

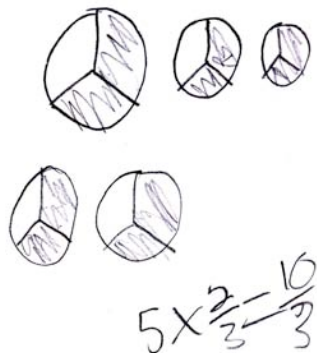
Rational Number Project

Fraction Operations and Initial Decimal Ideas Lesson 18: Overview	Materials
Students multiply a whole number and a fraction using fraction circles, pictures, and mental images.	<ul style="list-style-type: none"> • Fraction Circles • Student Pages A, B, and C • Transparency 1

Teaching Actions	Comments
<p>Warm Up</p> <p>Solve using your fraction circles.</p> <p>Scout walks $\frac{2}{10}$ of a mile each day on her treadmill. How many miles will she walk in 4 days?</p> <p>Large Group Introduction</p> <ol style="list-style-type: none"> Write $\frac{2}{3}$ on the board. Ask the students to picture this fraction in their minds. Ask a few students to describe what they are picturing. Write a 5 and a multiplication sign before the $\frac{2}{3}$. Ask the students to picture what the following statement would represent. $5 \times \frac{2}{3}$ <p style="margin-left: 40px;">Ask the students to draw a picture of this problem to find the product.</p> Walk around as students work and ask two or three students to prepare transparencies showing their 	<p>After all students are able to display the answers individually, review this problem by writing out the words and multiplication sentences.</p> $4 \text{ groups of } \frac{2}{10}$ $4 \times \frac{2}{10} = \frac{8}{10}$ <p>Some students may picture the brown fraction circle pieces while others may picture a rectangle similar to paper strips. Some may picture the numerals 2 over 3.</p> <p>The goal for this lesson is for students to draw pictures for fraction multiplication and create mental images for counting the product.</p> <p>For example, if a student is trying to determine what 5 groups of $\frac{2}{3}$ would total they should picture the two-thirds as two brown pieces. They would imagine that 5 groups of 2 brown pieces would be 10 brown pieces and the total would be $\frac{10}{3}$.</p>

Teaching Actions

pictures. Have the students show and explain their work. Be sure to emphasize that they draw 5 groups of $\frac{2}{3}$.



Sample student work for 5 groups of two-thirds

Small Group/Partner Work

4. Assign Student Pages A and B. Help students get started on the first problem by doing it with them. Have them complete the rest of the problems as you circulate and help individual groups of students.

Wrap Up

5. Review problems from Student Pages A, B, and C (as appropriate) after most of the students are done. Emphasize the different representations (i.e. words, multiplication sentence, picture, real-world situation) and translations for each multiplication problem you review.
6. Write the problem $3 \times \frac{1}{5}$ on the board. Cover up the 3 and the multiplication sign with your hand. Ask them to picture the fraction $\frac{1}{5}$. Ask one student to tell the class what they are picturing. [Hopefully someone will state they see an orange fraction circle piece or one-fifth of a paper strip].

Comments

The 10 represents the total number of pieces and the 3 in the denominator represents the size of each piece.

Make sure to note some of the problems they struggle with so you know which problems you should review. Pass out Student page 18C to students if they successfully complete Student Pages A and B.

You do not need to review all of the problems from the sheet, just one or two that provide interesting discussion points.

Be sure to focus on how the students explain how they get their answers.

Some students may say that the answer to the problems can be found by multiplying the numerator of the fraction by the whole number. This is a good observation but make sure the focus is that this method counts

Teaching Actions

7. Uncover the multiplication problem and ask them to picture what this statement is telling them. [Hopefully some will be picturing three groups of one orange piece. They should state that three orange pieces are $\frac{3}{5}$ of the black circle].

8. Complete the multiplication sentence by writing $3 \times \frac{1}{5} = \frac{3}{5}$.

You may want to ask the students why they did not multiply both the numerator and the denominator by 3 when doing this problem.

9. Repeat the same process one at a time with the following examples.

$$4 \times \frac{3}{10}$$

$$3 \times \frac{7}{8}$$

$$7 \times \frac{5}{12}$$

Comments

the number of pieces total.

The product of the whole number and the numerator in the fraction count the number of pieces while the denominator determines the size of the pieces.

We will be working on the algorithm for multiplying fractions in a couple lessons so resist writing a 1 under the whole number and using the fraction multiplication algorithm until later.


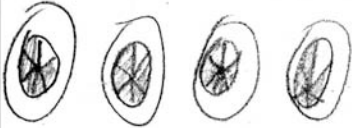
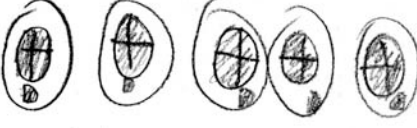
Translations:

- Real-world to picture
- Symbol to picture to verbal
- Real-world to written symbol
- Picture to written symbol
- Real-world to manipulative

Additional Notes to the Teacher

Lesson 18

A common mistake for some students on Student Page B is shown below. The student wrote the correct answer for $2 \times \frac{2}{5}$ in the top row but incorrectly stated the answers to the Multiplication Sentence problems on the next two rows. Both answers are missing the denominators. Note that the picture correctly show that 4 groups of $\frac{5}{6}$ is $\frac{20}{6}$ but this student and his partner chose to write 20 instead of $\frac{20}{6}$. Be sure to emphasize that the numerator gives the number of pieces and the denominator gives the number of equally-sized pieces that the unit is divided. Also emphasize that 20 represents 20 full circles and $\frac{20}{6}$ represents 20 pieces that are one-sixth of a circle in size.

Multiplication Sentence	Words	Picture
$2 \times \frac{2}{5} = \frac{4}{5}$	2 groups of $\frac{2}{5}$	
$4 \times \frac{5}{6} = 20$	4 groups of $\frac{5}{6}$	
$5 \times \frac{5}{4} = 25$	5 groups of $\frac{5}{4}$	

Student work from Student Page B

Mentally Picture

$$3 \times \frac{1}{5}$$

$$4 \times \frac{3}{10}$$

$$3 \times \frac{7}{8}$$

$$7 \times \frac{5}{12}$$

Use Fraction Circles

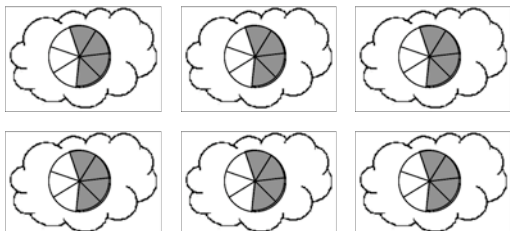
Scout walks $\frac{2}{10}$ of a mile each day on her treadmill. How many miles will she walk in 4 days?

Multiplying Fractions

(whole number x fraction)

Write a multiplication sentence for each picture shown below. Each cloud contains a group.

1. Unit is



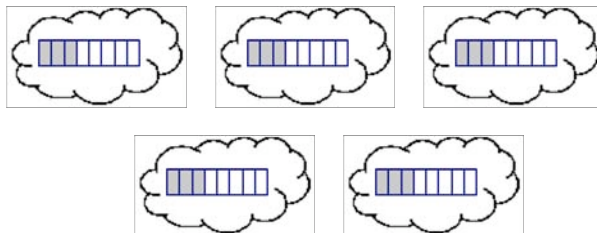
Words:

_____ groups of _____

Multiplication Sentence:

_____ x _____ = _____

2. Unit is



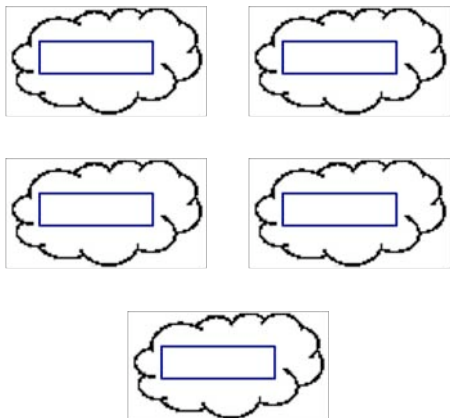
Words:

Multiplication Sentence:

Draw a picture and write a multiplication sentence for the given problems.

3. **5 groups of $\frac{3}{4}$**

Picture:



Multiplication Sentence:

4. **4 groups of $\frac{1}{8}$**

Picture:

Multiplication Sentence:

Draw a picture for each mathematical sentence written below and complete the sentence.

5. $7 \times 5 = \underline{\quad}$	6. $2 \times \frac{3}{4} = \underline{\quad}$
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Fill in the missing blanks.

Multiplication Sentence	Words	Picture
$2 \times \frac{2}{5} = \underline{\quad}$		
	4 groups of $\frac{5}{6}$	
$5 \times \frac{5}{4} = \underline{\quad}$		

Write a story problem to represent each sentence below then draw a picture to find the answer and complete the sentence.

7. $4 \times 7 = \underline{\quad}$

Story Problem:

Picture:

8. $5 \times \frac{1}{4} = \underline{\quad}$

Story Problem:

Picture:

Try to mentally picture the following problems. Write the product without drawing pictures. Explain a shortcut someone could use to find the answers quickly.

9. $7 \times \frac{1}{8} =$

10. $8 \times \frac{2}{11} =$

11. $7 \times \frac{4}{5} =$

Describe your shortcut for getting the answers to problems 9 to 11:

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: