim four spaces in a row.

10 Play a game of 4A The Product Game against the class. Use your copy of the Work Place 4A Instructions Student Book page as needed.

Pose questions like the following to promote flexible thinking and strategy development while you play:

- How is this version of the game different from the first?
- How do you decide which factor to choose?
- If you see a product that you want, but you are not sure which factor divides it evenly, what can you do?
- What strategies can you use as you play this game?

As you play, encourage students to verbalize their thinking and their strategies. If you think students could have used a more efficient strategy, validate the first strategy, but ask if they can come up with a more efficient one. Make sure students see that this game involves both division and multiplication strategies.

> ***Teacher*** *What strategies are you using or hearing as we play this game?*
>
> ***Moira*** *I thought I would see a lot of multiplication strategies because it's called The Product Game, but it seems like it's more about division.*
>
> ***Teacher*** *Can you say more about that?*
>
> ***Moira*** *Well, I use the products on the game board to figure out which factor I want. If I can block the other player by marking 54, I have to think about what divides into 54, and that's division.*
>
> ***Nate*** *I noticed that, too. You have a factor and a product, but you can also think about that like having a dividend and a divisor. I can think of the problem like 8 times something equals 72 or 72 divided by 8 equals something.*
>
> ***Ira*** *It's division, but you can use multiplication strategies to solve a division problem. If I want to figure out if 120 can be evenly divided by 8, I can multiply 8 by 10 to get to 80 and then try 8 times something else to get close to 120.*

Ongoing Assessment

The Assessment Guide includes a Work Places Differentiation Chart for each unit. If you like, you can use these charts to make notes about which students need support or challenge with the skills featured in each Work Place. Suggestions for differentiating a particular Work Place activity are included on the Work Place Guide.

Teacher *And that's using the distributive property to figure out if 120 is divisible by 8. Nice thinking everyone. This game really does help us see the connection between multiplication and division.*

11 Ask students to turn to a partner to summarize the directions for The Product Game, Version 2.

12 If time allows, have students play the game again in pairs.

- Each pair will need 2 game markers, 1 in each of 2 different colors, and a record sheet to share.
- As students play, circulate to make observations, answer questions, and provide differentiated instruction as suggested on the Work Place Guide.

13 Close the session.

Daily Practice

The optional Product Problems Student Book page provides additional opportunities to apply the following skills:

- Evaluate numerical expressions that contains parenthesis (5.OA.1)
- Write a simple expression to record calculations with numbers (5.OA.2)
- Divide a 4-digit whole number by a 2-digit whole number using strategies based on place value, the properties of operations, or the relationship between multiplication and division (5.NBT.6)

Session 3
Callie's Cake Pops

Summary

The session begins with a multiplication problem string that emphasizes the use of the doubling & halving strategy, modeled with arrays. Then student pairs work on a set of problems in which they determine cost and profit for a fundraiser. Finally, the teacher introduces the Thinking About Strategy Home Connection.

Skills & Concepts

- Interpret numerical expressions without evaluating them (5.OA.2)
- Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used (5.NBT.7)
- Compare the size of a product to the size of one of its factors on the basis of the size of the other factor, without performing the indicated multiplication (5.NF.5a)
- Make sense of problems and persevere in solving them (5.MP.1)
- Model with mathematics (5.MP.4)

Materials

Copies	Kit Materials	Classroom Materials
Problem String Doubling & Halving		
		• student journals
Problems & Investigations Callie's Cake Pops		
SB 116* Callie's Cake Pops **TM T7** Callie's Cake Pops Forum Planner		• 12″ × 18″ paper, 1 sheet per student pair
Home Connection		
HC 69–70 Thinking About Strategy		
Daily Practice		
SB 117 Multiplication Strategy		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master. ** Run 1 copy of this page for display.*

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

array*
double
factor*
half*
partial product*
product*

Preparation

Read Session 4 to see how students might share their work from today's session. Before tomorrow's forum, use the Callie's Cake Pops Forum Planner to help select students to share their work.

Problem String

Doubling & Halving

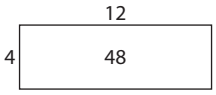
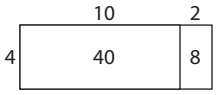
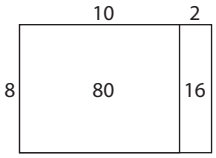
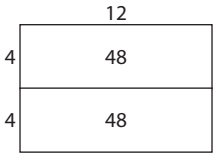
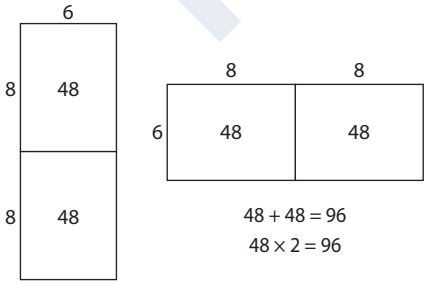
1 Open the session by explaining that today students will participate in a problem string and then solve problems involving cost and profit for a fundraiser.

2 Ask students to write today's date on a fresh page in their journals and title it *Doubling & Halving Problem String.*

3 Deliver the problem string.

- Pose each problem one at a time by writing the combination on the board.
- Give students time to work in their journals.
- Solicit and record all answers to a given problem, and then invite one or two students to share how they solved the problem.
- Model students' strategies on open arrays, keeping the dimensions as proportional as possible.
- Emphasize the relationships of the numbers in the problems and the effect doubling, halving, or doubling and halving, has on the product and size of the array.

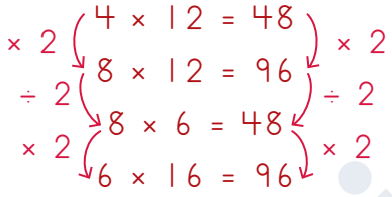
Problem String Doubling & Halving, Part 1

Problems	Sample Strategies & Recording	Connections
4×12	While some students will likely know the answer from memory, others may use a partial product strategy, multiplying 4×10, then 4×2, and adding the two products. Model both approaches on open arrays.  $4 \times 12 = 48$  $4 \times 12 = 4 \times (10 + 2) =$ $(4 \times 10) + (4 \times 2) = 40 + 8 = 48$	**Big Idea** When one of the factors in a multiplication combination is doubled, the product doubles. When one of the factors is halved, the product is halved as well.
8×12	Look for a student who used partial products—$(8 \times 10) + (8 \times 2)$—to solve the problem, and another who made use of the previous problem, noting that since 8 is twice as much as 4, the product of 4×12 can be doubled to get 8×12. Model both strategies on open arrays.  $8 \times 12 = 8 \times (10 + 2) =$ $(8 \times 10) + (8 \times 2) = 80 + 16 = 96$  $48 + 48 = 96$	
8×6	Look for a student who made a connection between this combination and the previous one, reasoning that because 6 is half of 12, the product of 8×6 will be half of 8×12. Reinforce this by sketching two open arrays, one for 8×12, and one for 8×6, and asking students to compare the two. Note with them that the second array is half the first, and press them to explain why. 	
6×16	Ask students to predict the product before they work the combination. Look for a student who doubled 8×6 to get the answer.  $48 + 48 = 96$ $48 \times 2 = 96$	

4 After discussing strategies for 6 × 16, have students pause to look back at the answers to the four problems they have already solved.

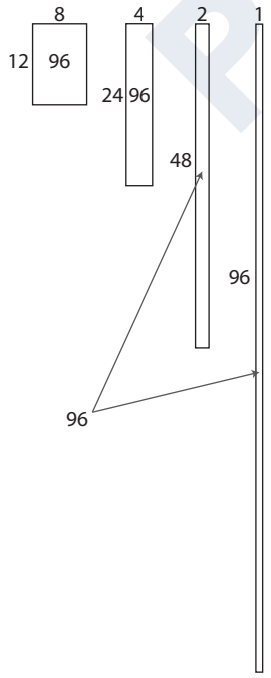
- Ask students to share, first in pairs and then as a whole group, any connections they notice between and among the expressions and the products.
- Record equations at the board or projector to mirror their comments.

> ***Franco*** *It's cool how the answers go 48, 96, 48, 96.*
>
> ***Teacher*** *But those aren't answers to the same problems, are they?*
>
> ***Esteban*** *No, but the problems are kind of alike. Remember, someone doubled the answer from the first problem to get the second and then halved the answer from the second problem to get the third one.*
>
> ***Hannah*** *And then we doubled the answer from the third problem to get the fourth one because 16 is twice as much as 8.*
>
> ***Teacher*** *I remember. But if you double, then half, then double again, don't you end up with the same problem?*
>
> ***Tyrell*** *You could. But each time we were doubling and halving a different factor.*



5 Pose the next four problems one at a time. Draw an open array to represent each, and look for students who begin to connect these combinations to 6 × 16.

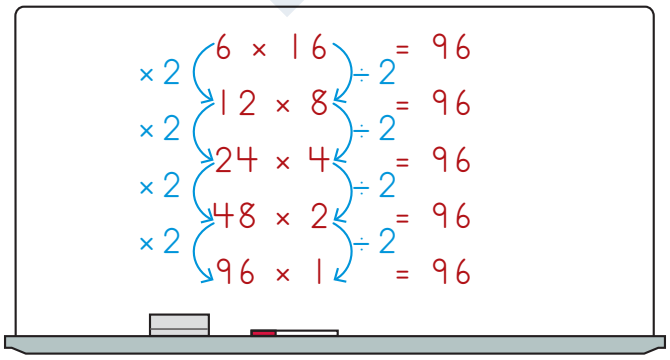
Problem String Doubling & Halving, Part 2

Problems	Sample Strategies & Recording	Connections
12 × 8 24 × 4 48 × 2 96 × 1		**Big Idea** When one of the factors in a multiplication combination is doubled, and the other factor in that combination is halved, the product remains the same.

6 After the last problem has been solved, draw students's attention to the arrays on the board and facilitate a discussion about the doubling & halving strategy.

- Ask students to share observations and explain what is happening, and why.
- Record equations at the board or projector to mirror their comments.

> ***Teacher*** *I am looking back at the problems we just solved, and I know some of you already noticed that we kept getting the same product over and over, even though the problems were different. Can someone tell me more about that?*
>
> ***Students*** *We got the same answer for five problems in a row! After the first few, I just predicted that the answer was going to be 96.*
>
> *I noticed the numbers in the problems changed but were still related.*
>
> *Yeah, me too. When we solved 24 × 4 after 12 × 8, I looked back and saw that the number, I mean factor, on the left of the problem was getting bigger and the factor on the right was getting smaller.*
>
> ***Teacher*** *So, every time one factor was getting bigger and the other factor was getting smaller? How much bigger and smaller? And why does the answer, the product, stay the same?*
>
> ***Students*** *The factor on the left got twice as big and the factor on the right was cut in half.*
>
> *If you look at the arrays, that really helps. The first problem started out as a longer rectangle, but with each new problem, the shape of the array changed.*
>
> ***Teacher*** *In what way did the shapes of the arrays change?*
>
> ***Students*** *Each time, they got longer and skinnier.*
>
> *Twice as long and twice as skinny. Well, cut in half.*
>
> ***Teacher*** *I am still wondering why all the answers are 96.*
>
> ***Pedro*** *Look at the arrays. The area is always 96. The rectangle just gets stretched out. If you look at the problems, you can see that one factor always doubled and the other factor got cut in half, but the area stayed the same.*



7 Pose the final problem in the string: 24 × 25.

Problem String Doubling & Halving, Part 3

Problems	Sample Strategies & Recording
24 × 25	Look for any students who used a doubling & halving strategy.

- If no one uses the doubling & halving strategy, solicit other efficient strategies, and then suggest students consider whether doubling and halving would be an efficient strategy for this combination.

> ***Teacher*** *I saw some really nice strategies for this problem. Lots of people thought about money, since one of the numbers was 25. That works well. I am wondering, though, about this doubling & halving strategy that we've been discussing. Did anyone use that kind of thinking on this problem?*
>
> ***Students*** *I decided it wouldn't work well because if you double the first number and cut the second number in half, you would get 48 × 12.5, and that's not an easier problem than the original one.*
>
> *I did use the doubling & halving strategy, but instead of doubling the first number and halving the second one, I halved the first one and doubled the second one. I started with 24 × 25. Then I cut 24 in half and doubled 25, so it was 12 × 50. Then I cut 12 in half and doubled 50, and I got 6 × 100, and that was really easy—the answer is 600!*

Problems & Investigations

Callie's Cake Pops

8 Ask students to turn to the Callie's Cake Pops Student Book page while you display your copy where everyone can see it.

9 Introduce the problems and answer any questions students have about the directions. Then pair students and set them to work.

10 Circulate as students work to note strategies and provide support as needed. Use the Callie's Cake Pops Forum Planner to make notes about the strategies students are using, and begin thinking about how you will structure the forum in Session 4.

11 As student pairs finish solving the problems, have them make a poster of their work on a 12″ × 18″ sheet of paper to share with their classmates next session.

Let students know that they will share their posters during math forum next session. They might regard their poster as a second draft of their original work, and take the opportunity to present their strategies and solutions clearly, neatly, accurately, and attractively.

12 Close the session by having students look over their work and think about what they would say in a math forum. Then have them bring you their work and put away any other materials.

Home Connection

13 Introduce and assign the Thinking About Strategy Home Connection, which provides more practice with the following skills:

- Find the value of an unknown in an equation (supports 4.OA)
- Multiply a 1- or 2-digit whole number by a 1, 2, or 3-digit whole number using strategies based on place value and the properties of operations (4.NBT.5)
- Divide a 2, 3, or 4-digit whole number by a 2-digit whole number using strategies based on place value, the properties of operations, or the relationship between multiplication and division (5.NBT.6)
- Multiply decimals to hundredths, using concrete models or drawings and strategies based on place value and properties of operations (5.NBT.7)

Daily Practice

The optional Multiplication Strategy Student Book page provides additional opportunities to apply the following skills:

- Find the value of an unknown in an equation (supports 4.OA)
- Multiply a 1- or 2-digit whole number by a 2-digit whole number using strategies based on place value and the properties of operations (4.NBT.5)
- Divide a 4 digit whole number by a 2-digit whole number using strategies based on place value, the properties of operations, or the relationship between multiplication and division (5.NBT.6)
- Multiply decimals to hundredths, using concrete models or drawings and strategies based on place value and properties of operations (5.NBT.7)

Session 4
Callie's Cake Pops Forum

Summary

Student share strategies for solving problems presented in Session 3 in a class math forum. They spend the remainder of the session doing Work Places.

Skills & Concepts

- Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used (5.NBT.7)
- Multiply a whole number by a fraction (5.NF.4a)
- Make sense of problems and persevere in solving them (5.MP.1)
- Construct viable arguments and critique the reasoning of others (5.MP.3)
- Model with mathematics (5.MP.4)

Materials

Copies	Kit Materials	Classroom Materials
Math Forum Callie's Cake Pops Forum		
		• Callie's Cake Pops Student Book page (SB 116, completed in Session 3) • students' posters from Session 3 • Callie's Cake Pops Forum Planner (TM T7, with notes from Session 3)
Work Places in Use		
3A Beat the Calculator: Fractions (introduced in Unit 3, Module 1, Session 2) **3B** Draw & Compare Decimals (introduced in Unit 3, Module 2, Session 1) **3C** Round & Add Tenths (introduced in Unit 3, Module 2, Session 3) **3D** Target 1 (introduced in Unit 3, Module 2, Session 4) **3E** Division Showdown (introduced in Unit 3, Module 4, Session 3) **4A** The Product Game, Version 2 (introduced in Unit 4, Module 1, Session 2)		
Daily Practice		
SB 118 Box Puzzle Challenges		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.

Preparation

- Today you will conduct a forum on students' work on the Callie's Cake Pops problems from the previous session. With the help of the Callie's Cake Pops Forum Planner, look over student work and decide which students should present today. The purpose of today's forum is to share efficient and effective strategies for multiplying whole numbers by money amounts that involve both dollars and cents.
- Write a list of Work Places from which students can choose today. You can just write the numbers (3A–4A) or write out the full names if you prefer. (See the Work Places in Use row of the Materials Chart for the complete list of Work Places in use today.)

Math Forum

Callie's Cake Pops Forum

1 Open the session by explaining that students will have a few minutes to review the posters they made last session. Then the class will conduct a math forum about the work they did, but first they will meet in small groups to compare answers and share strategies for solving the cake pops problems.

2 Have students meet with their work partners from the previous session. Return their posters, and give them a few minutes to review their work and add any finishing touches.

3 Combine pairs of students to meet and compare work.

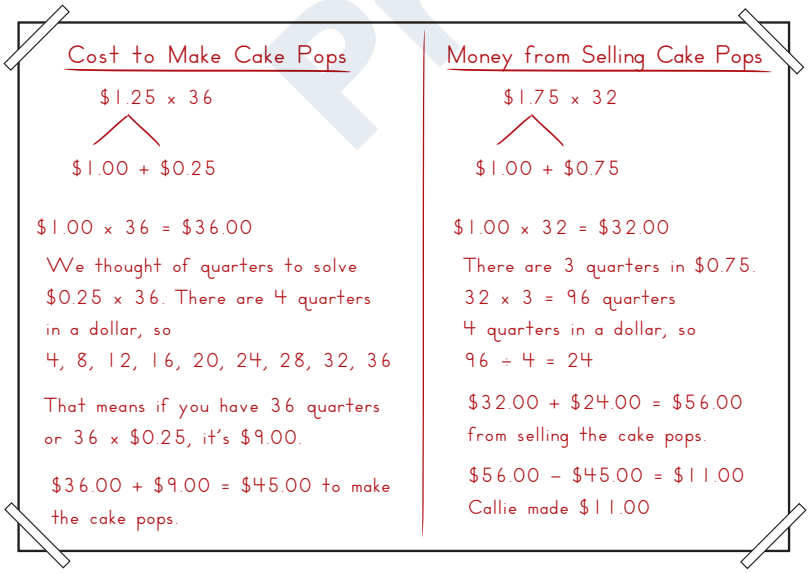
Ask students to explain how they dealt with the fact that they had to multiply both dollar and cents amounts in both problems. What strategies did they use to deal with the decimals, in particular?

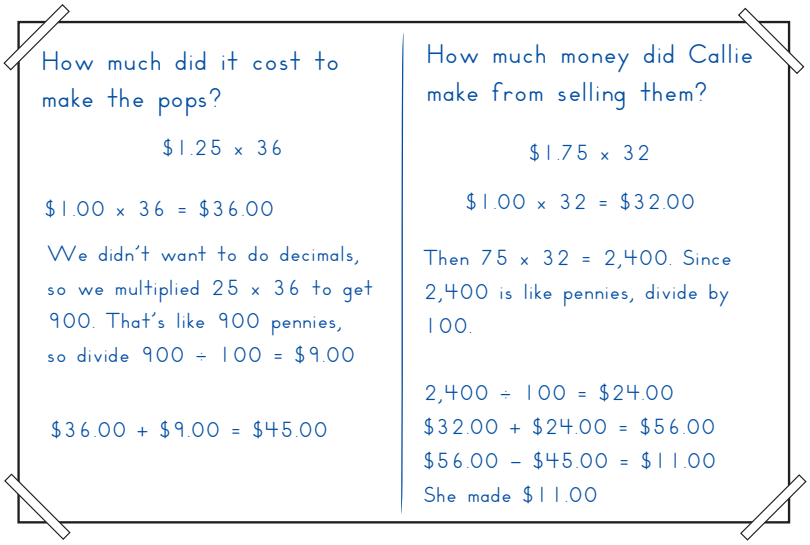
4 Next, gather students in the class meeting area with their posters. Begin the math forum with a short discussion about students' starting points with Callie's Cake Pops.

It is likely that a number of students started by separating the money amounts into dollars and cents, multiplying the whole dollar amounts by the number of cake pops made or sold, and then devising strategies for dealing with the decimal amounts ($0.25 × 36 and $0.75 × 32). This can be used as a common starting point for today's forum.

5 Ask several pairs of students who split the dollars and cents amounts to share their posters.

Encourage each of these pairs to emphasize the strategy they used to determine $0.25 × 36 and $0.75 × 32 as they share.



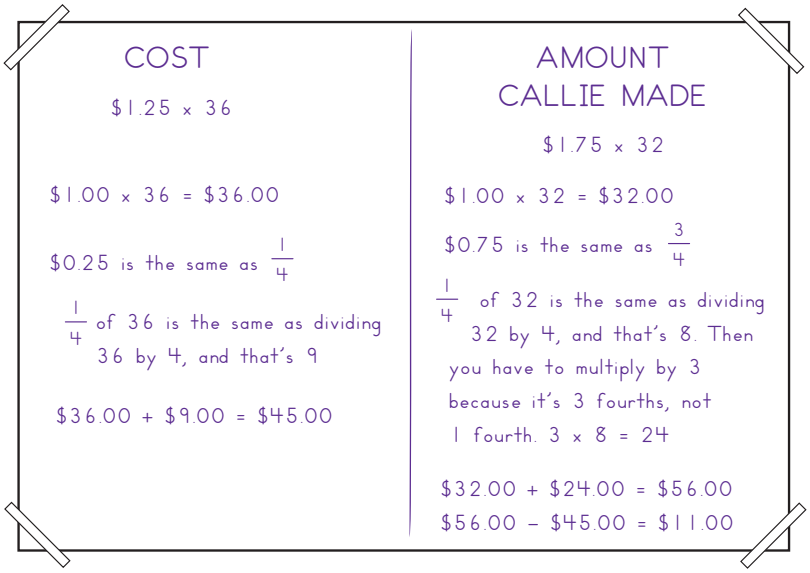


6 Then ask the class to discuss and compare the strategies these pairs employed for multiplying $0.25 × 36 and $0.75 × 32.

> ***Teacher*** *Let's take a look at how Sara and Eloise worked with these challenging combinations. They said they thought about quarters, and that since four quarters make a dollar, they found groups of four quarters and kept track of how many dollars that was. They ended up solving $0.25 × 36 to get $9.00. How is that different than what Alex and Ryan shared?*
>
> ***Students*** *Alex and Ryan said they didn't want to think about decimals, so they multiplied 25 × 36 and got 900.*
>
> ***Teacher*** *But then they said that they got the same answer of $45 to make 36 cake pops. How is that possible?*
>
> ***Students*** *They both added the $1 × 36 to the other part of the problem.*
>
> *Remember, they said that after they got the 900, they knew they had to change it because it was really 0.25, not 25.*
>
> ***Teacher*** *Hmm, so one group solved $0.25 × 36 and got $9 and another group solved 25 × 36 and got 900. Is there any connection between those computations?*
>
> ***Students*** *The 25 × 36 is 100 times bigger.*
>
> *You can divide 25 × 36 by 100 to get 0.25 × 36.*
>
> *It's like they said on their poster—if you multiply 36 by 25 instead of 0.25, it's like getting the answer in pennies. So then you have to divide the 900 by 100 to get dollars instead.*

7 Have a pair of students who changed the money to equivalent fractions share their poster.

> ***Teacher*** *Let's compare the two previous ways of thinking now to the work Darius and Sergio just shared. Didn't they say that they thought about 0.25 and 0.75 as quarters also? So why do they have fractions on their poster?*



Sean *They turned 0.25 into ¼ and 0.75 into ¾.*

Teacher *Can you do that? Are those fractions equivalent to those decimals?*

Students *Yes! Four quarters make a dollar, so 25 cents is ¼ and 75 cents is three quarters, or ¾.*

So on that first one, they did the easy part first—$1.00 x $36.00, and then they had to do ¼ × 36, but that's the same as asking what's one-fourth of 36, and that's 9.

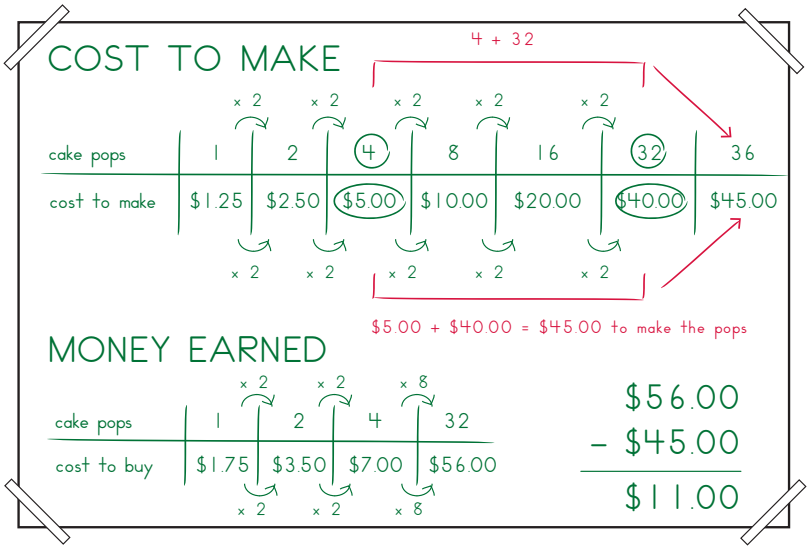
Teacher *I'm thinking about that. Does anyone have something to add?*

Ebony *Yes, I think that's why they got the answer 9—because 36 ÷ 4 is 9. Then they had to remember it was money, so they labeled it $9.*

8 Continue the forum by asking a pair of students who used a ratio table to keep track of the money and cake pops to share their poster.

Encourage these students to share their rationale for the numbers they labeled in the ratio table.

You may have students who used the same, or similar, ratios as illustrated in the dialog but didn't write them in a ratio table. Have that group share because they used the same relationships, and model the relationships for them on a ratio table. As students see their thinking modeled in a ratio table, they might begin to use it too.



Teacher *Allie and Maria Jose, will you please talk to us about the strategy you used to solve the cake pops problems?*

Allie *Sure. We decided to make a ratio table and build up to the total number of cake pops. We wrote that one cake pop cost $1.25, and then we started doubling to see how far we could get.*

Maria Jose *We doubled both the money and the number of cake pops.*

Allie *When we got to 32 cake pops we couldn't double anymore, but we saw that we could add 4 cake pops to the 32 cake pops to get 36 cake pops, and add the amount of money for each of those to get the answer.*

Teacher *Thank you for explaining. I want to ask you about the ratio table you made for the second problem. It looks a bit different that the first one you did. What were you thinking?*

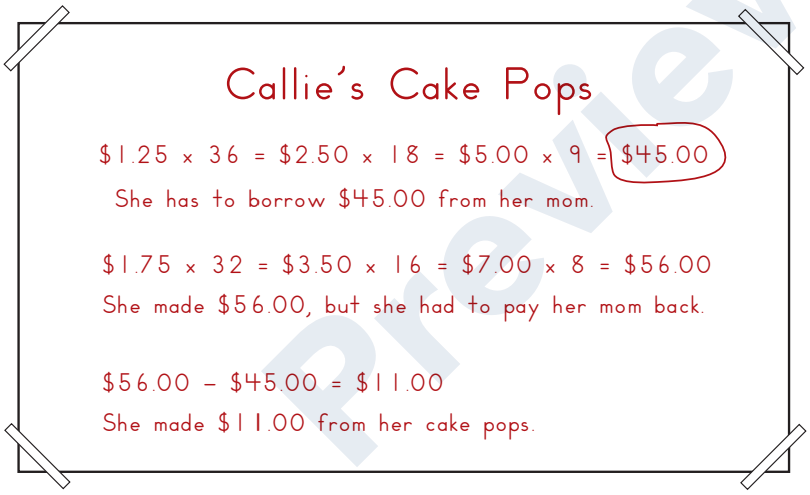
Allie *We knew she would make $1.75 for each cake pop, so we started by doubling like we did in the other question.*

Maria Jose *But when we got to 4 cake pops and $7.00, we realized that we could just multiply them both by 8, because 4 times 8 is 32, and that's how many cake pops she sold.*

Extension

Consider putting all of the posters on display in the hall, along with a copy of the original problems, for students, teachers, and parents to view. Or, you might post the collection in your classroom, and encourage students to examine each other's work for additional strategies or variations on strategies shared during the forum.

9 Next, ask a pair who used a doubling & halving strategy to share, and to explain how and why they chose that particular strategy.



Teacher *Rob and Theo, will you share with us what you did and why you chose your strategy?*

Rob *We knew that the first problem was $1.25 × 36, and at first we thought about splitting the money apart like some of the other groups did because the problem wasn't all that easy. But then we started thinking about how to make the problems easier, and realized that if we used doubling and halving, it might help.*

Theo *See, $1.25 × 36 has the same answer as $2.50 × 18, because you double the first number and cut the other one in half. If you double and half again, you get $5.00 × 9 which is easy, just $45. We did the same thing for $1.75 × 32. First we weren't sure it would work because we got $3.50 × 16, which is still kind of hard. But then we doubled and halved again, and it was $7.00 × 8, and that's $56.00, so it did work!*

10 Conclude the forum by summarizing the strategies shared. Thank students for their discussion, and then let them know they will spend the remainder of the session visiting Work Places.

Work Places

11 Have students get their folders and choose a Work Place.

Have students pick up their Work Place folders and a pencil, and remind them to fill out their Work Place Logs as they finish each activity.

SUPPORT Suggest specific Work Places for struggling students to work on critical skills.

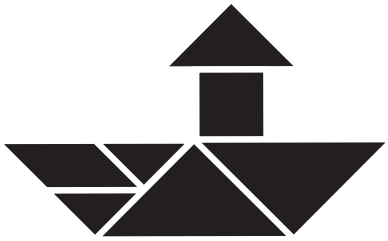
CHALLENGE Encourage students to think about the strategies they are using and share their thinking. Encourage students to generalize what happens in certain Work Places.

12 End the session by asking students to clean up their materials. Let students know they will continue to explore the ideas shared in the forum over the next several sessions.

Daily Practice

The optional Box Puzzle Challenges Student Book page provides additional opportunities to apply the following skills:

- Find the value of an unknown in an equation (supports 4.OA)
- Divide a 3-digit whole number by a 2-digit whole number using strategies based on place value, the properties of operations, or the relationship between multiplication and division (5.NBT.6)



Teacher Masters

GRADE 5 – UNIT 4 – MODULE 1

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NAME | **DATE**

Unit 4 Pre-Assessment page 1 of 2

1 Fill in the boxes to find the product using the standard multiplication algorithm.

a

$$\begin{array}{r} 54 \\ \times\ 67 \\ \hline 3\square 8 \\ +\ \square 240 \\ \hline \end{array}$$

b

$$\begin{array}{r} 387 \\ \times\ 72 \\ \hline 7\square 4 \\ +\ 2\square,09\square \\ \hline \end{array}$$

2 Use the standard multiplication algorithm to find 25×448. Show your work.

3 $\frac{3}{4}$ of 48 is _____, so 75×48 = _____.

4 $\frac{1}{4}$ of 64 is _____, so 25×64 = _____.

5 Mark each of the equations below true or false. (Hint: If you use your estimation and mental math skills, you may be able to get the correct answers to some of these without doing all the computation involved.)

a $32 \times 4 = 1{,}280 \div 10$ _____

b $342 \times 28 = 3{,}828 \div 3$ _____

c $58 \times 99 = 4{,}897$ _____

d $480 \times 25 = 12{,}000$ _____

(continued on next page)

NAME | **DATE**

Unit 4 Pre-Assessment page 2 of 2

6 Matthew wants to build craft stick birdhouses to sell at the crafts fair. Each birdhouse cost $3.50 to make. Use the ratio table to find the cost to make 21 birdhouses.

Birdhouses	1								
Cost	$3.50								

The cost to make 21 birdhouses is _____.

7 Use the ratio table to find how many birdhouses Matthew can make for $346.50.

Birdhouses	1								
Cost	$3.50								

Matthew can make _____ birdhouses for $346.50.

8 Esperanza is helping her aunt bag apples to sell at the market. They have 98 apples and they want to put 14 apples in each bag. How many full bags of apples will they have when they are done?

a Make and explain a reasonable estimate for this problem. About how many bags will they fill? How do you know?

b Now solve the problem, using numbers, labeled sketches, or words. Show all of your work below.

c Write your answer here using a complete sentence. Be sure to label your answer with the correct units.

NAME | DATE

Unit 4 Pre-Assessment Student Reflection Sheet

Skill	Look at these problems.	I can do this well already.	I can do this sometimes.	I need to learn to do this.	Notes
Can you use the standard multiplication algorithm to multiply 2- and 3-digit numbers by 2-digit numbers and get the correct answer?	1a, 1b, 2				
Can you multiply a whole number by a fraction, and then use the information to multiply two 2-digit numbers?	3, 4				
Can you use estimation, mental math, and what you know about multiplication and division to tell whether an equation is true or false?	5a, 5b, 5c, 5d				
Can you use a ratio table to multiply and divide decimals by whole numbers?	6, 7				
Can you make a reasonable estimate for a long division problem and then find the correct answer?	8a, 8b, 8c				

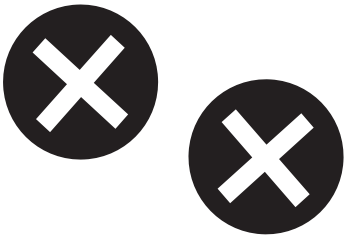
- After you have made a mark and some notes about each skill above, draw a star next to the two skills that you need to work on the most during this unit.
- Write other ideas about what you want or need to learn how to do during this unit.

NAME | **DATE**

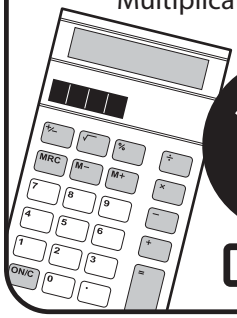
Unit 4 Work Place Log

4A The Product Game, Version 2

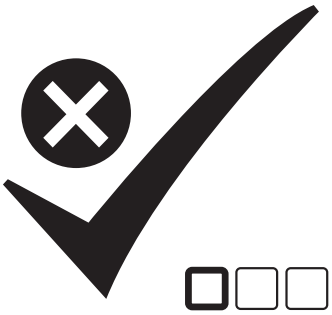
4B Multiplication Battle



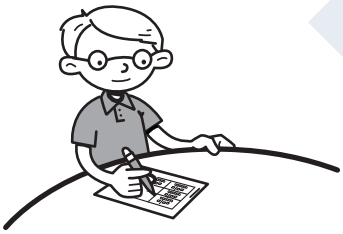
4C Beat the Calculator: Multiplication



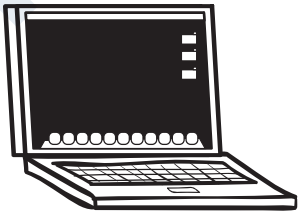
4D Estimate & Check



Personal Practice



Computer Activity



Work with the Teacher

Work Place Guide 4A The Product Game, Version 2

Summary

Students try to claim four spaces in a row by finding products of given 1- and 2-digit factors. On each turn, a player changes one of two factors to try to get four products in a row. As they play, students consider the factor pairs of several products to determine their best move. The winner is the first player to claim four spaces in a row.

Skills & Concepts

- Demonstrate an understanding that a whole number is a multiple of each of its factors (4.OA.4)
- Determine whether a whole number between 1 and 100 is a multiple of a given 1-digit number (4.OA.4)
- Divide a 2- or 3-digit number by a 1-digit number, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division (4.NBT.6)
- Multiply a 2-digit whole number by a 1-digit whole number and two 2-digit numbers using strategies based on place value and the properties of operations (4.NBT.5)
- Divide a 2- or 3-digit whole number by a 2-digit whole number using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division (5.NBT.6)

Materials

Copies	Kit Materials	Classroom Materials
TM T4 Work Place Guide 4A The Product Game, Version 2 **TM T5** 4A The Product Game, Version 2 Record Sheet **SB 114** Work Place Instructions 4A The Product Game, Version 2	• 2 game markers	

Assessment & Differentiation

If you see that…	Differentiate	Example
Students randomly choose factors or choose only factors that generate facts they already know	SUPPORT Remind students of the goal of the game: to get four products in a row. Help students use what they know to find useful products. Encourage them to test different factors that will lead them to the products they need.	*So, you picked 6 and 8 because you know that's 48, right? But what about 96? It's near one you already marked off. Which factor could you choose to get 96? How can you figure it out?*
Students have a hard time working with double and triple digit numbers	SUPPORT Encourage students to refer to their math journals and the class posters for multiplication and division strategies. Have them determine which strategies they are successful with. Gradually challenge them to use more efficient strategies. Have students play the game variation for 3 in a row.	
Students are quickly choosing factors and correctly covering appropriate products.	CHALLENGE Encourage students to consider all of the possible moves they can make and to choose the best possible move. Students can also analyze the game and their moves—what is the best product to choose first? Does it matter? Have students play the game variation for 5 in a row, or try one of the other variations suggested on the Work Place Instructions sheet in their Student Books.	*Is that the best possible move? Do you think it's better to get a product on the edge or in the middle? Is it possible to block your opponent and help yourself at the same time?*

English-Language Learners Use the following adaptations to support the ELL students in your classroom.

- Write the word *factor* above the line of factors. Write the word *product* above the grid of products. Make sure these Word Resource Cards are prominently posted.
- Help students show their thinking about multiplication and division strategies. Encourage them to write and sketch work as they choose factors and find products.
- Provide a same language peer, if one is available.
- Play a sample game in a small group and allow opportunities for students to request clarification and rephrasing.

4A The Product Game, Version 2 Record Sheet

Player 1 _____ Player 2 _____

Claim four products in a row to win.

36	135	42	84	60	81
63	96	150	100	56	96
48	120	72	90	54	105
70	225	108	64	80	63
144	105	60	90	49	108
72	56	84	135	42	120

Player 1

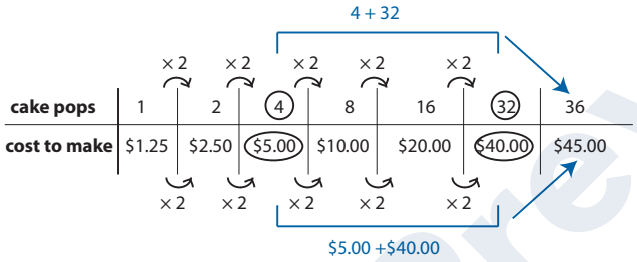
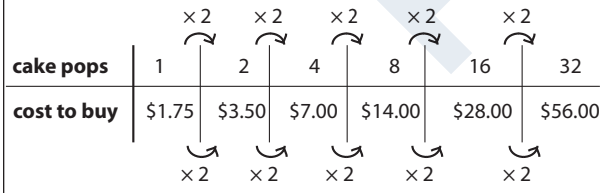
Player 2

6 7 8 9 10 12 15

Callie's Cake Pops Forum Planner

Use this planner to make a record of the strategies you see students using to solve problems during Session 3. Prior to Session 4, use the third column to indicate the order in which you plan to have students share during the forum.

Strategies for solving $1.25 × 36 and $1.75 × 32

Strategy	Student Names & Notes	Order of Sharing in Forum
1 Split the money amounts into dollars and cents, and worked from there to get the answers. **$1.25 = $1.00 + $0.25** **$1.00 × 36 = $36.00** $0.25 × 36 = $9.00 *or* 25 × 36 = 900 pennies = $9.00 *or* 0.25 = ¼, and ¼ of 36, or 36 ÷ 4 = 9 $36.00 + $9.00 = $45.00 **$1.75 = $1.00 + $0.75** **$1.00 × 32 = $32.00** $0.75 × 32 = $24.00 *or* 25 × 32 = 2400 pennies = $24.00 *or* 0.75 = ¾ and ¾ = 3 × ¼, so ¼ of 32 × 3 is 24. $32.00 + $24.00 = $56.00		
2 Used a ratio table to keep track of the number of cake pops and the total amount of money. **$1.25 × 36 = $45.00** **Note** This only one example of a ratio table that might be used to solve the problem; there are others as well.  **$1.75 × 32 = $56.00** 		
3 Used a Doubling & Halving strategy to create easier combinations to solve. (Doubled the decimal numbers until they were whole; cut the other number in half each time. This is a particularly easy and elegant strategy.) $1.25 × 36 = $2.50 × 18 = $5.00 × 9 = $45.00 $1.75 × 32 = $3.50 × 16 = $7.00 × 8 = $56.00		

Student Book

GRADE 5 – UNIT 4 – MODULE 1

BRIDGES™
IN MATHEMATICS

NAME | DATE

Fraction & Decimal Review

1 Find the sum or difference. Show your work.

a $\frac{1}{3} + \frac{3}{8}$

b $\frac{6}{7} + \frac{2}{5}$

c $\frac{6}{9} - \frac{1}{4}$

d $\frac{5}{12} - \frac{1}{8}$

2 Isabel and Jared each made a pan of brownies. Their pans of brownies were exactly the same size. After the first day, there was $\frac{1}{4}$ of one pan and $\frac{2}{12}$ of the other pan left. What fraction of the brownies were eaten? Show your work.

3 Which of the following describes the value of the number 6.21? (Mark all that are true.)

- ○ six hundred twenty-one hundredths
- ○ six and twenty-one hundredths
- ○ sixty-two tenths and one hundredth
- ○ six hundred twenty-one tenths

4 Round 156.789 to the nearest:

one tenth hundredth

Work Place Instructions 4A The Product Game, Version 2

Each pair of players needs:

- 1 Product Game, Version 2 Record Sheet
- 2 game markers
- pencils

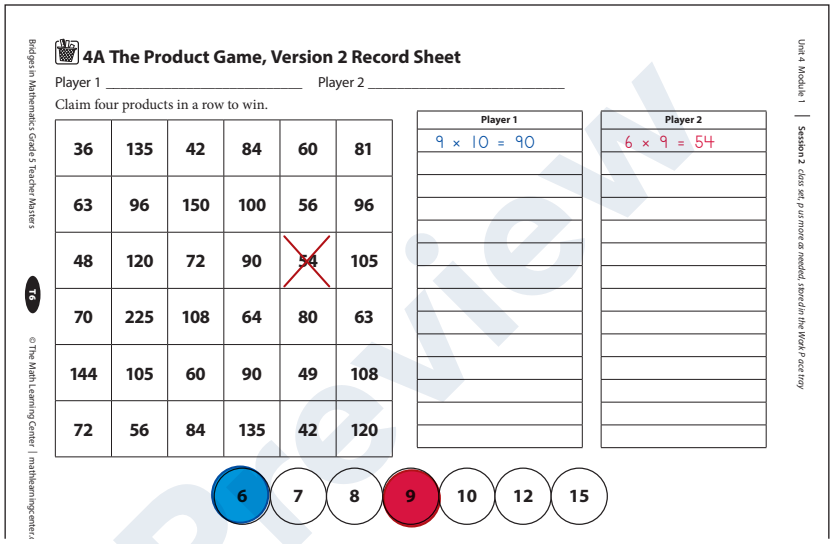
1 Players decide who is going first. Player 1 is O and Player 2 is X.

2 Player 1 places one of the game markers on any factor.

3 Player 2 places the other game marker on a factor. Then she multiplies the two factors, draws an X on the product, and writes an equation to match the combination.

Tabitha *I choose 6.*

Ambrose *I choose 9. I am drawing my X on 54 because 6 × 9 is 54.*



4A The Product Game, Version 2 Record Sheet

Player 1 _____ Player 2 _____

Claim four products in a row to win.

36	135	42	84	60	81
63	96	150	100	56	96
48	120	72	90	54	105
70	225	108	64	80	63
144	105	60	90	49	108
72	56	84	135	42	120

Player 1	Player 2
9 × 10 = 90	6 × 9 = 54

6 7 8 9 10 12 15

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Unit 4 Module 1 | Session 2 class set; print more as needed, store in the Work Place tray

4 Player 1 moves one game marker to get a new product. He can move either of the markers.

Tabitha *I moved the factor marker from the 6 to the 10. Since 9 × 10 is 90, I'll put my O on 90.*

5 Play continues until a player gets four products in a row across, up and down, or diagonally.

- Only one factor marker can be moved during a player's turn.
- Players can move a marker so that both are on the same factor. For example, both markers can be on 9. The player would mark the product 81 because 9 × 9 = 81.
- If the product a player chooses is already covered, the player loses that turn.

Game Variations

A Players can try for three in a row (easier) or five in a row (harder).

B Players can introduce wild numbers by adding a blank circle to the list of factors. Players can also cover some of the products to make them blank. Then players can make the blank spaces any factor or product they want or need as they play.

C Players can make their own game board in which they rearrange the numbers. They can also make a game board with different factors and products, but they need to make sure they include all of the products of the factors they choose.

NAME | DATE

Product Problems

1 Find the product.

a $(18 \times 4) \times 5$

b $22 \times (6 \times 10)$

c $15 \times (4 \times 20)$

2 Find the quotient.

a $1{,}300 \div 100$

b $1{,}300 \div 10$

c $1{,}300 \div 5$

3 Solve the problems in this string. Use the answers from the first few combinations to help solve the rest.

a 48×10

b 48×5

c 48×15

d 48×100

e 48×50

f $2{,}448 \div 48$

NAME | DATE

Callie's Cake Pops

Callie is trying to earn money to purchase a new pair of soccer cleats. She has decided to make her famous cake pops and sell them to her friends.

1 Callie's mom is willing to loan her the money to get the fundraiser started. Callie knows that her cake pops cost $1.25 to make, and she'd like to make 36 of them. How much money does Callie need to borrow from her mom?

2 Callie priced her cake pops at $1.75 each and sold 32 of them.

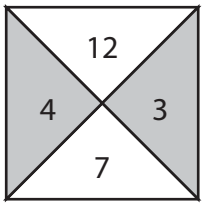
a How much money did Callie collect for her 32 cake pops?

b How much did Callie earn to put toward her soccer cleats? (What was her profit?)

NAME | DATE

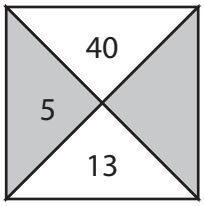
Multiplication Strategy

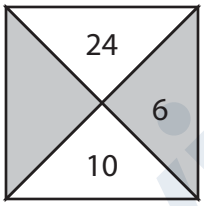
Here is a completed box challenge puzzle. If you look at it closely, you'll see that the number at the top is the product of the two numbers in the middle, and the number at the bottom is the sum of the two numbers in the middle.

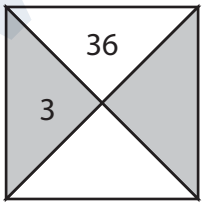


$4 \times 3 = 12$
$4 + 3 = 7$

1 Fill in the blanks to complete each of the box challenge puzzles below. Remember that the number at the top is the *product* of the two numbers in the middle, and the number at the bottom is the *sum* of the two numbers in the middle.







2 The craft store sells boxes of modeling clay. Each box holds 14 sticks of clay. Complete the ratio table to find out how many sticks there are in different numbers of boxes.

Boxes	1	2	3	6	10	9
Sticks of Clay	14					

3 You can also buy individual sticks of modeling clay for $0.35 each. Find out how much it would cost to buy different numbers of individual sticks of clay.

Clay Sticks	1	2	4	8	20	19
Cost	$0.35					

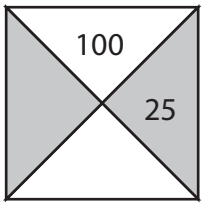
4 Miranda was asked to solve the problem 1,300 ÷ 26. How can she use multiplication to solve this problem? Find the answer and describe the strategy you used.

NAME | DATE

Box Puzzle Challenges

Complete the box puzzle challenges. Remember that the top box shows the *product* of the two middle numbers, and the bottom box shows *the* sum of the two middle numbers.

1



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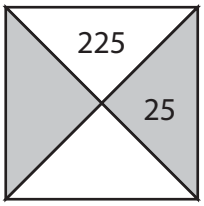

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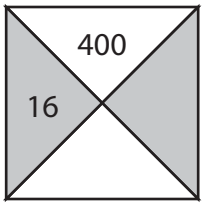

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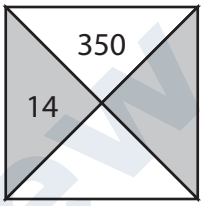

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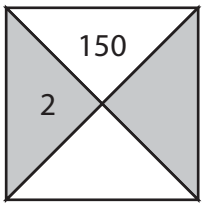

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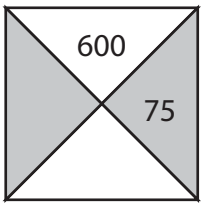
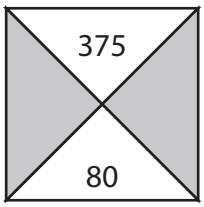
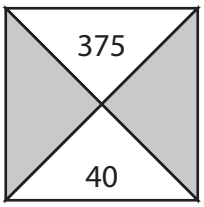


Challenge

7



8



Home Connections

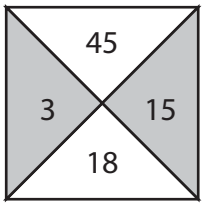
GRADE 5 – UNIT 4 – MODULE 1

BRIDGES™
IN MATHEMATICS

NAME | DATE

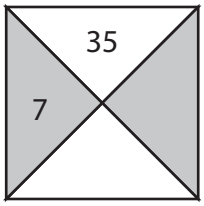
Number Review page 1 of 2

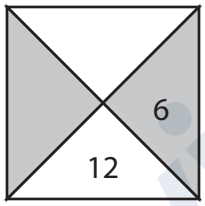
Here is a completed box challenge puzzle. If you look at it closely, you'll see that the number at the top is the product of the two numbers in the middle, and the number at the bottom is the sum of the two numbers in the middle.

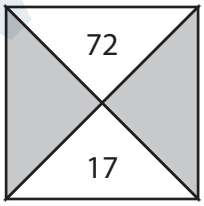


$3 \times 15 = 45$
$3 + 15 = 18$

1 Fill in the blanks to complete each of the box challenge puzzles below. Remember that the number at the top is the *product* of the two numbers in the middle, and the number at the bottom is the *sum* of the two numbers in the middle.







2 Evaluate each expression.

a $(14 \times 3) \times 10$

b $4 \times (9 \times 20)$

c $(600 \div 20) \times 5$

d $99 \times (99 + 1)$

3 Julia said that she solved the problem $360 \div 12$ by dividing 36 by 12 and then multiplying her answer by 10. Write an expression to show her thinking.

4 Lucas said he solved $360 \div 12$ by multiplying 12 by 3 and then multiplying the product by 10. Write an expression to show his thinking.

5 Who got the correct quotient (answer), Julia or Lucas?

6 Billy said that he thinks 30×176 is three times larger than 10×176. Do you agree or disagree? Explain your thinking.

(continued on next page)

NAME | DATE

Number Review page 2 of 2

7 Write the following decimals in standard form.

a 1,000 + 6 + .1 + .003

b Fourteen and three hundred ninety-seven thousandths

8 Write the following decimals in word form.

a 10 + .06 + .008

b 40.545

9 Write the following decimals in expanded notation.

a Seven hundred twenty-two and sixteen-thousandths

b 938.120

10 Compare the decimals. Fill in each blank with <, >, or =.

a 160.30 ____ 160.03

b 7.098 ____ 7.908

c 3.071 ____ 3.701

d 90.0 ____ 0.90

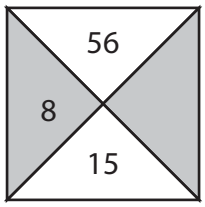
11 **CHALLENGE** Sean says that any time two numbers are given in a box challenge, there are only two other numbers that can be filled in the blank spots. Carlos disagrees. Write an example of a box challenge that Carlos could use to prove his thinking.

NAME | DATE

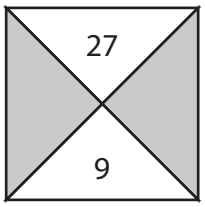
Thinking About Strategy page 1 of 2

1 Complete the box challenges below.

a



b CHALLENGE



2 The craft store sells large boxes of modeling clay that hold 18 sticks each. Complete the ratio table to find out how many sticks there are in different numbers of boxes.

Large Boxes	1	2	3	5	10	50	55
Sticks of Clay	28						

3 You can also buy small boxes of modeling clay at the craft store for $3.50 each. Find out how much it would cost to buy different numbers of small boxes of clay.

Small Boxes	1	2	10	20	19	40	39
Cost	$3.50						

4 Solve the problems in the string below. Use the answers from the first few combinations to help solve the rest.

a 36×10

b 36×5

c 36×15

d 36×100

e 36×50

f $1{,}872 \div 36$

(continued on next page)

NAME | DATE

Thinking About Strategy page 2 of 2

5 Solve the problems in this string.

a 36 ÷ 18

b 72 ÷ 18

c 108 ÷ 18

d 180 ÷ 18

e 1800 ÷ 18

f 18 × 99

6 **CHALLENGE** Noah loves the Half-Tens facts and often uses them to solve multiplication problems. Make up a 2-digit by 3-digit multiplication problem for which using Half-Ten facts is efficient. Then, solve the problem using that strategy.

