Lesson 7.10
Problem Solving • Two-Step Problems

About the Math
Professional Development

Why Teach This
Using a graphic organizer to scaffold a problem helps students analyze the problem to understand what they need to find, identify what information they need to use, and develop or select a strategy.

In this lesson, students use the act it out strategy. Students use counters, write equations, and work backward to solve two-step problems.

Students will represent the situations in the steps of a problem with equations containing a letter that stands for the unknown quantity. Writing equations with an unknown quantity can help students to relate the situations in problems to operations. Carrying out each operation and finding the unknown helps students to solve the two-step problems.

GO DIGITAL
Interactive Student Edition
Personal Math Trainer
Math on the Spot
iTools: Counters

Professional Development Videos
**Daily Routines**

**Common Core**

**Problem of the Day 7.10**
The product of two factors is 27. One factor is 9. What is the other factor? 3

**Vocabulary**

- Go Digital Interactive Student Edition Multimedia eGlossary

**Fluency Builder**

**Common Core Fluency Standard 3.OA.C.7**

**Materials**: K.I.M. Chart (see eTeacher Resources)

**Graphic Organizer**: Have students work in groups to brainstorm all the division words they have learned. Then have students complete a K.I.M. chart for the words.

Students write the term or key idea in the left column. Then they write the information that goes with the term, the definition, in the center column. Then students draw a picture of the idea, a memory clue, in the right column.

<table>
<thead>
<tr>
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<th>M</th>
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<tbody>
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**Learning Activity**

What is the problem the students are trying to solve? Connect the story to the problem.

- How many rabbit holes did the first set of beetles hide in? 4
- How many beetles were seen first? 28
- How many beetles were seen after the first set hid in the rabbit holes? 8
- What is the question asking for? how many beetles will be in each hole

**Literacy and Mathematics**

Choose one or more of the following activities.

- Have students visualize the beetles separating and hiding in the holes.
- Have students draw a picture of four holes with the beetles hiding.
- Have students write a short story about what it would be like to live for 1 day as a beetle.
MULTISTEP 

Model 

Language 

similar in 

explain. Have 
persevere in solving them. 

Math Talk 
Use Math Talk to focus on solving 
multistep problems. 

MP2 Reason abstractly and 
quantitatively. 

How would the problem change if Madilyn 
bought 3 packs of pens and a notebook 
for $15? You would still subtract the price of 
the notebook from $15, but now you would divide 
the remaining amount by 3 instead of 2. 

ELL Strategy: Model Language 
Go over four strategies—act it out, draw a 
diagram, make a table, and find a pattern. 

Write the name of each strategy and put an 
icon or visual to represent the strategy on 
an index card. 

Have students draw a card and act out the 
strategy. Allow students to use props as 
needed. The other students check which 
strategy is being performed. 

Discuss the strategy using sentence frames. 
You can use the ______ strategy to solve 
problems by _______. 

Madilyn bought 2 packs of pens and a notebook for 
$11. The notebook cost $3. Each pack of pens cost the 
same amount. What is the price of 1 pack of pens?

Read the Problem 
What do I need to find? 
I need to find the price of 
1 pack of pens. 

What information do I need to use? 
Madilyn spent $11 in all. 
She bought 2 packs of pens 
and 1 notebook. 
The notebook cost $3. 

How will I use the information? 
I will use the information to 
act out the problem. 

Solve the Problem 
Describe how to act out the problem. 
Start with 11 counters. Take away 3 counters. 

What is the total cost? 
$11 - $3 = p 

What is the cost of 2 packs of pens? 
$8 = p 

Now I know that 2 packs of pens cost $8. 
Next, make 2 equal groups with the 
8 remaining counters. 

Possible explanation: I need to subtract the cost of 
the notebook to know what the pens cost. Then I need 
to divide to find the cost of 1 pack of pens.

Unlock the Problem 
Real World 

MATHEMATICAL PRACTICES 

MP1 Make sense of problems and 
persevere in solving them. Have students 
explain how the description to act out the 
problem helps them to solve the problem. 

Why do you subtract $3 from $11? Possible 
answer: the total cost for the pens and notebook 
is $11. You have to subtract the cost of the notebook 
to find out how much the pens cost. 

Why do you divide by 2 in the last step? 
The cost of 2 packs of pens is $8. To find the cost of 
1 pack, you divide by 2. 

Discuss the letter that stands for the unknown 
in each equation. Tell students that a letter is 
similar to the answer lines or the squares that 
they have seen in equations in the position of the 
answer they need to find. 

How can you use multiplication and 
addition to check your answer? I can multiply 
the cost of 1 pack of pens, $4 by 2. That gives me $8. 
Then add the notebook price $3, to $8 to get $11. So, 
my answer is correct. 

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Try Another Problem

Chad bought 4 packs of T-shirts. He gave 5 T-shirts to his brother. Now Chad has 19 shirts. How many T-shirts were in each pack?

Read the Problem | Solve the Problem
--- | ---
**What do I need to find?** I need to find the number of T-shirts that were in each pack. | **Describe how to act out the problem.** Possible description is given. Start with 19 counters. Add 5 counters.

<table>
<thead>
<tr>
<th>T-shirts given away</th>
<th>T-shirts in 4 packs</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>24</td>
</tr>
</tbody>
</table>

Now I know there were 24 T-shirts in the packs. Next, divide the counters into 4 equal groups to find the number of T-shirts in each pack.

<table>
<thead>
<tr>
<th>T-shirts in 4 packs</th>
<th>number of packs</th>
<th>p, number in each pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>4</td>
<td>6 = 6</td>
</tr>
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</table>

So, there were 6 T-shirts in each pack.

What information do I need to use?
Chad bought 4 packs of T-shirts and gave 5 T-shirts to his brother. Chad has 19 shirts left.

How will I use the information?
I will use the information to act out the problem.

- **How can you use multiplication and subtraction to check your answer?**
  - Possible answer: I can start with the number of T-shirts in each pack and work through the problem. Multiply 6 shirts by 4 packs: $4 \times 6 = 24$. Then subtract 5 T-shirts: $24 - 5 = 19$. So, my answer is correct.

  - Possible explanation: I could draw a diagram adding 5 tiles to 19 tiles. Then I would make an array by dividing the 24 tiles into 4 equal rows.

Math Talk

**Apply** What is another strategy you could use to solve this problem?

Advanced Learners

Materials play coins

- **Write the following problem on the board.**
  
  Cathy had 6 coins. She used 2 coins to buy an apple for 50¢. Then her friend gave her 35¢. Now she has 75¢. How much money did Cathy have to start? What are the coins Cathy had before buying the apple?

- **Have students solve the problem.** Provide students with play coins if they need to act out the problem. 90¢; possible answers: 2 quarters and 4 dimes, or 3 quarters and 3 nickels

- **Have students write out the steps they used to solve the problem.**

- **Challenge students to write more problems on their own and exchange papers to solve them.**

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Common Errors

**Error** When solving some multistep problems, students may not understand they can use an inverse operation.

**Example** In this problem, students might want to subtract 5 T-shirts instead of adding them, using the reasoning that they were given away.

**Springboard to Learning** Tell students that when working a problem from the end to the beginning, each operation should be an inverse operation.
1. Mac bought 4 packs of toy cars. Then his friend gave him 9 cars. Now Mac has 21 cars. How many cars were in each pack?

Act out the problem by using counters or the picture and by writing equations.

**First,** subtract the cars Mac’s friend gave him.

\[
21 - 9 = c
\]

\[
12 = c
\]

**Then,** divide to find the number of cars in each pack.

\[
c, \text{ cars in each pack}
\]

\[
12 \div 4 = p
\]

\[
3 = p
\]

So, there were _3_ cars in each pack.

2. **SMARTER** What if Mac bought 8 packs of toy boats, and then he gave his friend 3 boats? If Mac has 13 boats now, how many boats were in each pack?

2 boats

3. **SMARTER** Ryan gave 7 of his model cars to a friend. Then he bought 6 more cars. Now Ryan has 13 cars. How many cars did Ryan start with?

14 cars
4. **Differentiated Centers Kit**

Chloe bought 5 sets of books. Each set has the same number of books. She donated 9 of her books to her school. Now she has 26 books. How many books were in each set?

- **7 books**

5. Hilda cuts a ribbon into 2 equal pieces. Then she cuts 4 inches off one piece. That piece is now 5 inches long. What was the length of the original ribbon?

- **18 inches**

6. **Differentiated Centers Kit**

Teanna has 2 boxes of color pencils. One box has 20 color pencils and the other box has 16 color pencils. She gives her brother 3 of the color pencils. She wants to put the color pencils that she has left into 3 equal groups. How many color pencils will Teanna put in each group?

- **11 color pencils**

7. Rose saw a movie, shopped, and ate at a restaurant. She did not see the movie first. She shopped right after she ate. In what order did Rose do these activities? **Explain** how you know.

- ate, shopped, saw a movie; possible explanation: since Rose did not see the movie first, she saw it second or third.

- Since she shopped right after she ate, she saw the movie third, which means she ate first and shopped second.

8. **Differentiated Centers Kit**

Eleni bought 3 packs of crayons. Each pack contains the same number of crayons. She then found 3 crayons in her desk. Eleni now has 24 crayons. How many crayons were in each pack she bought? **Explain** how you solved the problem.

- Possible explanation: First, I subtracted 24 - 3 = 21. Then I divided 21 by 3 and got 7, so there were 7 crayons in each pack.

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**DIFFERENTIATED INSTRUCTION INDEPENDENT ACTIVITIES**

**Grab-a-Go!**

Differentiated Centers Kit

**Activities**

- **Division Dilemmas**

Students complete purple Activity Card 19 by relating division facts to known multiplication facts.

**Literature**

- **The Garden Fence**

Students read the book and use division facts to find how much wood they need to build a fence.

**Games**

- **Division Cover-Up**

Students practice division facts to place counters on the gameboard.

**Math Journal**

**WRITE > Math**

Write a division word problem and explain how to solve it by acting it out.

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**4 ELABORATE**

**MATHEMATICAL PRACTICES**

**Go Deeper**

Work with students to determine the hidden question in Exercise 4. In this exercise, the hidden question is: How many books did Chloe have before she donated books to her school?

**MP6 Attend to precision.** Exercise 7 requires students to use logical reasoning to determine the order of events and then explain their thinking.

**Personal Math Trainer**

Be sure to assign this problem to students in the Personal Math Trainer. It features a video to help them model and answer the problem. If students make errors, encourage them to act out the problem. Students may act out buying 3 packs of crayons and then picking up 3 more crayons. Repeating the steps in reverse order will help them visualize the solution steps.

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**5 EVALUATE**

**Formative Assessment**

**Essential Question**

**Using the Language Objective**

**Reflect** Have student teams role play to answer the Essential Question.

**How can you use the strategy act it out to solve two-step problems?** Possible answer: I can act out the problem by using counters, writing descriptions, making drawings, or writing equations. It organizes what I am doing and helps me see the steps. It also makes checking my work easy.
Practice and Homework

Use the Practice and Homework pages to provide students with more practice of the concepts and skills presented in this lesson. Students master their understanding as they complete practice items and then challenge their critical thinking skills with Problem Solving. Use the Write Math section to determine student’s understanding of content for this lesson. Encourage students to use their Math Journals to record their answers.

Problem Solving • Two-Step Problems

Solve the problem.

1. Jack has 3 boxes of pencils with the same number of pencils in each box. His mother gives him 4 more pencils. Now Jack has 28 pencils. How many pencils are in each box?

   Think: I can start with 28 counters and act out the problem.

   8 pencils

2. The art teacher has 48 paintbrushes. She puts 8 paintbrushes on each table in her classroom. How many tables are in her classroom?

   6 tables

3. Ricardo has 2 cases of video games with the same number of games in each case. He gives 4 games to his brother. Ricardo has 10 games left. How many video games were in each case?

   7 video games

4. Patty has $20 to spend on gifts for her friends. Her mother gives her $5 more. If each gift costs $5, how many gifts can she buy?

   5 gifts

5. Joe has a collection of 35 DVD movies. He received 8 of them as gifts. Joe bought the rest of his movies over 3 years. If he bought the same number of movies each year, how many movies did Joe buy last year?

   9 movies

6. Write a division word problem and explain how to solve it by acting it out.

   Check students’ work.

Inequalities

Materials index cards

Investigate In this activity, students compare quantities using inequality signs, < or >.

- Write the following examples on the board.
  
  \[ 2 \times 3 < 10 \div 1 \]
  
  \[ 45 \div 5 > 12 - 7 \]

- Have groups of students take turns writing inequalities. Two students each choose an index card. They place the cards on the table. Then another student chooses the sign card that makes the inequality true.

- Explain that an inequality is made using two amounts that are not equal. The signs < and > show that the two sides are not equal.

Summarize Ask students to explain how they decided which sign made the inequality true.
Lesson Check (3.OA.D.8)
1. Gavin saved $16 to buy packs of baseball cards. His father gives him $4 more. If each pack of cards costs $5, how many packs can Gavin buy?

2. Chelsea buys 8 packs of markers. Each pack contains the same number of markers. Chelsea gives 10 markers to her brother. Then, she has 54 markers left. How many markers were in each pack?

Spiral Review (3.OA.A.1, 3.OA.A.3, 3.OA.A.4, 3.OA.D.8)
3. Each foot has 5 toes. How many toes do 6 feet have?

4. Each month for 5 months, Sophie makes 2 quilts. How many more quilts does she need to make before she has made 16 quilts?

5. Meredith practices the piano for 3 hours each week. How many hours will she practice in 8 weeks?

6. Find the unknown factor.

9 \times \underline{4} = 36