

7-1**Estimating Products** (pages 256–258)

You can use **compatible numbers** to estimate products when multiplying fractions. Compatible numbers are easy to divide mentally.

EXAMPLES

A Estimate $\frac{1}{4} \times 13$.

$\frac{1}{4} \times 13$ means $\frac{1}{4}$ of 13.

$$\frac{1}{4} \times 12 = \underline{3}$$

For 13, the nearest multiple of 4 is 12.
4 and 12 are compatible numbers because $12 \div 4 = 3$.

$$\frac{1}{4} \times 12 = 3$$

so the product of $\frac{1}{4}$ and 13 is about 3.

B Estimate $\frac{2}{3} \times 17$.

$$\frac{1}{3} \times 18 = 6$$

For 17, the nearest multiple of 3 is 18.

$$\frac{1}{3} \text{ of } 18 \text{ is } 6.$$

$$\frac{2}{3} \times 18 = 12$$

Since $\frac{1}{3}$ of 18 is 6, it follows that $\frac{2}{3}$ of 18 is 2×6 or 12.

$$\text{So, } \frac{2}{3} \times 17 \text{ is about } 12.$$

You can also estimate products by rounding fractions to 0, $\frac{1}{2}$, or 1, and by rounding mixed numbers to the nearest whole numbers.

Try These Together**Estimate each product.**

1. Estimate $\frac{1}{5} \times 9$.

HINT: For 9, what is the nearest multiple of 5?

2. Estimate $\frac{5}{6} \times 22$.

*HINT: For 22, what is the nearest multiple of 6?***PRACTICE****Estimate each product.**

3. $\frac{1}{5} \times 24$

4. $\frac{1}{6} \times 5$

5. $\frac{5}{8} \times 42$

6. $2\frac{1}{4} \times 3\frac{1}{3}$

7. $\frac{1}{10} \times \frac{5}{8}$

8. $6\frac{2}{3} \times 1\frac{4}{5}$

9. $\frac{4}{9} \times 14$

10. $3\frac{4}{5} \times 7\frac{1}{8}$

11. $4\frac{7}{9} \times 2\frac{1}{6}$



12. Standardized Test Practice Ann receives an allowance of \$10 a week.

She spends about $\frac{2}{3}$ of her allowance on school lunches and about $\frac{1}{6}$ on entertainment. About how much does she have left?

A \$2**B** \$0**C** \$8**D** \$1

Answers: Sample answers are given. 1. 2 2. 20 3. 5 4. 1 5. 25 6. 6 7. 0 8. 14 9. 7 10. 28 11. 10 12. A

7-2

Multiplying Fractions (pages 261–264)

Use the following rules to multiply fractions.

Multiplying Fractions	To multiply fractions, multiply the numerators and multiply the denominators. Simplify if necessary.
Simplify Before You Multiply	You can simplify before you multiply fractions if the numerator of one fraction and the denominator of another fraction have a common factor.

EXAMPLES

Multiply.

A $\frac{1}{3} \times \frac{2}{5}$

$$\frac{1}{3} \times \frac{2}{5} = \frac{1 \times 2}{3 \times 5} \quad \text{To multiply fractions, multiply the numerators and the denominators}$$

$$= \frac{2}{15} \quad \text{You cannot simplify } \frac{2}{15}.$$

B $\frac{4}{7} \times \frac{3}{8}$

$$\frac{4}{7} \times \frac{3}{8} \quad \text{Estimate: } \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

$$= \frac{\cancel{4} \times 3}{7 \times \cancel{8}_2} \quad \text{The GCF of 4 and 8 is 4. Divide both the numerator and denominator by 4 and then multiply.}$$

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

Try These Together

Multiply.

1. $\frac{1}{2} \times \frac{3}{8}$

HINT: Multiply the numerators and the denominators.

2. $\frac{5}{6} \times \frac{3}{25}$

HINT: Simplify before you multiply.

PRACTICE

Multiply. Write in simplest form.

3. $\frac{1}{2} \times \frac{3}{4}$

4. $\frac{5}{8} \times \frac{2}{3}$

5. $\frac{2}{3} \times \frac{6}{8}$

6. $\frac{2}{3} \times \frac{1}{9}$

7. $\frac{3}{5} \times \frac{5}{12}$

8. $\frac{1}{3} \times \frac{9}{10}$

9. $\frac{1}{12} \times \frac{4}{5}$

10. $\frac{3}{7} \times \frac{4}{9}$

11. $\frac{3}{5} \times \frac{3}{4}$



12. Standardized Test Practice There are a dozen eggs in a carton. You use $\frac{1}{6}$ for an omelet. Your sister uses $\frac{1}{5}$ of the leftover eggs for a cake. How many eggs are left?

A 10

B 2

C 8

D 6

Answers: 1. $\frac{3}{8}$ 2. $\frac{10}{9}$ 3. $\frac{8}{3}$ 4. $\frac{12}{5}$ 5. $\frac{2}{1}$ 6. $\frac{27}{2}$ 7. $\frac{4}{1}$ 8. $\frac{10}{3}$ 9. $\frac{15}{1}$ 10. $\frac{4}{4}$ 11. $\frac{20}{9}$ 12. C

7-3

Multiplying Mixed Numbers

(pages 265–267)

Use the following rules to multiply mixed numbers.

Multiplying Mixed Numbers	<ul style="list-style-type: none"> Express mixed numbers as improper fractions. Multiply the numerators and multiply the denominators.
Simplify Before You Multiply	After you express mixed numbers as improper fractions, check to see if the numerator of one fraction and the denominator of another fraction have a common factor. If they do, simplify before you multiply.

EXAMPLES

Multiply.

A $1\frac{1}{4} \times \frac{3}{4}$

Estimate: $1 \times 1 = 1$

$$1\frac{1}{4} \times \frac{3}{4} = \frac{5}{4} \times \frac{3}{4}$$

Express $1\frac{1}{4}$ as an improper fraction.

$$= \frac{15}{16}$$

Multiply and then compare with your estimate.

B $2\frac{2}{3} \times 5\frac{1}{2}$

$$\frac{8}{3} \times \frac{11}{2}$$

$$= \frac{4 \cdot 8 \cdot 11}{3 \cdot 2 \cdot 1}$$

$$= \frac{44}{3} \text{ or } 14\frac{2}{3}$$

Estimate $3 \times 5 = 15$ and then rewrite the mixed numbers as improper fractions.

The GCF of 8 and 2 is 2. Divide both the numerator and denominator by 2 and then multiply.

Rewrite as a mixed number and compare with your estimate.

Try These Together

Multiply. Write in simplest form.

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

HINT: Rewrite the mixed number as an improper fraction and multiply.

2. $1\frac{1}{3} \times 2\frac{3}{8}$

HINT: Simplify before you multiply.

PRACTICE

Multiply. Write in simplest form.

3. $4\frac{2}{3} \times 1\frac{1}{8}$

4. $3\frac{1}{3} \times 4\frac{1}{2}$

5. $1\frac{7}{9} \times 2\frac{1}{7}$

6. $4\frac{2}{5} \times 1\frac{4}{11}$

7. $2\frac{4}{9} \times 2\frac{7}{10}$

8. $2\frac{4}{5} \times 9\frac{1}{6}$



9. Standardized Test Practice It takes Julie $2\frac{1}{4}$ minutes to run once

around a track. How long will it take her to run $8\frac{1}{2}$ laps?

A $19\frac{1}{8}$ minutes

B $19\frac{1}{4}$ minutes

C $18\frac{7}{8}$ minutes

D $18\frac{3}{4}$ minutes

Answers: 1. $2\frac{25}{14}$ 2. $3\frac{6}{1}$ 3. $5\frac{4}{1}$ 4. 15 5. $3\frac{21}{17}$ 6. 6 7. $6\frac{5}{3}$ 8. $25\frac{3}{2}$ 9. A

7-4

Dividing Fractions (pages 272–275)

Any two numbers whose product is 1 are called **reciprocals**. For example, $\frac{1}{2}$ and 2 are reciprocals because $\frac{1}{2} \cdot 2 = 1$. You use reciprocals when you divide by fractions.

Dividing Fractions

To divide by a fraction, multiply by its reciprocal.

EXAMPLES

A Find the reciprocal of $\frac{2}{3}$.

Since $\frac{2}{3} \cdot \frac{3}{2} = 1$, the reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$.

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

$\frac{4}{5} \div \frac{1}{3} = \frac{4}{5} \times \frac{3}{1}$ *Multiply by the reciprocal of $\frac{1}{3}$.*
 $= \frac{12}{5}$ or $2\frac{2}{5}$ *Multiply the numerators and denominators. Rewrite the improper fraction as a mixed number.*

Try These Together

1. Find the reciprocal of $\frac{2}{7}$.

HINT: What times $\frac{2}{7}$ equals 1?

2. Find $\frac{7}{8} \div \frac{3}{4}$.

HINT: Multiply by the reciprocal. Simplify before you multiply.

PRACTICE

Find the reciprocal of each number.

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

4. 5

5. $\frac{3}{5}$

6. $\frac{1}{14}$

7. $\frac{1}{7}$

8. $\frac{9}{10}$

Divide. Write in simplest form.

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

10. $\frac{5}{8} \div \frac{1}{6}$

11. $\frac{4}{9} \div \frac{1}{5}$

12. $\frac{2}{9} \div \frac{3}{4}$

13. $\frac{1}{2} \div \frac{1}{16}$

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



15. Standardized Test Practice After the initial fee of \$2.00, a taxi ride costs \$0.25 per $\frac{1}{5}$ mile. How much would a 4 mile cab ride cost, including the initial fee?

A \$5.00

B \$3.00

C \$20.00

D \$7.00

Answers: 1. $\frac{7}{8}$ 2. $1\frac{6}{7}$ 3. $\frac{5}{3}$ 4. $\frac{1}{14}$ 5. $\frac{5}{3}$ 6. $1\frac{1}{4}$ 7. 7 8. $\frac{9}{10}$ 9. $\frac{4}{9}$ 10. $3\frac{1}{3}$ 11. $2\frac{2}{3}$ 12. $\frac{8}{27}$ 13. 8 14. $2\frac{2}{5}$ 15. D

7-5

Dividing Mixed Numbers (pages 276–279)

When you divide mixed numbers, first rewrite the mixed numbers as improper fractions. Then divide as you would with a fraction—by multiplying by the reciprocal.

EXAMPLES

A Find the reciprocal of $4\frac{1}{5}$.

$$4\frac{1}{5} = \frac{21}{5} \text{ Rewrite as an improper fraction.}$$

$$\text{Since } \frac{21}{5} \times \frac{5}{21} = 1, \text{ the reciprocal of}$$

$$4\frac{1}{5} \text{ is } \frac{5}{21}.$$

B Find $2\frac{2}{3} \div 3\frac{1}{2}$.

$$2\frac{2}{3} \div 3\frac{1}{2} = \frac{8}{3} \div \frac{7}{2}$$

$$= \frac{8}{3} \times \frac{2}{7}$$

$$= \frac{16}{21}$$

Rewrite mixed numbers as improper fractions.

Multiply by the reciprocal.

Try These Together

1. Find the reciprocal of $1\frac{5}{7}$.

HINT: Rewrite the mixed number as an improper fraction.

2. Find $3\frac{3}{5} \div 8\frac{1}{5}$.

HINT: Rewrite the mixed numbers as improper fractions. Multiply by the reciprocal.

PRACTICE

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

3. $7\frac{1}{6}$

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

5. $1\frac{7}{8}$

6. $2\frac{4}{9}$

7. $5\frac{3}{5}$

8. $6\frac{1}{8}$

9. $2\frac{5}{8}$

10. $1\frac{4}{7}$

Divide. Write in simplest form.

11. $2\frac{2}{5} \div 1\frac{1}{11}$

12. $3\frac{1}{6} \div \frac{1}{3}$

13. $1\frac{2}{3} \div 4$

14. $4\frac{1}{3} \div \frac{6}{7}$

15. $\frac{2}{5} \div 1\frac{1}{12}$

16. $3\frac{1}{10} \div 2\frac{1}{5}$

17. $2\frac{4}{9} \div 1\frac{1}{9}$

18. $4\frac{1}{2} \div 2\frac{2}{5}$

19. $2\frac{1}{8} \div \frac{1}{2}$



20. Standardized Test Practice A sand mosaic requires $\frac{1}{4}$ cup of sand per project. If there are $3\frac{3}{4}$ cups of sand available, how many mosaics can be completed?

A 9

B 12

C 15

D 18

Answers: 1. $\frac{12}{7}$	2. $\frac{41}{18}$	3. $\frac{43}{6}$	4. $\frac{2}{7}$	5. $\frac{8}{15}$	6. $\frac{9}{22}$	7. $\frac{5}{28}$	8. $\frac{8}{49}$	9. $\frac{8}{21}$	10. $\frac{7}{11}$	11. $2\frac{5}{1}$	12. $9\frac{2}{1}$	13. $\frac{5}{12}$	14. $5\frac{1}{1}$	15. $\frac{65}{24}$	16. $1\frac{9}{22}$	17. $2\frac{5}{1}$	18. $1\frac{8}{7}$	19. $4\frac{4}{1}$	20. C
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7-6**Sequences** (pages 282–284)

A **sequence** is a list of numbers in a specific order. For example, the numbers 3, 6, 9, 12, 15 are a sequence. In this sequence, notice that 3 is added to each number. The next number in the sequence is $15 + 3$, or 18. There are also sequences in which you find the numbers by multiplying by the same number.

EXAMPLES

Describe each pattern. Then find the next number in each sequence.

A 13, 18, 23, 28, ...

In this sequence, 5 is added to each number. The next number is $28 + 5$, or 33.

B 5, 10, 20, 40, ...

Each number in this sequence is multiplied by 2. The next number is 40×2 , or 80.

Try These Together

Describe each pattern. Then find the next number in each sequence.

1. 63, 59, 55, 51, ...

HINT: What number is subtracted from each number in the sequence?

2. $2\frac{1}{2}$, 5, $7\frac{1}{2}$, 10, ...

HINT: What number is added to each number in the sequence?

PRACTICE

Describe each pattern. Then find the next two numbers in each sequence.

3. 114, 57, $28\frac{1}{2}$, ...

4. $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, ...

5. 14, $16\frac{1}{2}$, 19, ...

6. 2, 16, 128, ...

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

8. 31, 34, 37, ...

Find the missing number in each sequence.

9. 4, ?, 36, 108

10. 59, ?, 50, $45\frac{1}{2}$

11. $\frac{1}{4}$, $2\frac{1}{2}$, ?, 250

12. $\frac{1}{8}$, $\frac{5}{8}$, ?, $1\frac{5}{8}$

13. 5, 20, 35, ?

14. ?, 90, 62, 34

15. Standardized Test Practice Team A is playing Team B in a baseball game. By the end of the fifth inning, how many total outs has each team gotten? (There are 3 outs per inning per team.)

A 18

B 25

C 15

D 12

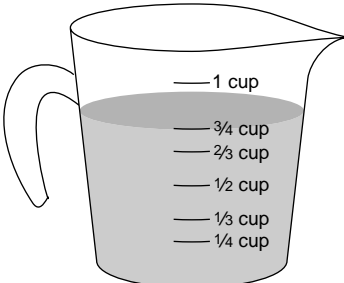
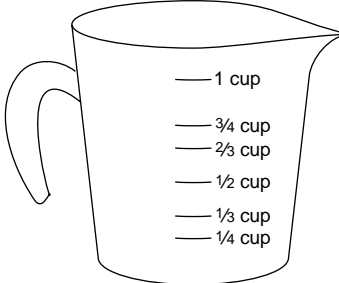
Answers: 1. subtract 4; 47 2. add $2\frac{1}{2}$; $12\frac{1}{2}$ 3. multiply by $\frac{2}{1}$; $4\frac{1}{4}$, $7\frac{1}{4}$ 4. multiply by $2\frac{1}{2}$; $21\frac{1}{2}$, 24 5. add $2\frac{1}{2}$; 21, 24 6. multiply by 8; 1,024, 8,192 7. multiply by 3; $6\frac{2}{3}$, $20\frac{1}{3}$ 8. add 3; 40, 43 9. 12 10. 54 11. 25 12. $1\frac{1}{8}$ 13. 50 14. 118 15. C

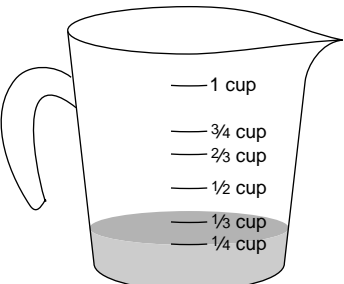
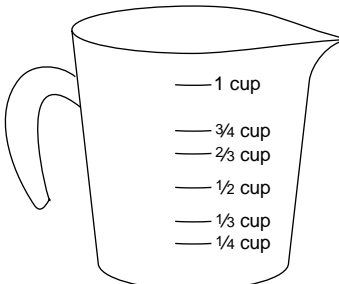
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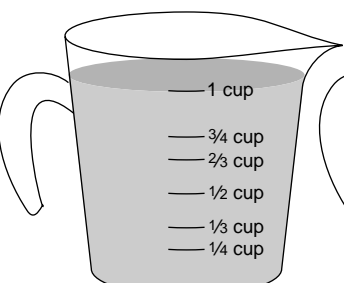
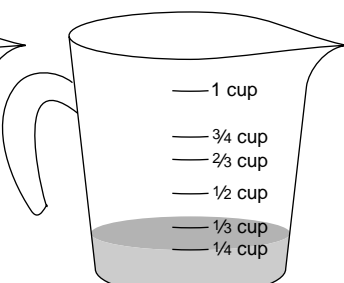
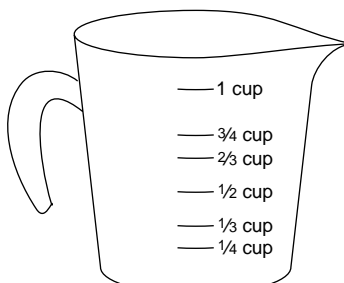
Chapter 7 Review

Chef's Secret

Chefs often have to change the amounts of ingredients that they use in their recipes when they change the size of the recipes. Help Chef Ramirez change the amounts shown in the measuring cups below. Shade in the new amounts in the empty measuring cups.

1.  $\times \frac{1}{3} =$ 

2.  $\div \frac{3}{4} =$ 

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

Answers are located on p. 106.