

4

The Four Operations Using Bar Models

Across-Grades Progression

Looking Back	Looking Here	Looking Ahead
Grade 3 Chapter 4 Section 4G Word Problems <ul style="list-style-type: none"> Two-Part Word Problems: The Four Operations Two-Step Word Problems: The Four Operations 	Grade 4 Chapter 4 Section 4A Word Problems <ul style="list-style-type: none"> Two-Part Word Problems: The Four Operations Multi-Step Word Problems: The Four Operations 	Grade 5 Chapter 2 Section 2G Word Problems <ul style="list-style-type: none"> Three-Step Word Problems: The Four Operations Multi-Step Word Problems: The Four Operations

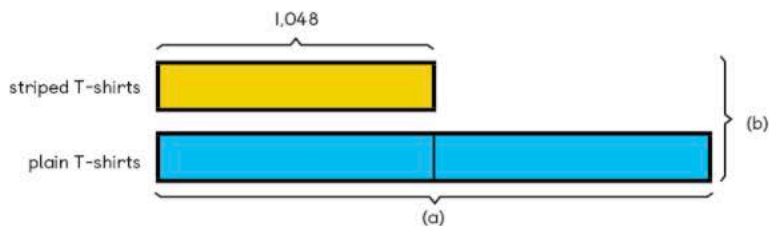
Across- Chapters STEAM Project Work

This project spans **Chapters 1 to 4**. Students are required to research the design and construction of the Golden Gate Bridge, estimating its length, the distance between the two towers of the bridge, and its weight. Students will use the information gathered to design and build a bridge that can hold ten toy cars. They will need to think about the materials they need and use bar models to aid in calculating the amount they require. Finally, students will present their design to their classmates.

Chapter Progression

In **Section 4A**, students use bar models and the four-step problem-solving method to solve two-part and multi-step word problems involving addition, subtraction, multiplication, and division. They learn multiple methods for solving problems and are introduced to before-and-after word problems.

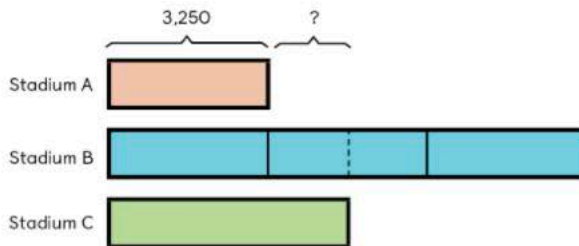
Two-Part



- (a) $1,048 \times 2 = 2,096$
2,096 plain T-shirts were sold.
- (b) $1,048 + 2,096 = 3,144$
A total of 3,144 T-shirts were sold.
 $3,144 \times 6 = 18,864$
The bargain store received \$18,864.



Multi-Step



- 1 unit = 3,250
3 units = $3 \times 3,250$
= 9,750
The seating capacity of Stadium B is 9,750.
 $9,750 \div 2 = 4,875$
The seating capacity of Stadium C is 4,875.
 $4,875 - 3,250 = 1,625$
The difference between the seating capacities of Stadiums A and C is 1,625.

Lesson 1

Chapter Opener (page 163)

20 minutes

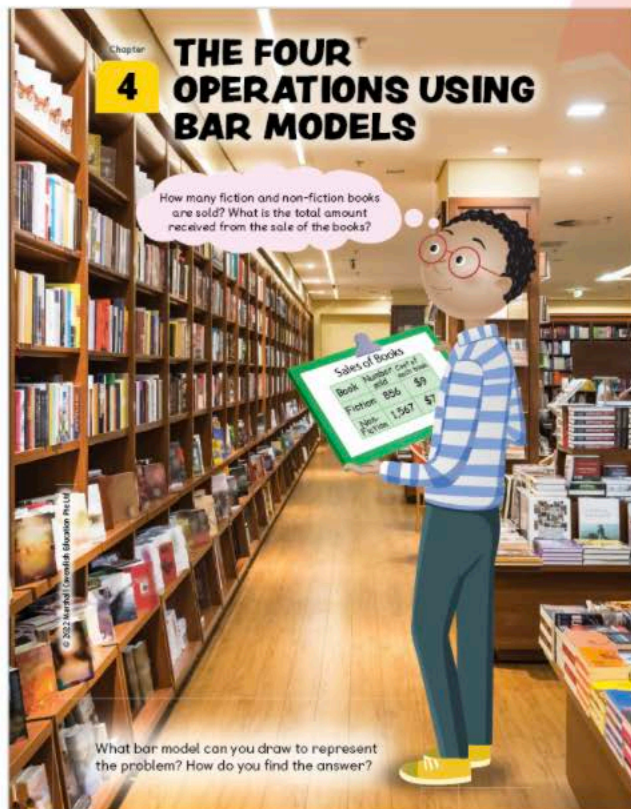
This picture provides a familiar context for students to use what they know about multiplication and division and solving word problems to explore solving a two-part word problem.

- You may use the Interactive Class Presentation to facilitate discussions and promote interactions.
- Display the picture. Invite students to share what they see. **a bookstore; books on shelves; a table showing the sales of books; a storekeeper thinking about the sales of books**
- Invite students to talk about situations that required them to use the four operations on multi-digit numbers.
- Groups students in pairs or small groups to discuss the picture and questions on the page.
- You may facilitate discussions with these questions. Observe student discussions and pay attention to the language they use.
 - How might you find the total number of fiction and non-fiction books that are sold? I can add 856 and 1,567. How might you find the total sales for each type of book? I can multiply the cost of each type of book by the number sold. How might you find the total sales for all the books? Add the total sales for each type of book. How can you represent the problem? I can draw bar models. Is there another way to solve the problem? What strategies might you use to find the answer?**
- Have students discuss the questions on the page and justify their answers.
- Extend the task by having students write other questions that could be asked about the information on the page.

English Language Support

Help students make sense of the four operations in word problems. Give students 9 red counters and 18 blue counters. Have them complete the sentence frames and draw bar models to represent the situation.

- To find the total number of counters I _____ **add**
- I can compare the number of counters by _____ **subtracting**
- There are _____ more/fewer red counters than blue counters. **fewer**
- There are _____ as many blue counters as red counters. **twice**
- There are _____ as many red counters as blue counters. **half**
- I can _____ the counters into equal groups of _____. **divide; 3 or 9**



Student Book Page 163

Promoting Growth

You may need to review the different types of bar models with students. Be sure they know how to represent part-whole, comparison, equal parts, and equal part comparison situations. Consider using the activity described in the **English Language Support** with all students.

Encourage students to use concrete materials to support and make connections to what they already know about multiplication and division and bar modeling. Some students may struggle with the calculations of greater numbers and lose sight of the thinking. To promote their thinking, you might consider allowing them to use a calculator.

Recall (pages I64 to I66)

30 minutes

Have students complete the **Recall** questions to check their readiness for the chapter. After students have answered all the questions, go through each of them by facilitating the following class activities and/or discussions. You may refer to the **Transition Guide** for additional resources. As an option, you may refer students to the online **Recall** questions. These online questions will be auto-graded. For questions that require students to show their work, have them do so in the Student Book.

Material(s)

- 1 set of place-value chips per pair or small group

QUESTION 1 assesses students' understanding of the term "sum" and their ability to reason the sum of the two numbers.

What operation is indicated by the term "sum?" addition **How can estimation help you eliminate some of the answers?** I can estimate to determine that only options C and D are large enough to be possible choices. **Which option is correct? Why?** Option D because in C they did not add the ones or tens place digits.

QUESTION 2 assesses students' understanding of the term "product" as an indication to multiply a 4-digit number by a 1-digit number.

What operation is indicated by the term "product?" multiplication **How can estimation help you choose the correct solution?** 2,196 is close to 2,000, and 2,000 times 4 is 8,000, so Option A is the correct answer.

QUESTION 3 assesses students' ability to solve multi-digit addition and subtraction problems involving regrouping.

What strategies can you use to solve each problem? I can use place value to subtract each place or a write the problem in a vertical algorithm. **How can you check the answer?** Use the inverse operation and work backwards.

QUESTION 4 assesses students' ability to divide a four-digit number by a 1-digit number without and with a remainder.

How do you determine if the answer has a remainder? If the remaining amount is less than the number that describes the number of groups or the number in each group (divisor), there will be a remainder. **How can you check the answer?** Multiply the answer and the divisor, then add in any remainder to see if I get the original number (dividend).

Recall

1. What is the sum of 256,147 and 541,502?

- (A) 285,355 (B) 286,000
 (C) 797,600 (D) 797,649

2. What is the product of 2,196 and 4?

- (A) 8,784 (B) 4,392
 (C) 2,192 (D) 549

3. Add or subtract. Show your work.

- (a) $364,597 + 207,842$ (b) $620,756 - 315,974$

$$\begin{array}{r} 364,597 \\ + 207,842 \\ \hline 572,439 \end{array}$$

$$\begin{array}{r} 620,756 \\ - 315,974 \\ \hline 304,782 \end{array}$$

4. Divide. Show your work.

- (a) $1,864 \div 4 = 466$ (b) $2,097 \div 7 = 299 \text{ R } 4$

$$\begin{array}{r} 466 \\ 4 \overline{) 1864} \\ \underline{16} \\ 26 \\ \underline{24} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

$$\begin{array}{r} 299 \text{ R } 4 \\ 7 \overline{) 2097} \\ \underline{14} \\ 69 \\ \underline{63} \\ 67 \\ \underline{63} \\ 4 \end{array}$$

Lesson 2

4A Word Problems (I)

Focus Question

- How do bar models help you solve two-part word problems involving the four operations?

I CAN

- I can use bar models to solve two-part word problems involving the four operations.

Mathematical Practice(s)

- 4 Model
- 6 Use Math Language

Material(s)

- 1 set of place-value chips per pair or small group
- 1 copy of Place-Value Chart I (TRO1) per pair or small group

TWO-PART WORD PROBLEMS: THE FOUR OPERATIONS (pages I67 to I74)

Lesson Opener



Task (page I67)

10 minutes

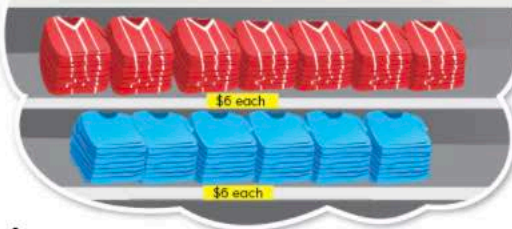
- You may use the appropriate digital manipulatives to support teaching and learning throughout the lesson(s) in Section 4A.
- Group students in pairs or small groups. Provide them with place-value chips and Place-Value Chart I (TRO1).
- Have students work on the task. Observe student discussions.
- After students have attempted the task, use the following prompts to facilitate a class discussion. Pay attention to the language students use.
 - What information do you know from the problem?** A store sells two kinds of T-shirts: striped and plain. It sold 1,048 striped T-shirts and twice as many plain T-shirts. Each T-shirt costs \$6. **What are you trying to find?** The number of plain T-shirts sold and the total sales made from selling all the T-shirts. **How would you solve the problem?** I can draw a bar model. I can identify the missing information that I need to find to help me solve the problem. **What strategies and operations can you use?**
- Invite students to solve the problem using a bar model and record the solution with equations. Remind students that they can use their place-value chips on the place-value chart, if needed. Encourage students to explain how they know their answer is correct and what strategies they used to check the answer.

Name: _____ Date: _____

4A Word Problems

1,048 striped T-shirts were sold at a bargain store in a year. The store sold twice as many plain T-shirts as striped T-shirts. Each T-shirt was sold for \$6.

- How many plain T-shirts were sold?
- How much money did the store receive from the sale of the T-shirts?



Learn

Step 1

Understand.

How many striped T-shirts were sold?
Do I know how many plain T-shirts were sold?
How much was each T-shirt sold for?
What do I need to find?



Step 2

Plan.

I first find the number of plain T-shirts sold.



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4A Word Problems 167

Student Book Page I67



Lesson Development

Learn (pages I67 and I68)

10 minutes

Step 1

Understand

- Invite students to read through the problem.
- What relationship do you know about the two kinds of T-shirts?** The store sold twice as many plain T-shirts as striped T-shirts. **How many striped T-shirts were sold?** 1,048 striped T-shirts were sold. **How will the information you know help you find the number of plain t-shirts sold?** I can double the number of striped t-shirts sold to find the number of plain T-shirt sold.

Step 2

Plan

- Remind students that they can use bar models to represent the problem and solve the parts separately.
- How do you know this is a two-part problem?** There is a part (a) and a part (b) in the question. **How are the two parts related?** Part (b) cannot be solved without the answer of part (a). **What model can be used to show the problem?** comparison model **How will you show each question in your model?** Show the relationship between the shirts as a comparison model and the total costs of the shirts as the total of the two bars.

- Draw the bar model together on the board. Note the use of (a) and (b) as they relate to the unknowns in the problem.

Step 3 Solve

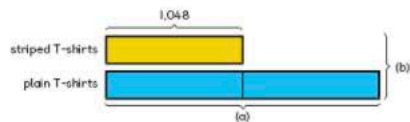
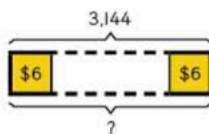
- Encourage students to use vertical algorithms to solve the problem. Provide place-value chips as needed.
- **How did you solve for (a)?** I multiplied 1,048 by 2. **How did knowing (a) help you solve for (b)?** Part (b) asked for the total amount of money received from all the T-shirts sold. So I first find the total number of T-shirts sold by adding 1,048 and the answer I obtained in (a). Then I multiplied the total number by \$6 to obtain the total amount collected.

Step 4 Check

- Remind students that they should check the answer to make sure it is reasonable.
- **How can rounding help you decide whether the answer is reasonable?** Rounding gives an estimate of the number to the nearest tens, hundreds, or thousands. It is also easier to work with the rounded number. If the answer is near the rounded answer, the answer is reasonable. **Why does it make sense to round to the thousands place?** It is the place they all have in common. Rounding to the ten thousands place would not give a reasonable estimate. Rounding to the hundreds or tens would not make the calculation easy for checking.

Best Practice

Students may want to draw two bar models for this problem to show both steps. The first bar model should look similar to page 165. The second bar model could show equal groups of 6 to find the total.



Step 3 Solve.

$$(a) \quad 1,048 \times 2 = 2,096$$

2,096 plain T-shirts were sold.

$$(b) \quad 1,048 + 2,096 = 3,144$$

A total of 3,144 T-shirts were sold.

$$3,144 \times 6 = 18,864$$

The bargain store received \$ 18,864

Step 4 Check.

$$18,864 \text{ is close to } 18,000$$

$$18,000 \div 6 = 3,000$$

About 3,000 T-shirts were sold in all.

$$3,000 = 1,000 + 2,000$$

2,000 is twice of 1,000.

About 1,000 striped T-shirts were sold.

$$1,048 \text{ is close to } 1,000.$$

The answer is reasonable.