4.3 Equal Shares and Equal Groups

**Objective** To review division as equal sharing and equal grouping.

<table>
<thead>
<tr>
<th>Teaching the Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children practice division by solving equal-sharing and equal-grouping number stories. They form arrays with counters and draw pictures of arrays. [Operations and Computation]</td>
</tr>
<tr>
<td>□ Math Journal 1, p. 90</td>
</tr>
<tr>
<td>□ Home Link 4.2</td>
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<tr>
<td>□ about 30 pennies or other counters per partnership</td>
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</tbody>
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**Materials**

See Advance Preparation

<table>
<thead>
<tr>
<th>Ongoing Learning &amp; Practice</th>
</tr>
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<tbody>
<tr>
<td>Children play <em>Division Arrays</em>. [Operations and Computation] Children practice and maintain skills through Math Boxes and Home Link activities.</td>
</tr>
<tr>
<td>□ Math Journal 1, p. 91</td>
</tr>
<tr>
<td>□ Home Link Master (<em>Math Masters</em>, p. 250)</td>
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<tr>
<td>□ Student Reference Book</td>
</tr>
<tr>
<td>□ Teaching Master (<em>Math Masters</em>, p. 43; optional)</td>
</tr>
<tr>
<td>□ paper or slate</td>
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<tr>
<td>Per group:</td>
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<tr>
<td>□ number cards 6–18 (1 of each from the Everything Math Deck, if available)</td>
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<tr>
<td>□ 18 counters; 1 six-sided die</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Options for Individualizing</th>
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<tbody>
<tr>
<td><strong>Language Diversity</strong> Children play with words to build a background for mathematics vocabulary. [Operations and Computation]</td>
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</table>

**Additional Information**

Advance Preparation Prepare an area, such as a bulletin board, for an "Arrays Exhibit." Write the following on the board with semipermanent chalk: _ pennies; _ children; _ pennies per child; _ pennies remaining.

**Getting Started**

**Mental Math and Reflexes**

Pose multiplication number stories like the following. Encourage children to use arrays, counters, or multiplication/division diagrams as necessary.

- Thomas reads 2 chapters in his book each day. How many chapters does he read in 4 days? 8 chapters
  - In a week? 14 chapters
- One cup of yogurt has 100 calories. There are 8 cups of yogurt in a package. What is the total number of calories per package? 800 calories
1 Teaching the Lesson

♦ Math Message Follow-Up

WHOLE-CLASS DISCUSSION

Counters are a useful tool for solving division problems. Have partners act out the Math Message problem with 14 pennies. Ask volunteers to share their solution strategies. Some example strategies are listed below:

Strategy 1

Count out the pennies, 1 or 2 at a time, until each child has the same number of pennies, or 1 penny is left over. For example, “One for you, one for me. Two for you, two for me ....”

Strategy 2

Think in terms of multiplication: $2 \times ? = 14$.

Strategy 3

Use the basic division fact $14 \div 2 = 7$. If 2 children share 14 pennies, then each child will get 7 pennies.

Draw a picture on the board to illustrate the solution to the problem. Record the solution as shown in the margin. If children begin to use the terms even and odd to describe the number of pennies, encourage them to do so.

♦ Solving Equal-Sharing Division Number Stories with Counters

WHOLE-CLASS ACTIVITY

Repeat the Math Message activity with 15 pennies. Again, have children share strategies as you draw a picture and record the solution as shown in the margin. Discuss what happens: When pennies are shared equally, some pennies may be left over.
Science Link
Astronomers think that there are about 10 billion trillion stars in the universe. To help children understand how big a number this is, explain that if all the people in the world shared the stars equally, each person would have more than $1\frac{1}{2}$ trillion stars.

NOTE: This problem is an example of an equal-grouping situation. The number of objects per group and the total number of objects are known. The number of groups is to be found. It is not important for children to be able to distinguish between equal-sharing and equal-grouping division number stories; it is important, however, that they have experience with both types.

As necessary, pose other equal-sharing stories. Encourage children to use counters or draw pictures. Record the pictures and solutions on the board.

- 12 pennies, 3 children 4 pennies per child, 0 remaining
- 15 pennies, 4 children 3 pennies per child, 3 remaining
- 20 pennies, 6 children 3 pennies per child, 2 remaining
- 16 pennies, 2 children 8 pennies per child, 0 remaining
- 18 band members are lined up in 3 equal rows. How many members are in each row? 6 How many are left over? 0
- Elsa, Frank, Maria, and Tim together have 14 crackers to share equally. How many crackers does each person get? 3 Are any crackers left over? Yes, 2 are left over.

♫ Solving Equal-Grouping Division Number Stories

WHOLE-CLASS ACTIVITY

Pose the following problem to the class. Encourage children to use counters to solve it.

- Each child has 5 pennies. There are 30 pennies. How many children have pennies? 6

Have volunteers share their solution strategies.

Some example strategies are listed below:

**Strategy 1**
Count out the pennies, 5 at a time to each child, until all of the pennies are distributed or it is not possible to make another group of 5. There are 6 groups of 5 pennies. There are no pennies left over.

**Strategy 2**
Think in terms of multiplication: $5 \times ? = 30$.

**Strategy 3**
Use the basic division fact $30 \div 5 = 6$. If there are 30 pennies and each child has 5, then there must be 6 children.

Draw a picture on the board or use pennies on the overhead to illustrate the solution. Record the solution as shown in the margin.

Pose another equal-grouping problem.

- Each child must have 3 pennies. There are 20 pennies. How many children can have 3 pennies?

Have volunteers share their solution strategies.
Some example strategies are listed below:

**Strategy 1**
Distribute 20 pennies, 3 at a time, until all of the pennies are distributed, or it is not possible to make another group of 3. There are 6 groups of 3 pennies. There are 2 pennies left over.

**Strategy 2**
Think in terms of multiplication: $3 \times ? = 20$. $3 \times 6 = 18$, but that's 2 less than 20. $3 \times 7 = 21$, but that's 1 more than 20. If I try to give 3 pennies to 7 children, there won’t be enough. Six children can get 3 pennies each. There will be 2 pennies remaining.

**Strategy 3**
Know that $20 \div 3 = 6$, with 2 remaining.

Draw a picture on the board or use pennies on the overhead to illustrate the solution. Record the solution as shown in the margin.

As necessary, pose other equal-grouping stories. Encourage children to use counters or draw pictures. Record the pictures and solutions on the board.

- 24 pennies, 8 pennies per child 3 children, 0 pennies remaining
- 18 pennies, 4 pennies per child 4 children, 2 pennies remaining
- 15 pennies, 6 pennies per child 2 children, 3 pennies remaining
- 16 pennies, 4 pennies per child 4 children, 0 pennies remaining
- 24 children want to play basketball. How many teams can they make with 5 players on each team? 4 Can all the children be on a team if each team has exactly 5 players? No. There are 4 children left over. Can all the children be on a team if there are 6 children on each team? Yes. There are 4 teams.
- Anna was trying to determine how many horses were in a large stall. She could see only the horses’ legs. Anna counted 20 legs. How many horses were there? 5

Adjusting the Activity  In solving the final two problems, children may find that drawing a picture is more helpful than making an array with counters.
Solving Division Number Stories
(Math Journal 1, p. 90)

INDEPENDENT ACTIVITY

Children use counters or pictures, as necessary, to solve equal-sharing and equal-grouping division problems. (Problems 1–3, 7–9, and 14 are equal-sharing situations. Problems 4–6, and 10–13 are equal-grouping situations.)

Playing Division Arrays (Student Reference Book, p. 207; Math Masters, p. 43)

SMALL-GROUP ACTIVITY

In this game, players make an array. The total number of counters in the array is determined by a card draw, and the number of equal rows is determined by a die roll. A player's score is the number of counters in one row. The number is doubled if there are no leftover counters. See page 207 in the Student Reference Book for game directions.

NOTE: Some children find it easier to make arrays on square grid paper (Math Masters, page 43).
**Math Boxes 4.3 (Math Journal 1, p. 91)**

**INDEPENDENT ACTIVITY**

**Mixed Review** This journal page provides opportunities for cumulative review or assessment of concepts and skills.

**Home Link 4.3 (Math Masters, p. 250)**

**Home Connection** Children practice equal-sharing and equal-grouping division with number stories.

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**Options for Individualizing**

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**LANGUAGE DIVERSITY**

**Developing Vocabulary**

**SMALL-GROUP ACTIVITY**

Children acquiring English proficiency may need extra help assimilating *array* into their vocabularies. Work with forms of the word, as well as with words that may sound the same, to help these children form a clear meaning of *array* for their use. Write the word *array* and then *arrangement* underneath it, either on the board or on a piece of paper. Have children circle the letters of each word that are the same (*arra-*) and explain that the words mean almost the same thing.

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**Home Link Master**

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**Math Journal 1, p. 91**

1. Find the perimeter.  
   **Unit:** cm  
   2. Make a 4-by-4 array. Complete the number model.  
   - 4  
   - 4  
   = 16

2. Solve.  
   - 45.582 - 10 = 45.572
   - 45.582 + 100 = 56.682
   - 45.582 + 1,000 = 56.582
   - 45.582 - 10,000 = 55.582

3. Solve.  
   - 45.582 - 10 = 45.572
   - 45.582 + 100 = 56.682
   - 45.582 + 1,000 = 56.582
   - 45.582 - 10,000 = 55.582

4. Put these metric units of measure in order from smallest to largest.  
   - centimeter
   - millimeter
   - centimeter
   - meter
   - kilometer

5. Draw the hands to show 10:20.  
   How many minutes until 11:10?  
   50 min

6. Complete.  
   - 2 yd  
   - 1 ft  
   - 10 in

Answers vary.

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**Division with Counter**

**Math Masters, p. 250**

1. 25 counters are shared equally by 5 people.  
   - 5 counters per person  
   - 0 counters remaining

2. 25 counters are shared equally by 10 people.  
   - 2 counters per person  
   - 5 counters remaining

3. There are 31 days in January.  
   - 7 days per week  
   - 4 weeks in January  
   - 3 days remaining

4. There are 22 children.  
   - 5 children per team  
   - 2 children remaining

5. Mrs. March has 34 pencils to give to the 15 students in her music class.  
   - How many pencils can she give each student?  
   - 2 pencils
   - How many pencils are left over?  
   - 4 pencils

6. Caleb shared 11 jelly beans with his sister.  
   - How many jelly beans did each child get?  
   - 11 jelly beans
   - 0 jelly beans left over

7. Marta has 30 books to put on shelves. Each shelf holds 4 books.  
   - How many shelves will she need?  
   - 8 shelves

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From Everyday Mathematics, Grade 3