

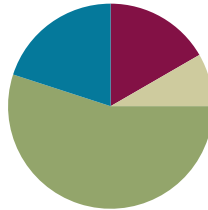
Lesson 18

Objective: Solve multi-step word problems modeled with tape diagrams and assess the reasonableness of answers using rounding.

Related Topics: [More Lesson Plans for the Common Core Math](#)

Suggested Lesson Structure

■ Fluency Practice	(10 minutes)
■ Application Problem	(5 minutes)
■ Concept Development	(33 minutes)
■ Student Debrief	(12 minutes)
Total Time	(60 minutes)



Fluency Practice (10 minutes)

- Number Patterns **4.OA.5** (5 minutes)
- Convert Units **4.MD.1** (5 minutes)

Number Patterns (5 minutes)

Materials: (S) Personal white boards

Note: This fluency bolsters students' place value understanding and helps them apply these skills to a variety of concepts.

T: (Project 40,100 50,100 60,100 ____.) What is the place value of the digit that's changing?

S: Ten thousand.

T: Count with me saying the value of the digit I'm pointing to.

S: (Point at the ten thousand digit as students count.) 40,000, 50,000, 60,000.

T: On your boards write what number would come after 60,100.

S: (Students write 70,100.)

Repeat with the following possible sequence: 82,030, 72,030, 62,030, ____ ; 215,003, 216,003, 217,003, ____ ; 943,612, 943,512, 943,412, ____ ; and 372,435, 382,435, 392,435, ____.

Convert Units (5 minutes)

Materials: (S) Personal white boards

Note: Reviewing these unit conversions that were learned in third grade will help prepare the students solve problems with kilometers and meters in Topic A of Module 2.

T: Count by 200 meters, starting at 200 meters. When you get to 1000 meters, say 1 kilometer.

S: 200 m, 400 m, 600 m, 800 m, 1 km, 1,200 m, 1,400 m, 1,600 m, 1,800 m, and 2 km.

Repeat process, this time pulling out the kilometer (e.g., 1 km 200 m, 1 km 400 m).

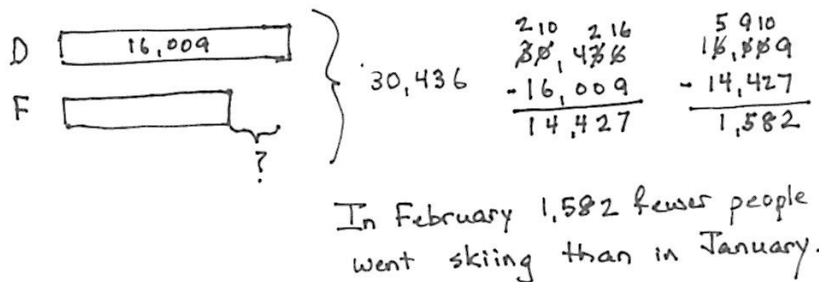
T: (Write $1,300\text{ m} = \underline{\hspace{1cm}}\text{ km } \underline{\hspace{1cm}}\text{ m}$.) On your boards, fill-in the blanks.

S: (Students regroup 1,300 m into 1 km 300 m.)

Repeat process for 1,003 m, 1,750 m, 3,450 m, and 7,030 m.

Application Problem (5 minutes)

In all, 30,436 people went skiing in February and January. 16,009 went skiing in February. How many fewer people went skiing in February than in January?



In February 1,582 fewer people went skiing than in January.

Note: This problem reviews content from the prior lesson and is a comparison subtraction problem.

Concept Development (33 minutes)

Materials: (S) Student Problem Set

Suggested Delivery of Instruction for Solving Topic F’s Word Problems

1. Model the problem.

Have two pairs of students who you think can be successful with modeling the problem work at the board while the others work independently or in pairs at their seats. Review the following questions before beginning the first problem.

- Can you draw something?
- What can you draw?
- What conclusions can you make from your drawing?

As students work, circulate. Reiterate the questions above. After 2 minutes, have the two pairs of students share *only* their labeled diagrams. For about 1 minute, have the demonstrating students receive and respond to feedback and questions from their peers.

2. Calculate to solve and write a statement.

Give everyone 2 minutes to finish work on that question, sharing their work and thinking with a peer. All should then write their equations and statements of the answer.

3. Assess the solution for reasonableness.

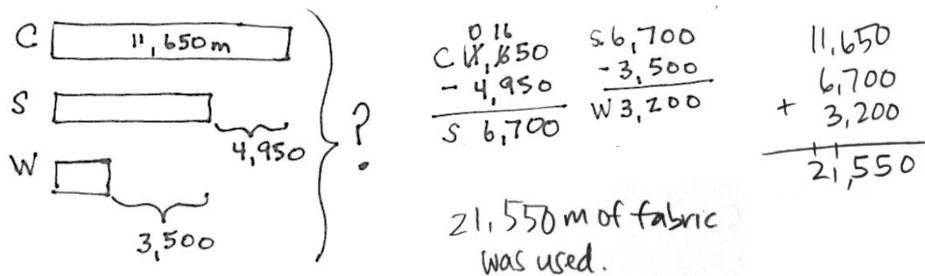
Give students 1–2 minutes to assess and explain the reasonableness of their solution.

Note: In Lessons 17–19, the Problem Set will be comprised of the word problems from the lesson and is therefore to be used during the lesson itself.

Problem 1

Solve a multi-step word problem, requiring addition and subtraction, using a tape diagram, and checking the reasonableness of the answer using estimation.

In one year, a factory used 11,650 meters of cotton, 4,950 fewer meters of silk than cotton, and 3,500 fewer meters of wool than silk. How many meters in all were used of the three fabrics?



This problem is a step forward for students as they subtract to find the amount of wool from the amount of silk. Students also might subtract the sum of 4,950 and 3,500 from 11,650 to find the meters of wool and add that to the amount of silk. It’s a longer method but makes sense. As you circulate, look for other alternate strategies which can be quickly mentioned or explored more deeply as per your professional judgment. Be advised, however, not to emphasize creativity but rather analysis and efficiency. Ingenious short cuts might be highlighted.

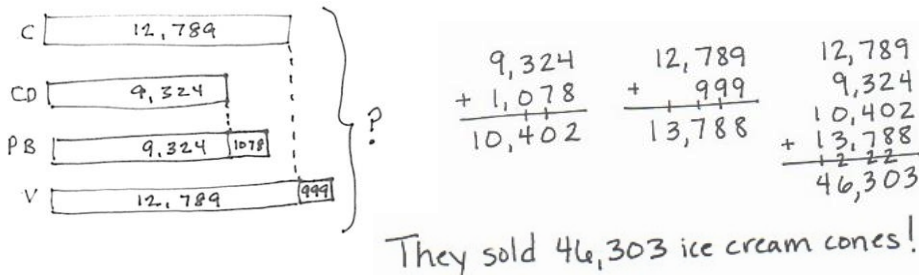
After the students have solved the problem, ask them to check their answer for reasonableness.

- T: How can you know if 21,550 is a reasonable answer? Discuss with your partner.
- S: Well, I can see by looking at the diagram that the amount of wool fits in the part that the silk is missing. So the answer is a little less than double 12 thousand, so our answer makes sense.
- S: Another way to think about it is that 11,650 can be rounded to 12 thousand. 12 thousand plus 7 thousand for the silk since 12 thousand minus 5 thousand is 7 thousand plus about 4 thousand for the wool, that’s 23 thousand.

Problem 2

Solve an additive multi-step word problem using a tape diagram, checking the reasonableness of the answer using estimation.

The shop sold 12,789 chocolate and 9,324 cookie dough cones. They sold 1,078 more peanut butter cones than cookie dough cones and 999 more vanilla cones than chocolate cones. What was the total number of ice cream cones sold?



The solution above shows calculating the total number of cones of each flavor and then adding. Students may also add like units before adding the extra parts.

After the students have solved the problem, ask them to check their answer for reasonableness.

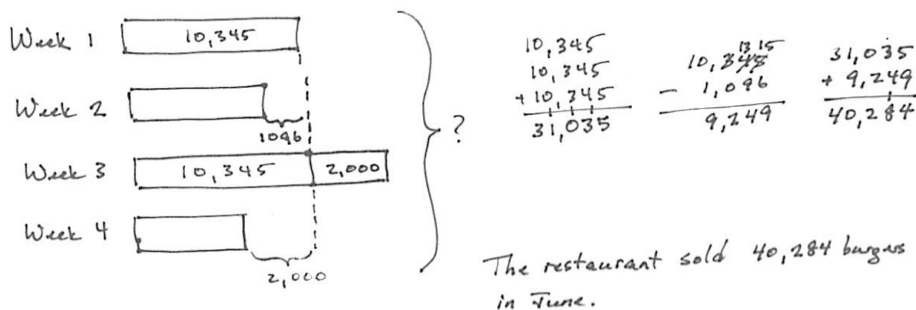
- T: How can you know if 46,303 is a reasonable answer? Discuss with your partner.
- S: By looking at the tape diagram, I can see we have 2 thirteen thousands. That's 26 thousand. We have 2 nine thousands, that's 26 and 18 is 44. Plus about 2 thousand more, that's 46 thousand. That's close.
- S: Another way to see it is that I can kind of see 2 thirteen thousands and the little extra pieces with the peanut butter make 11 thousand. That is 37 thousand plus 9 thousand from cookie dough is 46 thousand. That's close.

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Problem 3

Solve a multi-step word problem, requiring addition and subtraction, modeled with a tape diagram, checking the reasonableness of the answer using estimation.

In the first week of June, a restaurant sold 10,345 omelets. The second week, they sold 1,096 fewer omelets than the first week. The third week, they sold 2 thousand more than the first week. The fourth week, they sold 2 thousand fewer than the first week. How many omelets did they sell in all in June?



This problem is interesting because 2 thousand more and 2 thousand less mean that there is one more unit of 10,345. We therefore simply add in the omelets from week 2.

- T: How can you know if 40,284 is a reasonable answer? Discuss with your partner.
- S: By looking at the tape diagram, it's easy to see it is like 3 ten thousands plus 9 thousand, that's 39 thousand. That is close to our answer.
- S: Another way to see it is just rounding one week at a time starting at week one, 10 thousand plus 9 thousand plus 12 thousand plus 8 thousand. That's 39 thousand.

Problem Set

Please note that the Problem Set in Topic F is comprised of the lesson's problems as stated at the introduction of the lesson.

For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.

Student Debrief (12 minutes)

Lesson Objective: Solve multi-step word problems modeled with tape diagrams and assess the reasonableness of answers using rounding.

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

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson. You may choose to use any combination of the questions below to lead the discussion.

- How are the problems alike? How are they different?
- How was your solution the same and different from those that were demonstrated?
- Why is there more than one right way to solve, for example, Problem 3?
- Did you see other solutions that surprised you or made you see the problem differently?
- In Problem 1, was the part unknown or the total unknown? What about in Problems 2 and 3?
- Why is it helpful to assess for reasonableness after solving?
- How were the tape diagrams helpful to us in estimating to test for reasonableness? Why is that?

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 18 Worksheet 4•1

Name Jack Date _____

Directions: Model each problem using a tape diagram. Solve using numbers and words.

1. In one year the factory used 11,650 m of cotton, 4,950 fewer meters of silk than cotton, and 3,500 fewer meters of wool than silk. How many meters in all were used of the three fabrics?

Cotton $\overline{\hspace{2cm}}$ 11,650
 Silk $\overline{\hspace{2cm}}$ 4,950
 Wool $\overline{\hspace{2cm}}$ 3,500

21,550 m of fabric was used.

2. The shop sold 12,789 chocolate and 9,324 cookie dough cones. They sold 1,078 more peanut butter cones than cookie dough cones and 999 more vanilla cones than chocolate cones. What was the total number of ice cream cones sold?

Chocolate $\overline{\hspace{2cm}}$ 12,789
 Cookie Dough $\overline{\hspace{2cm}}$ 9,324
 Peanut Butter $\overline{\hspace{2cm}}$ 1,078
 Vanilla $\overline{\hspace{2cm}}$ 999

They sold 46,303 ice cream cones.

3. In the first week of June, a restaurant sold 10,345 omelets. The second week, they sold 1,096 fewer omelets than the first week. The third week, they sold 2 thousand more than the first week. The fourth week they sold 2 thousand fewer than the first week. How many omelets did they sell in all in June?

Week 1 $\overline{\hspace{2cm}}$ 10,345
 Week 2 $\overline{\hspace{2cm}}$ 1,096
 Week 3 $\overline{\hspace{2cm}}$ 2,000
 Week 4 $\overline{\hspace{2cm}}$ 2,000

40,284

The restaurant sold 40,284 omelets in June.

COMMON CORE Lesson 18: Solve multi-step word problems modeled with tape diagrams and assess the reasonableness of answers using rounding. Date: 4/24/13 engage^{ny} 4.F.7

Exit Ticket (3 minutes)

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

Name _____

Date _____

Directions: Model each problem using a tape diagram. Solve using numbers and words.

1. In one year the factory used 11,650 meter of cotton, 4,950 fewer meters of silk than cotton, and 3,500 fewer meters of wool than silk. How many meters in all were used of the three fabrics?

2. The shop sold 12,789 chocolate and 9,324 cookie dough cones. They sold 1,078 more peanut butter cones than cookie dough cones and 999 more vanilla cones than chocolate cones. What was the total number of ice cream cones sold?

3. In the first week of June, a restaurant sold 10,345 omelets. The second week, they sold 1,096 fewer omelets than the first week. The third week, they sold 2 thousand more than the first week. The fourth week, they sold 2 thousand fewer than the first week. How many omelets did they sell in all in June?

Name _____

Date _____

Directions: Draw a tape diagram to represent the problem. Use numbers and words to explain your thinking.

1. Park A covers an area of 4,926 square kilometers. It is 1,845 square kilometers larger than Park B. Park C is 4,006 square kilometers larger than the Park A.

a. What is the area of all three parks?

b. Assess the reasonableness of your answer.

