



Lesson 8: Dividing Fractions and Mixed Numbers

Student Outcomes

- Students divide fractions by mixed numbers by first converting the mixed numbers into a fraction with a value larger than one.
- Students use equations to find quotients.

Lesson Notes

There is some mandatory prep work before teaching this lesson. The memory game that is included in this lesson needs to be cut and prepared for pairs or individual students.

Classwork

Example 1 (12 minutes): Introduction to Calculating the Quotient of a Mixed Number and a Fraction

- Carli has $4\frac{1}{2}$ walls left to paint in order for all the bedrooms in her house to have the same color paint. However, she has used almost all of her paint and only has $\frac{5}{6}$ of a gallon left. How much paint can she use on each wall in order to have enough to paint the remaining walls?
- In order to solve the word problem, we must calculate the quotient of $\frac{5}{6} \div 4\frac{1}{2}$.

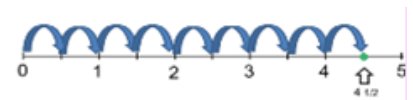
Before dividing, discuss how the answer must be less than one because you are dividing a smaller number by a larger number. Estimation could also be used to emphasize this point: $1 \div 5 = \frac{1}{5}$.

Explain that the mixed number must be converted into a fraction with a value larger than one. You may also emphasize that converting mixed numbers to fractions with a value larger than one is important for different division strategies. Have students complete this conversion on their own and share the process they followed.

Remind students about the formula they learned in the previous lesson; then, have them attempt to solve the problem. Have students show the process they used to find the quotient.

Scaffolding:

If students struggle with converting mixed numbers into fractions, a model may help. On a number line, show students how 9 steps of length $\frac{1}{2}$ will end up at $4\frac{1}{2}$.



Example 1

Carli has $4\frac{1}{2}$ walls left to paint in order for all the bedrooms in her house to have the same color paint. However, she has used almost all of her paint and only has $\frac{5}{6}$ of a gallon left.

- a. How much paint can she use on each wall in order to have enough to paint the remaining walls?

Calculate the quotient: $\frac{5}{6} \div 4\frac{1}{2}$

Convert into a fraction: $\frac{9}{2}$

Divide fractions: $\frac{5}{6} \div \frac{9}{2} = \frac{5}{6} \times \frac{2}{9} = \frac{10}{54}$ or $\frac{5}{27}$

Carli can use $\frac{5}{27}$ of a gallon of paint on each of the remaining walls.

- Calculate the quotient. $\frac{2}{5} \div 3\frac{4}{7}$

Students solve this problem individually as the teacher walks around checking for understanding. Students then share their answers and processes used to find the quotients. Provide time for students to ask questions.

- b. Calculate the quotient.

$$\frac{2}{5} \div 3\frac{4}{7}$$

Convert into a fraction: $\frac{25}{7}$

Divide fractions: $\frac{2}{5} \div \frac{25}{7} = \frac{2}{5} \times \frac{7}{25} = \frac{14}{125}$

Exercise (25 minutes)

Students complete the memory game individually or in small groups.

The following are some important directions for the teacher to share with students:

- The goal is to match each expression with the equivalent quotient. For the cards to match, it may be necessary to rewrite the quotient as a mixed number or equivalent fraction.
- Each expression is assigned a letter. Students must show their work in that box on the student materials. Once they have solved a particular problem, they will not have to solve it again if they record their work in the correct place.
- Students are able to flip two cards over during each turn. If the expression and the quotient do not match, both cards should be flipped back over. If the expression and quotient do match, the student keeps the matches to determine a winner at the end.

If students are not clear about the directions, the teacher may choose two or three problems for students to do as a class to show how the memory game works.

MP.1

Exercise

Show your work for the memory game in the boxes provided below.

A.	$\frac{3}{4} \div 6\frac{2}{3} = \frac{3}{4} \div \frac{20}{3} = \frac{3}{4} \times \frac{3}{20} = \frac{9}{80}$
B.	$\frac{1}{3} \div 4\frac{3}{4} = \frac{1}{3} \div \frac{19}{4} = \frac{1}{3} \times \frac{4}{19} = \frac{4}{57}$
C.	$\frac{2}{5} \div 1\frac{7}{8} = \frac{2}{5} \div \frac{15}{8} = \frac{2}{5} \times \frac{8}{15} = \frac{16}{75}$
D.	$7\frac{1}{2} \div \frac{5}{6} = \frac{15}{2} \div \frac{5}{6} = \frac{15}{2} \times \frac{6}{5} = \frac{90}{10} = 9$
E.	$3\frac{4}{7} \div \frac{5}{8} = \frac{25}{7} \div \frac{5}{8} = \frac{25}{7} \times \frac{8}{5} = \frac{200}{35} = 5\frac{5}{7}$
F.	$5\frac{5}{8} \div \frac{9}{10} = \frac{45}{8} \div \frac{9}{10} = \frac{45}{8} \times \frac{10}{9} = \frac{450}{72} = 6\frac{1}{4}$
G.	$\frac{1}{4} \div 10\frac{11}{12} = \frac{1}{4} \div \frac{131}{12} = \frac{1}{4} \times \frac{12}{131} = \frac{12}{524} = \frac{3}{131}$
H.	$5\frac{3}{4} \div \frac{5}{9} = \frac{23}{4} \div \frac{5}{9} = \frac{23}{4} \times \frac{9}{5} = \frac{207}{20} = 10\frac{7}{20}$
I.	$3\frac{1}{5} \div \frac{2}{3} = \frac{16}{5} \div \frac{2}{3} = \frac{16}{5} \times \frac{3}{2} = \frac{48}{10} = 4\frac{4}{5}$
J.	$\frac{3}{5} \div 3\frac{1}{7} = \frac{3}{5} \div \frac{22}{7} = \frac{3}{5} \times \frac{7}{22} = \frac{21}{110}$
K.	$\frac{10}{13} \div 2\frac{4}{7} = \frac{10}{13} \div \frac{18}{7} = \frac{10}{13} \times \frac{7}{18} = \frac{70}{234} = \frac{35}{117}$
L.	$2\frac{1}{4} \div \frac{7}{8} = \frac{9}{4} \div \frac{7}{8} = \frac{9}{4} \times \frac{8}{7} = \frac{72}{28} = 2\frac{4}{7}$

Closing (4 minutes)

- How does the process of dividing a fraction by a mixed number compare with our previous work with division of fractions? Discuss similarities and differences.

▫ *Answers will vary, but some possibilities are listed below.*

Similarities: We can use the invert and multiply method for both types of problems.

Differences: It is necessary to change the mixed number into a fraction greater than one before applying the invert and multiply method.

Exit Ticket (4 minutes)

Name _____

Date _____

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Exit Ticket

Calculate the quotient.

1. $\frac{3}{4} \div 5\frac{1}{5}$

2. $\frac{3}{7} \div 2\frac{1}{2}$

3. $\frac{5}{8} \div 6\frac{5}{6}$

4. $\frac{5}{8} \div 8\frac{3}{10}$

Exit Ticket Sample Solutions

Calculate the quotient.

1. $\frac{3}{4} \div 5\frac{1}{5}$

$$\frac{3}{4} \div 5\frac{1}{5} = \frac{3}{4} \div \frac{26}{5} = \frac{3}{4} \times \frac{5}{26} = \frac{15}{104}$$

2. $\frac{3}{7} \div 2\frac{1}{2}$

$$\frac{3}{7} \div 2\frac{1}{2} = \frac{3}{7} \div \frac{5}{2} = \frac{3}{7} \times \frac{2}{5} = \frac{6}{35}$$

3. $\frac{5}{8} \div 6\frac{5}{6}$

$$\frac{5}{8} \div 6\frac{5}{6} = \frac{5}{8} \div \frac{41}{6} = \frac{5}{8} \times \frac{6}{41} = \frac{30}{328} \text{ or } \frac{15}{164}$$

4. $\frac{5}{8} \div 8\frac{3}{10}$

$$\frac{5}{8} \div 8\frac{3}{10} = \frac{5}{8} \div \frac{83}{10} = \frac{5}{8} \times \frac{10}{83} = \frac{50}{664} \text{ or } \frac{25}{332}$$

Problem Set Sample Solutions

Calculate each quotient.

1. $\frac{2}{5} \div 3\frac{1}{10}$

$$\frac{2}{5} \div 3\frac{1}{10} = \frac{2}{5} \times \frac{10}{31} = \frac{20}{155} \text{ or } \frac{4}{31}$$

2. $4\frac{1}{3} \div \frac{4}{7}$

$$\frac{13}{3} \div \frac{4}{7} = \frac{13}{3} \times \frac{7}{4} = \frac{91}{12} \text{ or } 7\frac{7}{12}$$

3. $3\frac{1}{6} \div \frac{9}{10}$

$$\frac{19}{6} \div \frac{9}{10} = \frac{19}{6} \times \frac{10}{9} = \frac{190}{54} \text{ or } \frac{95}{27} \text{ or } 3\frac{28}{54} \text{ or } 3\frac{14}{27}$$

4. $\frac{5}{8} \div 2\frac{7}{12}$

$$\frac{5}{8} \div 2\frac{7}{12} = \frac{5}{8} \times \frac{12}{31} = \frac{60}{248} \text{ or } \frac{15}{62}$$

Memory Game

A. $\frac{3}{4} \div 6\frac{2}{3}$	$\frac{9}{80}$	B. $\frac{1}{3} \div 4\frac{3}{4}$	$\frac{4}{57}$
C. $\frac{2}{5} \div 1\frac{7}{8}$	$\frac{16}{75}$	D. $7\frac{1}{2} \div \frac{5}{6}$	9
E. $3\frac{4}{7} \div \frac{5}{8}$	$5\frac{5}{7}$	F. $5\frac{5}{8} \div \frac{9}{10}$	$6\frac{1}{4}$
G. $\frac{1}{4} \div 10\frac{11}{12}$	$\frac{3}{131}$	H. $5\frac{3}{4} \div \frac{5}{9}$	$10\frac{7}{20}$
I. $3\frac{1}{5} \div \frac{2}{3}$	$5\frac{4}{5}$	J. $\frac{3}{5} \div 3\frac{1}{7}$	$\frac{21}{110}$
K. $\frac{10}{13} \div 2\frac{4}{7}$	$\frac{35}{117}$	L. $2\frac{1}{4} \div \frac{7}{8}$	$2\frac{4}{7}$