10.1 PROBLEM SOLVING • Model Division

Essential Question How can you use the strategy *act it out* to solve problems with equal groups?

the 5 Es ENGAGE

GO DIGITAL Lesson Opener

Making Connections

Invite students to tell you what they know about hot-air balloons.

Have you ever seen a hot-air balloon? How is a hot-air balloon different from a plane? (A hot-air balloon flies lower and more slowly.) **Why would a hot-air balloon be better than a plane for seeing animals on the ground?** (Going slowly and flying low would let you see better.) **How many people do you think can fly on a hot-air balloon at one time?**

Using the Digital Lesson

To help students prepare for dividing equal groups with counters, you may wish to use counters to model multiplication. For example, have students make three groups of two counters each, count the total, and state the multiplication.

Learning Task

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

- **How many students are taking a ride in the hot-air balloon?** (30)
- **How many trips does the hot-air balloon make?** (6)
- **Are there an equal number of students on each trip?** (Yes)
- **What does Doc want to find out?** (How many students will be in each group)

Literacy and Mathematics

Choose one or more of the following activities.

- Help students visualize the scenario of the problem. Ask them about times they have needed to divide into groups, such as sitting at lunch tables or sharing pieces of food. Depending on the number of students in the class, give them the opportunity to divide themselves into several equal groups.
- Have students research hot-air balloons, finding out how many people they can carry, and how fast, high, and long they can fly.

Texas Essential Knowledge and Skills

TEKS Number and Operations—3.4.H
Determine the number of objects in each group when a set of objects is partitioned into equal shares or a set of objects is shared equally

3.4.K Solve one-step and two-step problems involving multiplication and division within 100 using strategies based on objects; pictorial models, including arrays, area models, and equal groups; properties of operations; or recall of facts

MATHEMATICAL PROCESSES
3.1.A Apply mathematics to problems
3.1.B Use a problem-solving model

Are You Ready?

Access Prior Knowledge

Use the *Are You Ready?* 10.1 in the *Assessment Guide* to assess students' understanding of the prerequisite skills for this lesson.

Vocabulary

GO DIGITAL Multimedia eGlossary at *thinkcentral.com*

Materials

counters

GO DIGITAL Resources

For the student

- iSE **Interactive Student Edition** *provides students with an interactive learning environment!*
- Math on the Spot Video Tutor
- iTools Virtual Manipulatives
- Soar to Success Math Online Intervention

For the teacher

- **Digital Management Center** *organizes program resources by TEKS!*
- eTE eTeacher Edition
- Online Assessment System

Unlock the Problem

After students read the problem, discuss how they will use the information in the problem to answer the question. Be sure students understand that they need to find how many flowers will go in each of 4 vases.

- **How does acting out the problem help to solve it?** Possible answer: you can be sure you have done what the problem asks.
- **Did you find the number of equal groups or the number in each group in this problem? Explain.** the number in each group; possible explanation: the problem tells how many vases, or groups, there are. Finding how many flowers go in each vase is finding the number in each group.
- **How do you know your answer is correct?** Possible answer: there are 4 counters in each of 4 groups, which equals 16 counters, so I know my answer is correct.

Name _____

10.1 PROBLEM SOLVING • Model Division

TEKS Number and Operations—3.4.H, 3.4.K
MATHEMATICAL PROCESSES 3.1.A, 3.1.B

Essential Question How can you use the strategy *act it out* to solve problems with equal groups?

Unlock the Problem (Real World)

Stacy has 16 flowers. She puts an equal number of flowers in each of 4 vases. How many flowers does Stacy put in each vase?

Use the graphic organizer below to solve the problem.

Read

What do I need to find?

I need to find the number of flowers Stacy puts in each vase.

What information am I given?

Stacy has 16 flowers. She puts an equal number of flowers in each of 4 vases.

Plan

What is my plan or strategy?

I will act out the problem by making equal groups with counters.

Check students' drawings. There should be 4 counters in each group.

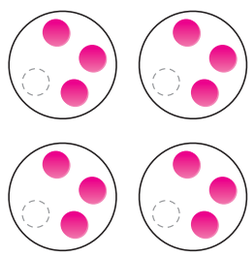
Solve

Describe how to act out the problem to solve.

First, count out 16 counters.

Next, make 4 equal groups. Place 1 counter at a time in each group until all 16 counters are used.

Last, draw the equal groups by completing the picture below.



So, Stacy puts 4 flowers in each vase.

Differentiated Instruction

ELL English Language Learners

Leveled Activities	ELPS
Beginning: Activity 49	2.C.1, 2.D.1, 4.F.1
Intermediate: Activity 3	2.D.2, 2.E.3, 3.F.2
Advanced: Activity 41	4.F.3, 4.F.8
Advanced High: Activity 18	4.C.4, 4.E, 4.F.7

GO DIGITAL Go to *thinkcentral.com* for the **ELL Activity Guide** containing these leveled activities.

ELL Language Support

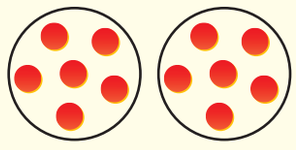
Verbal / Linguistic
Small Group

ELPS 1.B.1, 4.C.4, 4.F.9

Strategy: Rephrase

Materials: counters

- Read this problem: **I have 12 cookies that I want to share without breaking the cookies. How many different numbers of people can share them equally?**
- Have students rephrase the problem either verbally or with models.
- If students need help, write these sentence starters on the board: **I have 12 cookies to share. I do not want to break the cookies.** Have students read the sentence starters, and then help each other rephrase the question.



Try Another Problem

Hayden is planning a party. He bakes 21 cookies. If he plans to give each person 3 cookies, how many people will be at his party?

Read	Solve
What do I need to find? I need to find the number of people who will be at Hayden's party.	**Describe how to act out the problem to solve.** First, count out 21 counters. Next, make a group of 3. Keep making groups of 3 until all 21 counters are in groups. Then, draw the groups to show the number of groups of 3. Last, count the number of equal groups. There are 7 equal groups, so there will be 7 people at Hayden's party.
What information am I given? Hayden bakes 21 cookies. He plans to give each person 3 cookies.	
Plan	
What is my plan or strategy? I will act out the problem by making equal groups with counters.	

- How can you check that your answer is reasonable?

Possible answer: you can skip count by 3s to 21, and then count the number of times you counted by 3. Or you can use repeated addition.

3 + 3 + 3 + 3 + 3 + 3 + 3 = 21

Possible explanation: I can picture the action in the problem and this helps me understand how to solve it.

Math Talk
Mathematical Processes
Explain how acting out a problem helps you solve it.

Enrich

Visual / Kinesthetic
Individual

Materials: square tiles, counters

- Display this arrangement using counters in groups or square tiles in an array.
- Have students write a two-step word problem that can be solved by using the model. For example: **Kyle had 30 cookies. He put half the cookies on 3 plates. He put the same number of cookies on each plate. How many cookies did Kyle put on each plate?** 5 cookies
- Repeat the activity with other arrangements.

GO DIGITAL Go to *thinkcentral.com* for additional enrichment activities in the **Enrich Activity Guide**.

Try Another Problem

Have students answer the questions in the graphic organizer and solve the problem. When students finish, invite them to share their descriptions of how they acted out the problem.

- **In this problem, did you find the number of equal groups or the number in each group? Explain.** I found how many equal groups; possible explanation: the problem gives how many are in each group, 3 cookies. I need to find how many equal groups, or how many people.
- **How did you know you needed to break apart 21 into smaller groups to solve the problem?** Possible answer: I need to break apart 21 cookies into groups of 3 because each person will get 3 cookies.
- **If Hayden had 22 cookies, would the answer change? Explain.** No, but there would be 1 cookie left over.

Math Talk Mathematical Processes

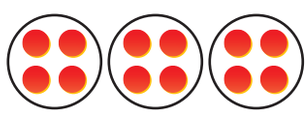
Use Math Talk to focus on students' understanding of how to use the strategy *act it out* to solve a problem.

As students complete the problems on the following pages, watch for the common error described below.

COMMON ERRORS

Error Students may draw correct pictures of equal groups, but then use the wrong number for the number in each group.

Example



3 in each group

Springboard to Learning Tell students to check their pictures to be sure they make sense. Have them read the problem aloud and check to be sure their pictures match the information in the problem. Work with students to help them check their work.

Share and Show

The first problem connects to the learning model. Have students use the MathBoard to explain their thinking.

Problem 2 requires students to apply the learning model to another situation.

- **What other arrangement of stacks of cups could Sue make with 24 cups?** Possible answer: 3 stacks of 8

RtI Quick Check

IF a student misses the checked exercises

THEN **Differentiate Instruction** with RtI Tier 1 Lesson 45

Problem Solving

H.O.T. Problems

Problem 3 is a multi-step problem for which students must first find the total number of children in order to find the number of teams.

For Problem 4, have students make a list of all the possible ways to put the 12 cookies equally on plates. Their lists should include the following: 1 plate of 12, 2 plates of 6, 3 plates of 4, 4 plates of 3, 6 plates of 2, and 12 plates of 1.

Go Deeper

To extend students' thinking, have them write multiplication equations to prove that their answer to Problem 4 is correct.

Math on the Spot Video Tutor

Through the ***Math on the Spot Video Tutor***, students will be guided through an interactive solving of this type of H.O.T. problem. Use this video to also help students solve the H.O.T. problem in the Interactive Student Edition. With these videos and the H.O.T. problems, students will build skills needed in the TEXAS assessment.

GO DIGITAL **Math on the Spot** videos are in the Interactive Student Edition and at *thinkcentral.com*.

Name _____

Unlock the Problem Tips

- Use the Problem Solving MathBoard.
- Underline important facts.
- Choose a strategy you know.

Share and Show

MATH BOARD

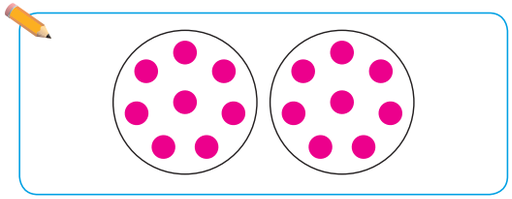
1. Sue is having a party. She has 16 cups. She puts them in 2 equal stacks. How many cups are in each stack?

First, decide how to act out the problem.

You can use counters to represent the cups.

You can draw circles to represent the stacks.

Then, draw to find the number of cups in each stack.



There are 2 groups. There are 8 counters in each group.

So, there are 8 cups in each stack.

2. **What if** Sue has 24 cups and puts 4 cups in each stack? If she already made 4 stacks, how many more stacks can she make with the remaining cups?

2 stacks

Problem Solving

3. H.O.T. **Multi-Step** At Luke's school party, the children get into teams of 5 to play a game. If there are 20 boys and 15 girls, how many teams are there?

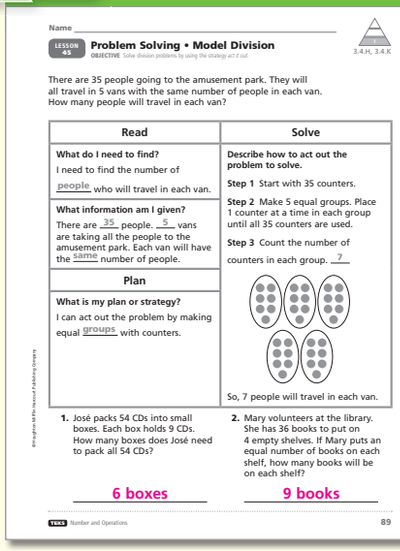
7 teams

4. H.O.T. **Evaluate** You have 12 cookies. How many ways can the cookies be put equally on any number of plates?

6 ways

Differentiated Instruction

RtI Tier 1 Lesson 45



Name _____

LESSON 4.5 **Problem Solving • Model Division**

OBJECTIVE Solve division problems by using the strategy act it out.

3.4.H, 3.4.K

There are 35 people going to the amusement park. They will all travel in 5 vans with the same number of people in each van. How many people will travel in each van?

Read	Solve
What do I need to find? I need to find the number of people who will travel in each van.	**Describe how to act out the problem to solve.** **Step 1** Start with 35 counters. **Step 2** Make 5 equal groups. Place 1 counter at a time in each group until all 35 counters are used. **Step 3** Count the number of counters in each group. 7
What information am I given? There are 35 people. 5 vans are taking all the people to the amusement park. Each van will have the same number of people.	
Plan	
What is my plan or strategy? I can act out the problem by making equal groups with counters.	

So, 7 people will travel in each van.

1. José packs 54 CDs into small boxes. Each box holds 9 CDs. How many boxes does José need to pack all 54 CDs?

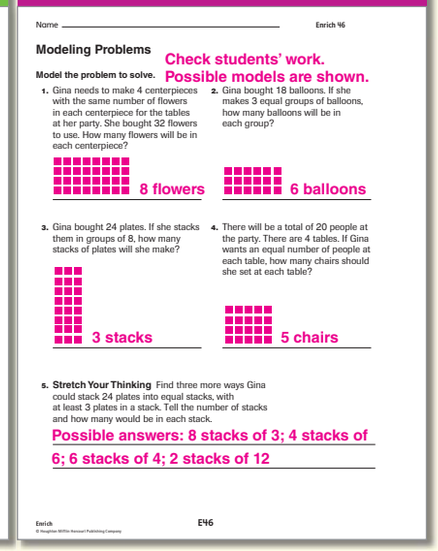
6 boxes

2. Mary volunteers at the library. She has 36 books to put on 4 empty shelves. If Mary puts an equal number of books on each shelf, how many books will be on each shelf?

9 books

TEKS Number and Operations 89

Enrich 46



Name _____ Enrich 46

Modeling Problems

Model the problem to solve.

Check students' work. Possible models are shown.

1. Gina needs to make 4 centerpieces with the same number of flowers in each centerpiece for the tables at her party. She bought 32 flowers to use. How many flowers will be in each centerpiece?

8 flowers

2. Gina bought 18 balloons. If she makes 3 equal groups of balloons, how many balloons will be in each group?

6 balloons

3. Gina bought 24 plates. If she stacks them in groups of 8, how many stacks of plates will she make?

3 stacks

4. There will be a total of 20 people at the party. There are 4 tables. If Gina wants an equal number of people at each table, how many chairs should she set at each table?

5 chairs

5. **Stretch Your Thinking** Find three more ways Gina could stack 24 plates into equal stacks, with at least 3 plates in a stack. Tell the number of stacks and how many would be in each stack.

Possible answers: 8 stacks of 3; 4 stacks of 6; 6 stacks of 4; 2 stacks of 12

Enrich E46

Mathematical Processes
Model • Reason • Communicate

Daily Assessment Task

Fill in the bubble for the correct answer choice.
You may use objects or models to solve.

5. Angie is having a tie-dye party. There are 20 T-shirts in 4 buckets of dye. There is the same number of T-shirts in each bucket. How many T-shirts are in each bucket?

Ⓐ 16 ● 5
Ⓑ 8 Ⓓ 24

6. **Analyze** Gabriel has 27 fish in 3 tanks. He has the same number of fish in each tank. How many fish are in each tank?

● 9 Ⓒ 30
Ⓑ 24 Ⓓ 8

7. **Multi-Step** Ira and his brother share a model car collection. Ira has 25 cars, and his brother has 15 cars. They store the model cars on a bookshelf, and place the same number of cars on each shelf. There are 5 shelves. How many model cars are on each shelf?

Ⓐ 35
Ⓑ 40
Ⓒ 5
● 8

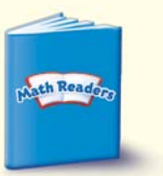
TEXAS Test Prep

8. **Apply** Miguel bought 18 party favors. He gave 2 party favors to each of the children at his party. How many children were at Miguel's party?

Ⓐ 8 ● 9
Ⓑ 16 Ⓓ 20

Grab-and-Go!™ Ready-Made Independent Activities

Differentiated Centers Kit



Literature
Sports Camp
Students read about how division is used to make groups at a sports camp.

Activities
Dividing Nickels
Students complete blue Activity Card 9 by using nickels to divide by five.

5 the 5 Es EVALUATE

Daily Assessment Task RtI

Can students use the strategy *act it out* to solve problems with equal groups?

IF	THEN
NO	• Soar to Success Math Warm-Up 13.23
YES	• Enrich 46 • Homework and Practice Lesson 10.1

TEXAS Test Prep Coach

Test Prep Coach helps teachers to identify common errors that students can make.

In the Test Prep exercise, if students selected:

A They incorrectly made equal groups of 2.

B They subtracted 2 from 18.

D They added 18 and 2.

Essential Question

Write Math

How can you use the strategy *act it out* to solve problems with equal groups? Possible answer: use objects to model what is going on in the problem.

Homework and Practice

TEKS Number and Operations—3.4.H, 3.4.K
MATHEMATICAL PROCESSES 3.1.A, 3.1.B

Name _____

10.1 Model Division

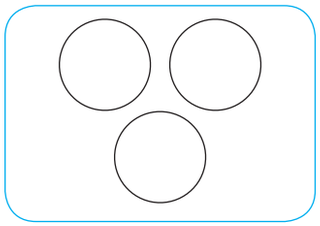
Draw to solve the problem. Check students' drawings.

1. Greg has 15 marbles. He puts them in 3 equal groups. How many marbles are in each group?

   There are 15 marbles.

   There are 3 groups.

   So, there are 5 in each group.

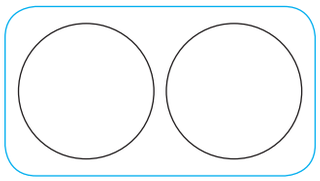


2. Yuri has 12 counters. He puts them in 2 equal groups. How many counters are in each group?

   There are 12 counters.

   There are 2 groups.

   So, there are 6 in each group.



Problem Solving Real World

3. A farmer puts an equal number of fruit in each of 6 baskets. If there are 18 pears and 24 peaches, how many pieces of fruit are in each basket?

   7 pieces of fruit

4. The same farmer has 16 pumpkins. How many different ways can the pumpkins be put into equal groups?

   5 ways

Lesson Check

TEXAS Test Prep

Fill in the bubble completely to show your answer.

5. Gordy makes 24 muffins. Each tray has 6 muffins. How many trays does Gordy have?
   - Ⓐ 18
   - Ⓑ 6
   - ● 4
   - Ⓓ 8

6. Sonja has 28 photos in an album. Each page has 4 photos. How many pages have photos?
   - Ⓐ 9
   - Ⓑ 24
   - Ⓒ 8
   - ● 7

7. Hunan works at the school breakfast party. He makes 30 pancakes. If he puts 5 pancakes on each plate, how many plates will he need?
   - Ⓐ 4
   - ● 6
   - Ⓒ 8
   - Ⓓ 25

8. Cara works in a cycle shop. She has 18 wheels for tricycles. If each tricycle needs 3 wheels, how many tricycles can she put together?
   - Ⓐ 21
   - Ⓑ 5
   - Ⓒ 15
   - ● 6

9. **Multi-Step** Jason has 15 red beads and 10 blue beads. He makes 5 bracelets with an equal number of beads. How many beads are on each bracelet?
   - Ⓐ 3
   - Ⓑ 2
   - ● 5
   - Ⓓ 4

10. **Multi-Step** Shana has 23 comic books and 19 coloring books. She puts them into 6 equal stacks. How many books are in each stack?
    - ● 7
    - Ⓑ 8
    - Ⓒ 42
    - Ⓓ 6

Homework and Practice

Use the Homework and Practice pages to provide students with more practice on the concepts and skills of this lesson.