Lesson 90

Materials
- Rulers
- Paper
- Journals

M6-025A
M6-090A–D

Divide Fractions and Mixed Numbers

Objective

The students will find quotients of fractions and mixed numbers.

Introduction

Present the problem:
Two sixth graders are making a math game. The game board will be drawn on an 8 1/2" by 11" piece of construction paper. They want each row on the game board to be 11 inches long. How many rows can they draw if each row is 1/2 inch wide? (**17 rows**)

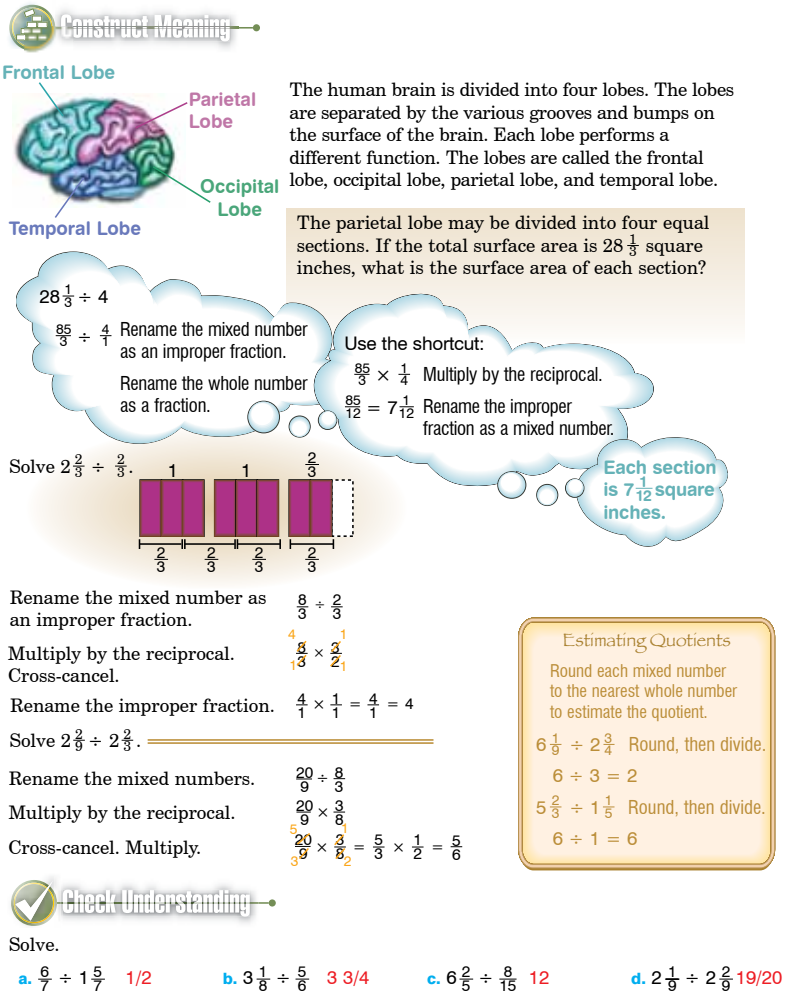
Ask the students to devise a strategy to solve the problem. (**Suggestions: mark or fold 1/2-inch increments on an 8 1/2" piece of paper; use mental math: 16 halves in 8 plus an additional half = 17 half inches; rename the mixed number as an improper fraction and multiply by the reciprocal of 1/2; share all effective strategies.**) If students had difficulty, have them use a RULER to mark and fold an 8 1/2" by 11" piece of PAPER into 1/2 inch rows that are 11 inches in length. Ask how the equation would be written to show the problem. (**8 1/2 ÷ 1/2 = 17**)

Directed Instruction

1 Challenge the students to find other fractions and mixed numbers that will divide the paper evenly into rows that are at least 1/4" wide. (**34 rows 1/4" wide; 4 rows 2 1/8" wide; 2 rows 4 1/4" wide**) They may use rulers with 8 1/2" by 11" papers.

2 Have the students write in their JOURNALS to show the equation for each way they found. (**8 1/2 ÷ 1/4 = 34; 8 1/2 ÷ 2 1/8 = 4; 8 1/2 ÷ 4 1/4 = 2**) What type of quotient was found each time? (**a whole number**) To reinforce the concept of dividing mixed numbers by fractions or whole numbers, ask students to express what each equation means. (**Possible answers: There are thirty-four fourths in 8 1/2"; 8 1/2" is divided into four 2 1/8" parts; 8 1/2" is divided into two 4 1/4" parts.**)

3 How can each step of the written division for an equation such as 8 1/2 ÷ 1/4 be shown? Suggest that the students first recall what they know about dividing a whole number by a fraction. What steps are needed for a problem such as 5 ÷ 1/3? (**Rename the whole number 5 as the fraction 5/1; multiply 5/1 by the**



reciprocal of 1/3, which is 3/1; answer is 15.) What will need to be renamed in order to divide a mixed number by a fraction? (**Rename the mixed number as an improper fraction.**) How is 8 1/2 renamed? (**Multiply the denominator by the whole number and add the product to the numerator; 17/2.**) Model each step of the division of 8 1/2 ÷ 1/4. Point out that after the mixed number is renamed, it is multiplied by the reciprocal of the fraction divisor.

$$8\frac{1}{2} \div \frac{1}{4} = \frac{17}{2} \div \frac{1}{4} = \frac{17}{\cancel{2}_1} \times \frac{\cancel{4}^2}{1} = 34$$

Estimate.

e. $1\frac{3}{4} \div 1\frac{1}{6}$ 2 f. $8\frac{2}{9} \div 4\frac{1}{4}$ 2 g. $9\frac{1}{3} \div 3\frac{1}{4}$ 3 h. $1\frac{7}{8} \div 1\frac{2}{9}$ 2

Practice

Write each mixed number as an improper fraction. Then write its reciprocal.

1. $4\frac{1}{2}$ 9/2 2/9 2. $1\frac{5}{8}$ 13/8 8/13 3. $7\frac{1}{7}$ 50/7 7/50 4. $3\frac{4}{9}$ 31/9 9/31 5. $8\frac{2}{3}$ 26/3 3/26 6. $6\frac{1}{9}$ 55/9 9/55

Estimate the quotient.

7. $4\frac{1}{3} \div 2\frac{1}{5}$ 2 8. $9\frac{3}{5} \div 2\frac{2}{9}$ 5 9. $5\frac{6}{7} \div 3\frac{1}{8}$ 2 10. $15\frac{3}{8} \div 5\frac{3}{8}$ 3

11. $13\frac{1}{4} \div 1\frac{2}{9}$ 13 12. $23\frac{3}{5} \div 5\frac{7}{8}$ 4 13. $8\frac{2}{31} \div 4\frac{3}{43}$ 2 14. $17\frac{18}{25} \div 2\frac{3}{4}$ 6

Find the quotient.

15. $4\frac{1}{2} \div 12$ 3/8 16. $7\frac{4}{5} \div \frac{3}{5}$ 13 17. $4\frac{3}{8} \div 3\frac{1}{2}$ 1 1/4 18. $5 \div 1\frac{1}{7}$ 4 3/8

19. $8\frac{1}{3} \div \frac{5}{9}$ 15 20. $\frac{5}{7} \div 1\frac{2}{3}$ 3/7 21. $\frac{2}{5} \div 3\frac{3}{5}$ 1/9 22. $5\frac{1}{4} \div 8\frac{1}{6}$ 9/14

Apply

23. Baby Jessica's weight at one year was about $2\frac{1}{2}$ times her weight at birth. At one-year of age she weighed $22\frac{1}{2}$ pounds. What was her weight at birth? 9 pounds

24. During a 30-minute television program there are about $5\frac{1}{3}$ minutes of advertising. If each commercial is an average of $\frac{2}{3}$ minutes long, how many commercials can be shown? 8 commercials

25. Elizabeth filled the bird feeder from a $10\frac{1}{2}$-pound bag. Every day she fed the birds with $\frac{1}{5}$-pound. How many days was she able to feed the birds from the $10\frac{1}{2}$-pound bag? 52 1/2 days

26. Lisel is covering the bathroom shelves in her house. She has $11\frac{1}{4}$ feet of shelving paper. How many shelves can she cover if each shelf is $1\frac{1}{2}$ feet long? 7 1/2 shelves

Review

1. $1\frac{1}{2} + 2\frac{1}{4}$ 3 3/4 2. $3\frac{2}{9} + 1\frac{1}{9}$ 4 1/3 3. $8\frac{1}{4} + 2\frac{1}{8}$ 10 3/8 4. $6\frac{7}{8} + 4\frac{1}{8}$ 11

5. $7\frac{5}{9} + 3\frac{4}{9}$ 11 6. $2\frac{1}{5} + 3\frac{3}{4}$ 5 19/20 7. $2\frac{7}{8} + 2\frac{1}{8}$ 5 8. $3\frac{9}{10} + 4\frac{1}{5}$ 8 1/10

Math Moments

On Valentine's Day, Romeo paid Speedy Express five and a half dollars to send one and three-quarters pounds of candy to Juliet. Jack paid United Package Flyers six dollars to send two pounds of candy to Jill. Which company offered the less expensive rate per pound? Who was the wiser consumer and how much less per pound did he pay?

Speedy: $\frac{\$5.50}{1.75\text{lb}} \rightarrow \frac{\$3.14 \text{ (rounded)}}{1\text{lb}}$

United: $\frac{\$6.00}{2\text{lb}} \rightarrow \frac{\$3.00}{1\text{lb}}$

Jack paid about $0.14 less per pound to United Package Flyers.

4 Next, write on the board 8 1/2 ÷ 2 1/8 and have students draw and divide with models made on **BLM M6-025A Square Centimeter Grid**. 8 1/2 is shown by outlining 8 rectangles of 8 squares each and 1 rectangle of 4 squares. What whole number is represented by each rectangle of 8 squares? (**1**) What fraction is represented by each individual square centimeter? (**1/8**) How many sets of 2 1/8 may be circled? (**4**)

Now have the students make a model to show the division for 8 1/2 ÷ 4 1/4. (**2 sets of 4 1/4 may be circled to divide the 8 and a half rectangles.**)

5 Model the written division for 8 1/2 ÷ 2 1/8. What numbers will need to be renamed? (**Both mixed numbers should be renamed as improper fractions.**) Have the students describe each step as you write it on the board. They should point out that the reciprocal of the improper fraction divisor will be multiplied by the improper fraction dividend. (**8 1/2 ÷ 2 1/8 = 17/2 ÷ 17/8 = 17/2 × 8/17 = 4**)

Ask the students to write in their journals to show each step of the division for 8 1/2 ÷ 4 1/4 (**8 1/2 ÷ 4 1/4 = 17/2 ÷ 17/4 = 17/2 × 4/17 = 2**). They should realize that both the divisor and dividend should be renamed as improper fractions. Proceed to LESSON 90. For additional practice, students may play *The Brain Game* in groups of 2 or more. Each group will need one copy of **M6-090A Brain Game Instructions**, **M6-090B and C Brain Game Cards I** and **II**, and **M6-090D Brain Game Board**.