

• Reducing Fractions, Part 1

Power Up

facts

Power Up H

estimation

Hold your hands about one foot apart. Hold your hands about one yard apart.

mental math

- Measurement:** One mile is how many feet?
- Fractional Parts:** $\frac{1}{4}$ of 30
- Fractional Parts:** $\frac{1}{4}$ of 300
- Powers/Roots:** 5^2
- Time:** After school J'Vonte walks his dog for 30 minutes and then starts his homework. J'Vonte is halfway through his daily walk. How long before J'Vonte starts his homework?
- Percent:** 10% of \$300
- Estimation:** Choose the more reasonable estimate for the diameter of a CD: 12 centimeters or 12 millimeters.
- Calculation:** $30 \times 30, + 100, \div 2, - 100, \div 4$

problem solving

Choose an appropriate problem-solving strategy to solve this problem. List the possible arrangements of the letters A, E, and R. What percent of the possible arrangements spell words?

New Concept

In Lesson 79, we practiced making equivalent fractions by multiplying by a fraction name for 1. We changed the fraction $\frac{1}{2}$ to the *equivalent fraction* $\frac{3}{6}$ by multiplying by $\frac{3}{3}$.

$$\frac{1}{2} \times \frac{3}{3} = \frac{3}{6}$$



Visit www.SaxonMath.com/Int5Activities for a calculator activity.

Multiplying by $\frac{3}{3}$ made the **terms** of the fraction greater. The terms of a fraction are the numerator and the denominator. The terms of $\frac{1}{2}$ are 1 and 2. The terms of $\frac{3}{6}$ are 3 and 6.

Generalize State a rule for writing an equivalent fraction using multiplication.

Sometimes we can make the terms of a fraction smaller by dividing by a fraction name for 1. Here we change $\frac{3}{6}$ to $\frac{1}{2}$ by dividing both terms of $\frac{3}{6}$ by 3:

$$\frac{3}{6} \div \frac{3}{3} = \frac{1}{2} \quad \begin{array}{l} (3 \div 3 = 1) \\ (6 \div 3 = 2) \end{array}$$

Math Language

Reducing a fraction is also referred to as writing a fraction in **lowest terms** or writing a fraction in **simplest form**.

Generalize State a rule for writing an equivalent fraction using division.

Changing a fraction to an equivalent fraction with smaller terms is called **reducing**. We reduce a fraction by dividing both terms of the fraction by the same number.

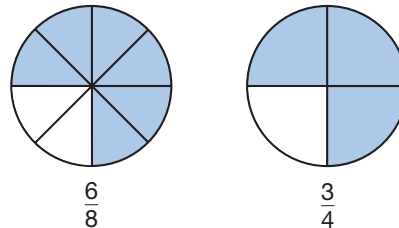
Example 1

Reduce the fraction $\frac{6}{8}$ by dividing both the numerator and the denominator by 2.

We show the reducing process below:

$$\frac{6 \div 2}{8 \div 2} = \frac{3}{4}$$

Model We can use fraction manipulatives to show equivalent fractions. The reduced fraction $\frac{3}{4}$ has smaller terms than $\frac{6}{8}$. We can see from the picture below, however, that $\frac{3}{4}$ and $\frac{6}{8}$ are equivalent fractions.



Not all fractions can be reduced. Only fractions whose terms can be divided by the same number can be reduced.

Example 2

Which of these fractions cannot be reduced?

A $\frac{2}{6}$

B $\frac{3}{6}$

C $\frac{4}{6}$

D $\frac{5}{6}$

We will consider each fraction:

A The terms of $\frac{2}{6}$ are 2 and 6. Both 2 and 6 are even numbers, so they can be divided by 2. The fraction $\frac{2}{6}$ can be reduced to $\frac{1}{3}$.

B The terms of $\frac{3}{6}$ are 3 and 6. Both 3 and 6 can be divided by 3, so $\frac{3}{6}$ can be reduced to $\frac{1}{2}$.

C The terms of $\frac{4}{6}$ are 4 and 6. Both 4 and 6 are even numbers, so they can be divided by 2. The fraction $\frac{4}{6}$ can be reduced to $\frac{2}{3}$.

D The terms of $\frac{5}{6}$ are 5 and 6. The only whole number that divides both 5 and 6 is 1. Since dividing by 1 does not make the terms smaller, the fraction $\frac{5}{6}$ cannot be reduced. The answer to the question is **D**.

Example 3

Add: $\frac{1}{8} + \frac{5}{8}$. Reduce the answer.

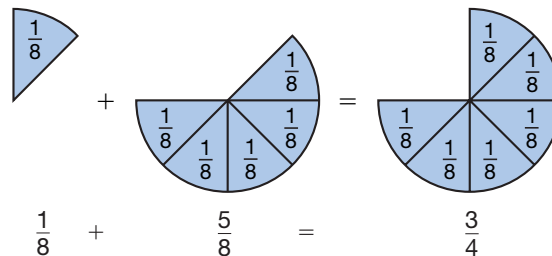
We add $\frac{1}{8}$ and $\frac{5}{8}$.

$$\frac{1}{8} + \frac{5}{8} = \frac{6}{8}$$

The terms of $\frac{6}{8}$ are 6 and 8. We can reduce $\frac{6}{8}$ by dividing each term by 2.

$$\frac{6 \div 2}{8 \div 2} = \frac{3}{4}$$

Model We can also use fraction manipulatives to show that the sum of $\frac{1}{8}$ and $\frac{5}{8}$ is $\frac{3}{4}$.



Example 4

Caroline has a box of beads that are all the same size and shape but are different colors. The box has 4 red beads, 6 yellow beads, and 20 blue beads. Without looking, Caroline chose one bead from the box.

- What are all the possible outcomes?
- What is the probability that the bead Caroline chose was blue?
 - There are three different colors of beads, so the possible outcomes are **red bead, yellow bead, and blue bead**.
 - Since 20 of the 30 beads are blue, the probability that Caroline chooses a blue bead is $\frac{20}{30}$. We reduce this ratio to $\frac{2}{3}$.

Example 5

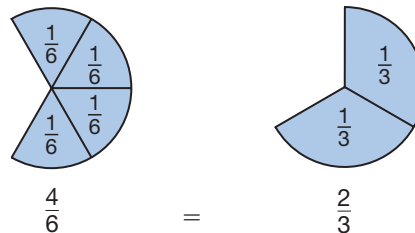
Subtract: $5\frac{5}{6} - 2\frac{1}{6}$. Reduce the answer.

First we subtract.

$$5\frac{5}{6} - 2\frac{1}{6} = 3\frac{4}{6}$$

Then we reduce $3\frac{4}{6}$. We reduce a mixed number by reducing its fraction.

Model We can use fraction manipulatives to reduce $3\frac{4}{6}$.



Since the fraction $\frac{4}{6}$ reduces to $\frac{2}{3}$, the mixed number $3\frac{4}{6}$ reduces to $3\frac{2}{3}$.

If an answer contains a fraction that can be reduced, we should reduce the fraction. Be aware of this as you work the problems in the problem sets.

Lesson Practice

- Reduce $\frac{8}{12}$ by dividing both 8 and 12 by 4.
- Multiple Choice** Which of these fractions *cannot* be reduced?

A $\frac{2}{8}$

B $\frac{3}{8}$

C $\frac{4}{8}$

D $\frac{6}{8}$

Add, subtract, or multiply as indicated. Remember to reduce your answers.

c. $\frac{3}{8} - \frac{1}{8}$

d. $\frac{3}{10} + \frac{3}{10}$

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

f. In Example 4, what is the probability that Jenna chose a yellow bead?

Rewrite each mixed number with a reduced fraction:

g. $1\frac{3}{9}$

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

i. $2\frac{5}{10}$

Find each sum or difference. Remember to reduce your answers.

j. $1\frac{1}{4} + 2\frac{1}{4}$

k. $1\frac{1}{8} + 5\frac{5}{8}$

l. $5\frac{5}{12} - 1\frac{1}{12}$

Written Practice

Distributed and Integrated

1. Evita's bowling scores for three games were 109, 98, and 135. Her highest score was how much more than her lowest score?

(35)
2. Find the average of the three bowling scores listed in problem 1.

(50)
3. Felix is 5 feet 4 inches tall. How many inches is 5 feet 4 inches?

(74)
4. When twenty-six and five tenths is subtracted from thirty-two and six tenths, what is the difference?

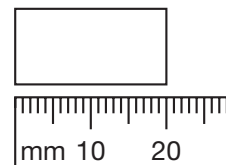
(68, 73)
- * 5. **Analyze** Write a fraction equal to $\frac{2}{3}$ that has a denominator of 12. Then write a fraction equal to $\frac{1}{4}$ that has a denominator of 12. What is the sum of the two fractions you made?

(79)
6. **List** Write all the prime numbers between 20 and 30.

(80)
- * 7. Reduce the fraction $\frac{10}{12}$ by dividing both 10 and 12 by 2.

(81)
8. If the width of this rectangle is half its length, then what is the perimeter of the rectangle?

(44, 53)



***9.** One fourth of the 24 members of an elementary school band can play more than one instrument. One half of the band members who can play more than one instrument also practice playing those instruments every day.

(46, 81)

- How many band members can play more than one instrument?
- How many band members who can play more than one instrument also practice every day?
- What fraction of the band members play more than one instrument and practice every day?

10. What is the area of the rectangle in problem 9?

(44, 72)

11. QS is 48 millimeters. Segment RS is half as long as QR . Find QR .

(61)



12. $3.4 + 6.25$

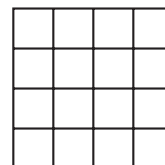
(73)

13. $6.25 - 3.4$

(73)

***14.** **Represent** The figure at right illustrates four squared (4^2). Using this model, draw a figure that illustrates three squared (3^2).

(78)



15. $6 \overline{) \$87.00}$

(34)

16. $40 \overline{) 2438}$

(54)

17. Divide 5280 by 9. Write the quotient as a mixed number with a reduced fraction.

(58)

18. $\$10 - (\$5.80 + 28\text{¢})$

(24, 70)

19. $5\frac{3}{5} + \left(4 - 1\frac{3}{5}\right)$

(59, 63)

***20.** Reduce: $\frac{3}{6}$

(81)

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

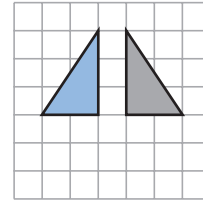
(76)

***22.** $\frac{10}{7} \times \frac{7}{10}$

(76)

- *23. Multiple Choice** Which transformation moves the blue triangle to the position of the gray triangle?
(Inv. 8)

A translation **B** rotation **C** reflection **D** slide



- *24.** Use this information to answer parts **a–b**:
(16, 21)

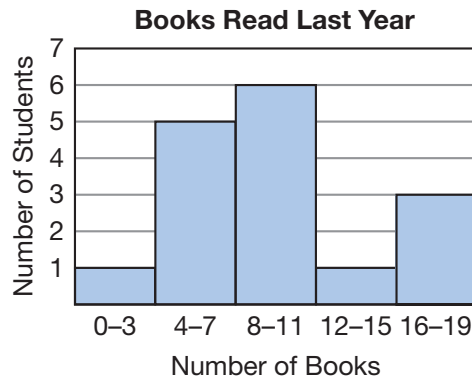
Rosa has a paper route. She delivers papers to 30 customers. At the end of the month, she gets \$6.50 from each customer. She pays the newspaper company \$135 each month for the newspapers.

- How much money does Rosa get each month from all her customers?
- How much profit does she make each month for her work?

- 25.** A standard number cube is rolled once.
(57)

- What is the probability that the upturned face is an even number?
- Describe a different event that has the same probability.

- *26.** The histogram below shows how many books some students read during the last year:
(Inv. 7)




- How many students read 12 books or more?
- How many students read 15 books or fewer?

- *27. Multiple Choice** Which of these Venn diagrams illustrates the relationship between rectangles (R) and squares (S)?
(45, Inv. 8)



28. Write 15% as a fraction. Then reduce the fraction by dividing both terms by 5.
(71, 81)

***29.** Compare: $\frac{1}{2} \times \frac{1}{2} \bigcirc \frac{1}{2}$
(Inv. 2, 76)

30.  **Estimate** Parts of the shorelines of four Great Lakes form a national boundary between the United States and Canada.
(35, 49)

Shorelines Shared by

U.S. and Canada
Length (miles)

Shoreline	
Lake Superior	283
Lake Huron	261
Lake Erie	252
Lake Ontario	

175

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Estimate the total length of the shorelines. Then explain why your estimate is reasonable.