



Rational Number Project

Fraction Operations and Initial Decimal Ideas Lesson 26: Overview	Materials <ul style="list-style-type: none"> • Transparencies 1-3 • Student Pages A and B
<p>Students solve measurement division story problems by using pictures. Students explain their solution strategies. Story problems include mixed numbers divided by a fraction <1; fraction <1 divided by another fraction <1. All answers include fractions.</p>	

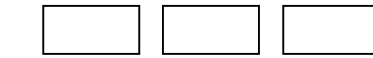
Teaching Actions	Comments
<p>Warm Up</p> <p>Use the four review problems as the day's warm up.</p> <p>Large Group Introduction</p> <ol style="list-style-type: none"> Present the 4 problems from the review at the overhead one at a time. Work together to draw pictures to solve the first problem. (You have $\frac{2}{3}$ pounds of candy hearts. You put together small bags each weighing $\frac{1}{9}$ of a pound. How many are bags did you make?) State: I will use a rectangle as my unit: <ul style="list-style-type: none"> If a rectangle is the unit, how can I show $\frac{2}{3}$? How many $\frac{1}{9}$'s are in $\frac{2}{3}$? How can I change the picture to find this out? Repeat for the other three problems. Have students come up to the overhead to draw and explain their solutions. 	<p>How many $\frac{1}{9}$'s in $\frac{2}{3}$?</p>  <p>How many $\frac{1}{9}$'s in $\frac{6}{9}$?</p>  <p>We found that students enjoyed presenting their solutions to the class.</p>

Teaching Actions

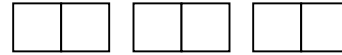
- Go back and translate each problem to a division sentence. For example: *You have 3 yards of ribbon and cut off $\frac{1}{2}$ yard pieces, how many pieces can you cut?* The division sentence would be: $3 \div \frac{1}{2} = 6$.
- Then record showing how when they solved the problem with their pictures they change the picture so each unit was partitioned into halves. Explain how this number sentence reflects the change picture:
$$\frac{6}{2} \div \frac{1}{2} = 6$$
- Ask: what type of number is each answer? Is it a fraction, decimal or whole number?
- Explain that in this lesson, they will solve fraction division problems and find out what to do when the answer is not a whole number.
- But first ask a few questions related to flexibility of the unit. Lead this discussion using fraction circle overheads.
 - If the whole circle is the unit, what value is 1 blue?
 - If the yellow is the unit, what value is the blue?
 - If the brown is the unit, what value are 2 reds?
 - If the yellow is the unit what value are 2 reds?*Conclude that the value of a fractional part depends on what it is being compared to.*
- Present this story problem from New Division Problems page.

You have 3 pounds of fish. You are planning on serving each person $\frac{2}{3}$ pound of fish. How many full servings are possible? How can you name the amount left over?
- Estimate first: Do you think there is at least one serving? 3 servings? Together draw pictures to solve.

Comments



$$3 \div \frac{1}{2} =$$



$$\frac{6}{2} \div \frac{1}{2} = 6$$

In later lessons you will formalize this strategy of changing the original number sentence to one with common denominators to show one possible algorithm for solving fraction division tasks. But mastery of this algorithm is not the goal of the lessons. Expect only some students to make this translation from pictures to symbols.

A student presented her solution to this problem as follows: She used four colors to show each $\frac{2}{3}$ serving. The last third she said was $\frac{1}{2}$ of the $\frac{2}{3}$. Her final answer was $4\frac{1}{2}$ servings.

Teaching Actions

11. Ask: We can see that you can make 4 full servings, but how can we describe the amount left over? [Draw a picture of three circles partitioned into thirds to show how to find that there are 4 full servings].
12. Describe the leftover amount: The piece that is leftover is $\frac{1}{3}$ of a whole circle. What is its value if you compare it to a $\frac{2}{3}$ amount, the size of each serving? [Draw on the board $\frac{2}{3}$ of a circle and write - size of the serving of fish underneath it.]
13. If we want to describe the fractional amount of a servings (each is $\frac{2}{3}$ of a pound), is the answer $4\frac{1}{3}$ or $4\frac{1}{2}$?
14. Try another example: You have $2\frac{1}{2}$ pounds of fish but now the serving size is $\frac{3}{4}$ of a pound. How many full servings? How can we describe the amount left over?
15. Conclude that when you are describing the leftover part, you need to compare it to the amount you are using as the unit.

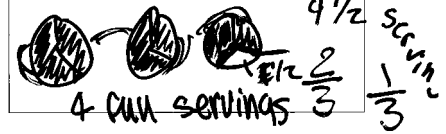
Small Group/Partner Work

16. Student Pages A and B include 5 more examples for students to work on in their group.

Comments

Problem A:

You have 3 pounds of fish. You are planning of serving each person $\frac{2}{3}$ pound of fish. How many full servings are possible?



Naming the remainder is the challenging part.

In this example, $\frac{2}{3}$ of a pound is being measured out of 3 pounds. From the picture you see that the left over amount is $\frac{1}{3}$ of a pound but to name this amount it needs to be compared to the $\frac{2}{3}$ serving size. Therefore, the remainder is $\frac{1}{2}$.

Another student presented her solution as follows. Again, the student used different colors to highlight three different groups of $\frac{3}{4}$. To describe why the answer was $3\frac{1}{3}$ servings, she drew a picture of the serving size, $\frac{3}{4}$. She explained that the extra amount was $\frac{1}{3}$ of that amount.



For additional examples of students' work see "Additional Notes for the Teacher for Lesson 26".

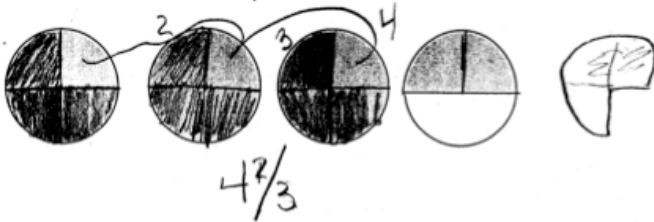
Teaching Actions

Comments

Wrap Up

17. End the lesson by selecting students to show their picture for each problem at the board. Record the number sentences for each problem as you did in lesson one. See example below:

1) A scoop holds $\frac{3}{4}$ cup. How many scoops of birdseed are needed to fill a bird feeder that holds $3\frac{1}{2}$ cups of birdseed? Use fraction circles or the drawing below to solve this problem.



Original division sentence: $3\frac{1}{2} \div \frac{3}{4} =$

Division sentence to reflect change in the picture:

$$\frac{14}{4} \div \frac{3}{4} =$$

Final answer: $4\frac{2}{3}$

The remainder is $\frac{2}{3}$ because the two parts left over is $\frac{2}{3}$ of a scoop.

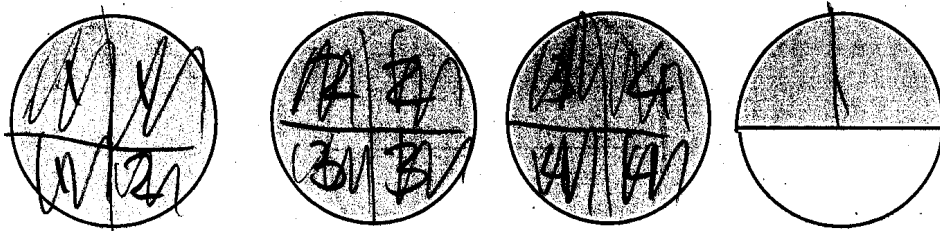
Translations:

- Real life to manipulatives to pictures to verbal
- Real life to pictures to verbal
- Real life to pictures to symbols
- Symbols to pictures to symbols

Additional Notes for the Teacher
Lesson 26

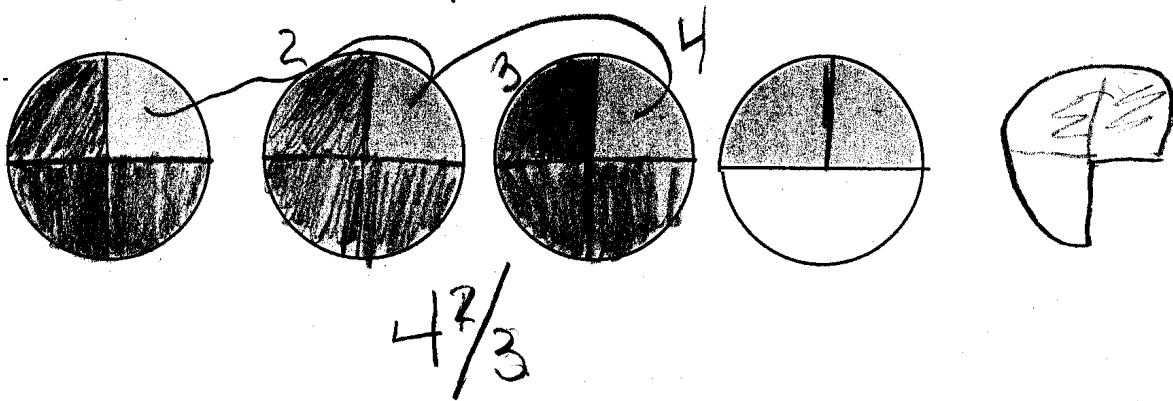
You want students to not only draw pictures of their solutions but to be able to explain how they determined how to name the remainder. Examples from students' work are shown below. The next step is to guide students to translate their actions on the pictures to symbols using common denominators.

How many groups of $\frac{2}{3}$ are there in $3\frac{1}{2}$ circles?



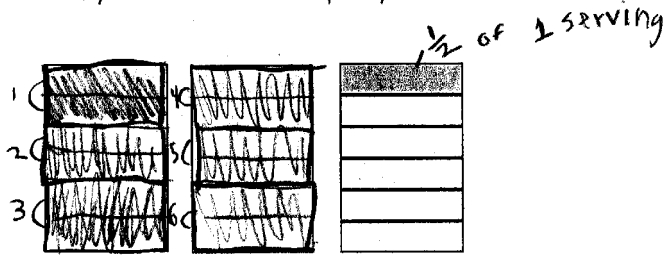
4 groups of $\frac{2}{3}$ in $3\frac{1}{2}$ or
 you include extra it is
 $4\frac{2}{3}$

1) A scoop holds $\frac{3}{4}$ cup. How many scoops of birdseed are needed to fill a bird feeder that holds $3\frac{1}{2}$ cups of birdseed? Use fraction circles or the drawing below to solve this problem.

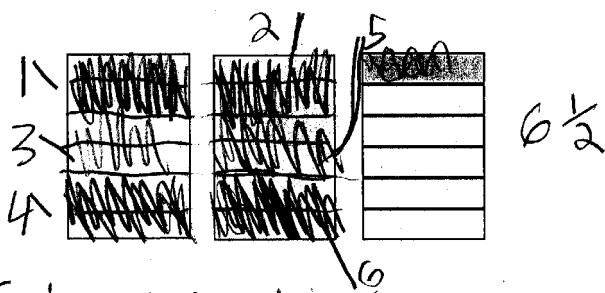


2) You bought $2\frac{1}{6}$ pints of ice cream from Ben and Jerry's for your party.

You plan on serving each friend about $\frac{2}{6}$ of a pint. How many servings can you dish out? Show how to use your fraction circles to solve this problem. Draw a picture of your solution below. Explain your solution in words.



Because each serving is $6\frac{1}{2}$
 $\frac{2}{6}$, so you divide the 6ths in
 the shaded parts, then figure
 out that the $\frac{1}{6}$ that was
 left over is $\frac{1}{2}$ of a
 serving.



I turned everything
 into 6ths and then counted how many
 two sixths there were then I had
 $\frac{1}{6}$ left over and since the
 serving size is $\frac{2}{6}$ there is $\frac{1}{2}$ of that
 left over.

Review Problems

Problem A:

You have $\frac{2}{3}$ of a pound of candy hearts. You put together small bags each weighing $\frac{1}{9}$ of a pound. How many bags did you make?

Problem B:

How many $\frac{3}{8}$'s are in $\frac{3}{4}$ of a circle?

Problem C:

You have a ribbon 3 yards long. You cut off pieces $\frac{1}{2}$ yard long. How many pieces can you cut?

Problem D:

You have $2\frac{1}{2}$ cups of birdseed. How many $\frac{1}{4}$ cups of bird seed can you scoop out?

New Division Problems

Problem A:

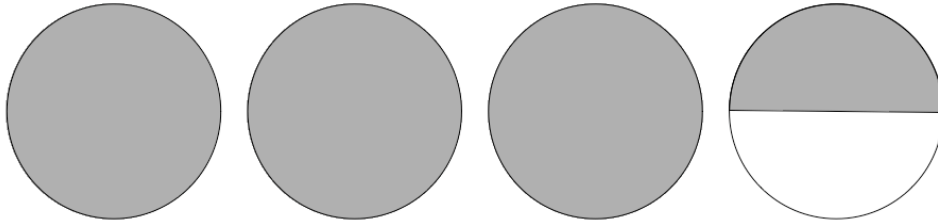
You have 3 pounds of fish. You are planning on serving each person $\frac{2}{3}$ pound of fish. How many full servings are possible? How can you describe the amount left over?

Problem B:

You have $2\frac{1}{2}$ pounds of fish but now the serving size is $\frac{3}{4}$ of a pound. How many full servings? How can we describe the amount left over?

Dividing Fractions

- 1) A scoop holds $\frac{3}{4}$ cup. How many scoops of birdseed are needed to fill a bird feeder that holds $3\frac{1}{2}$ cups of birdseed? Use fraction circles or the drawing below to solve this problem.

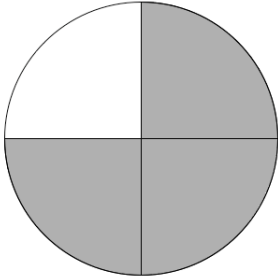


- 2) You bought $2\frac{1}{6}$ pints of ice cream from Ben and Jerry's for your party. You plan on serving each friend about $\frac{2}{6}$ of a pint. How many full servings can you dish out? What part of a serving is left? Draw a picture of your solution below. Explain your solution in words.

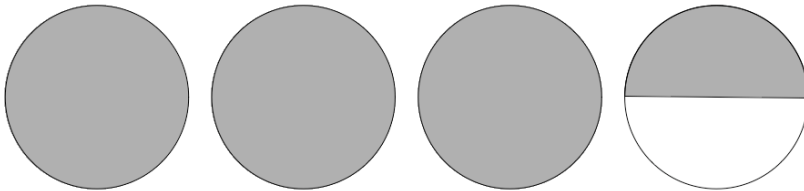


- 3) Use the pictures to solve each problem. Write a number sentence for each one.

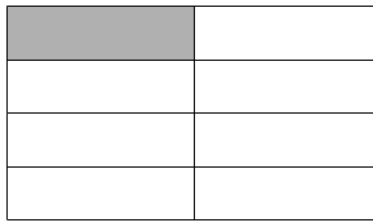
How many $\frac{1}{2}$'s are there in $\frac{3}{4}$ of a circle?



- 4) How many groups of $\frac{3}{4}$ are there in $3\frac{1}{2}$ circles?



- 5) You have $1\frac{1}{8}$ cups of m & m candies. You package them into $\frac{1}{4}$ cup baggies. How many baggies can you make? Include fraction of a package in your answer.



Challenge: You have ribbon $\frac{1}{2}$ yard long. You want to cut the ribbon into pieces $\frac{1}{3}$ yard long. How many pieces can you cut? Is there any extra? Describe that amount?

Post Lesson Reflection

Lesson _____

1) Number of class periods allocated to this lesson: _____

2) Student Pages used: _____

3) Adaptations made to lesson: (For example: added extra examples, eliminated certain problems, changed fractions used)

4) Adaptations made on Student Pages:

5) To improve the lesson I suggest: