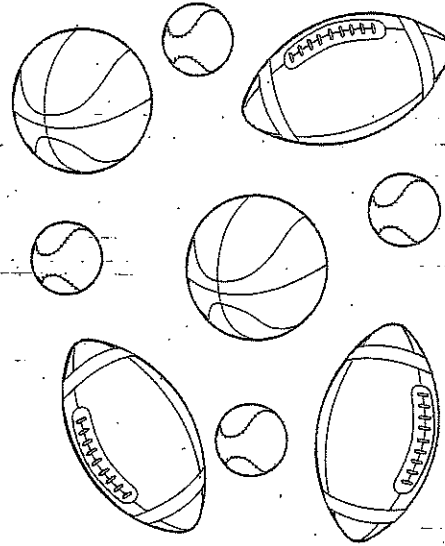




SKILL 1: Ratios

A **ratio** is a comparison of two quantities.

The ratio of footballs to basketballs shown at the right is $\frac{3}{2}$. This ratio can also be written as 3 : 2 and 3 to 2.



Example

Give the ratio comparing the number of baseballs to the total number of balls shown.

Four out of nine balls shown are baseballs.
The ratio of baseballs to balls shown can be written as 4 to 9, 4 : 9, or $\frac{4}{9}$.

Guided Practice

Use the letters in the box.

1. How many letters are there in all? _____

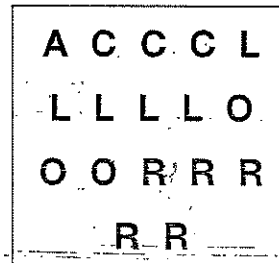
2. How many letters are Rs? _____

3. How many letters are Os? _____

4. Give the ratio of Rs to Os. _____

5. Give the ratio of Os to Rs. _____

6. Give the ratio of Rs to all letters in three ways. _____



In a group of students, 35 are right-handed and 6 are left-handed.

7. Give the ratio of right-handers to left-handers. _____

8. Give the ratio of left-handers to right-handers. _____

9. Give the ratio of right-handers to all students. _____

10. Give the ratio of left-handers to all students. _____

SKILL 1: Practice

The students at Monroe School are divided into three teams as shown at the right. Write the ratio that makes each comparison.

	Team A	Team B	Team C
Girls	50	72	65
Boys	57	49	58

- Girls to boys on Team A _____
- Boys on Team A to Boys on Team C _____
- Team B students to Team A students _____

Use the figures pictured. Give each ratio.



- Squares to circles _____
- Triangles to squares _____
- Circles to triangles _____
- Triangles to all figures _____
- Write the ratio of circles to squares in three ways. _____

Last season, the Yorktown football team won 6 games, lost 3 games and tied 1 game. Tell what each ratio compares.

- 6 to 3 _____
- 3 to 10 _____
- 7 to 3 _____



12. Give the ratio of Os to Xs.
O O O X X O X O

A $\frac{3}{5}$

C $\frac{5}{8}$

B $\frac{5}{3}$

D $\frac{3}{8}$

Skill 1

13. Last year 6 out of 8 days were sunny. Which ratio **does not** compare sunny days to total days?

F 6 to 8

H $\frac{6}{8}$

G 6 : 8

J 6 to 14

Skill 1

Compare and Order Rational Numbers

To compare fractions, rewrite them so they have the same denominator. The **least common denominator (LCD)** of two fractions is the **LCM** of their denominators.

Another way to compare fractions is to express them as decimals. Then compare the decimals.

Example 1

Which fraction is greater, $\frac{3}{4}$, or $\frac{4}{5}$?

Method 1 Rename using the LCD.

$$\begin{array}{l} \frac{3}{4} = \frac{3 \times 5}{4 \times 5} = \frac{15}{20} \\ \frac{4}{5} = \frac{4 \times 4}{5 \times 4} = \frac{16}{20} \end{array} \quad \begin{array}{l} \swarrow \\ \searrow \end{array} \quad \boxed{\text{The LCD is 20.}}$$

Because the denominators are the same, compare numerators.

$$\frac{16}{20} > \frac{15}{20} \quad \frac{4}{5} > \frac{3}{4}$$

Method 2 Graph each rational number on a number line.



The number line shows that $\frac{4}{5} > \frac{3}{4}$.

Exercises

Replace each \square with $<$, $>$, or $=$ to make a true sentence. Use a number line if necessary.

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

2. $\frac{4}{5} \square \frac{8}{10}$

3. $\frac{3}{4} \square \frac{7}{8}$

4. $\frac{1}{2} \square \frac{5}{9}$

5. $\frac{9}{14} \square \frac{3}{7}$

6. $-\frac{5}{7} \square -\frac{6}{11}$

7. $-3\frac{1}{3} \square -3\frac{2}{6}$

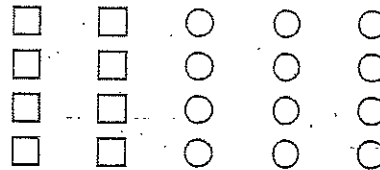
8. $4\frac{9}{10} \square 4\frac{3}{5}$



SKILL 2: Equal Ratios

The picture can be used to show **equal ratios** that compare squares to circles. Just as with fractions, ratios can be written in simplest form. $\frac{2}{3}$ is in simplest form.

You can find ratios equal to a given ratio by multiplying or dividing both quantities of a ratio by the same nonzero number.



$$\frac{\text{squares}}{\text{circles}} = \frac{8}{12} = \frac{6}{9} = \frac{4}{6} = \frac{2}{3}$$

Example 1

Use multiplication to find four ratios equal to the ratio 1 inch to 5 miles.

	1×2	1×3	1×4	1×5	
Inches	1	2	3	4	5
Miles	5	10	15	20	25
	5×2	5×3	5×4	5×5	

Example 2

Use multiplication or division to find five ratios equal to the ratio 36 students to 24 adults.

	36×2	$36 \div 2$	$36 \div 12$	36×3	$36 \div 6$
Students	36	72	18	108	6
Adults	24	48	12	72	4
	24×2	$24 \div 2$	$24 \div 12$	24×3	$24 \div 6$

Guided Practice

1. Nine pounds of trail mix costs \$15. Find two equal ratios.

$$\frac{9}{15} = \frac{9 \times 2}{15 \times 2} = \frac{\square}{\square} \quad \frac{9}{15} = \frac{9 \div 3}{15 \div 3} = \frac{\square}{\square}$$

For each ratio given, find three equal ratios.

2. $\frac{2 \text{ miles}}{8 \text{ minutes}} = \underline{\hspace{2cm}}$

3. $\frac{1 \text{ student}}{3 \text{ students}} = \underline{\hspace{2cm}}$

4. $\frac{5 \text{ pencils}}{1.25 \text{ dollars}} = \underline{\hspace{2cm}}$

5. $\frac{12 \text{ hits}}{50 \text{ at bats}} = \underline{\hspace{2cm}}$

SKILL 2: Practice

Complete each table to show equal ratios.

1.

Tablespoons cocoa	3	6	9				21
Ounces milk	8			32	40	48	

2.

Stickers	50	25				1
Dollars	10.00		2.00	1.00	0.40	

Find three ratios equal to the given ratio.

3. $\frac{3 \text{ picture postcards}}{75 \text{ cents}} = \underline{\hspace{2cm}}$

4. $\frac{3 \text{ wins}}{6 \text{ games}} = \underline{\hspace{2cm}}$

5. $\frac{55 \text{ miles}}{1 \text{ hour}} = \underline{\hspace{2cm}}$

6. $\frac{28 \text{ days}}{4 \text{ weeks}} = \underline{\hspace{2cm}}$

7. $\frac{12 \text{ inches}}{1 \text{ foot}} = \underline{\hspace{2cm}}$

8. $\frac{100 \text{ senators}}{50 \text{ states}} = \underline{\hspace{2cm}}$

Alaska has about 110 people per 100 square miles. Answer each question.

9. Is this more or less than 1 person per square mile? _____

10. Write two ratios equal to the ratio $\frac{110}{100}$. _____



11. Which ratio is **not** equal to $\frac{10}{15}$?
Skill 2

A $\frac{5}{2}$

C $\frac{20}{30}$

B $\frac{2}{3}$

D $\frac{50}{75}$

12. A team lost 3 games and won 5 games. Which ratio compares wins to losses?
Skill 1

F 3:5

H $\frac{5}{3}$

G $\frac{3}{5}$

J $\frac{5}{8}$

Add and Subtract Unlike Fractions

To add or subtract fractions with different denominators,

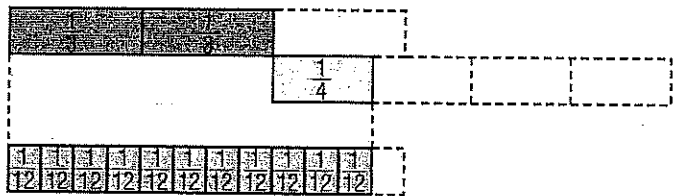
- Rename the fractions using the least common denominator (LCD).
- Add or subtract as with like fractions.
- If necessary, simplify the sum or difference.

Example

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

Method 1 Use a model.

$$\begin{array}{r} \frac{2}{3} \\ + \frac{1}{4} \\ \hline \frac{11}{12} \end{array}$$



Method 2 Use the LCD.

$$\begin{aligned} \frac{2}{3} + \frac{1}{4} &= \frac{2}{3} \cdot \frac{4}{4} + \frac{1}{4} \cdot \frac{3}{3} \\ &= \frac{8}{12} + \frac{3}{12} \text{ or } \frac{11}{12} \end{aligned}$$

Rename using the LCD, 12.

Add the fractions.

Exercises

Add or subtract. Write in simplest form.

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

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

3. $\frac{7}{15} + \left(-\frac{5}{6}\right)$

4. $\frac{2}{5} - \frac{1}{3}$

5. $\frac{5}{9} + \left(-\frac{5}{12}\right)$

6. $\frac{11}{12} - \frac{3}{4}$

7. $\frac{7}{8} - \left(-\frac{1}{3}\right)$

8. $\frac{7}{9} - \frac{1}{2}$

9. $\frac{3}{10} + \frac{7}{12}$

10. $\frac{3}{5} + \frac{2}{3}$

Divide Fractions

To divide by a fraction, multiply by its multiplicative inverse or reciprocal. To divide by a mixed number, rename the mixed number as an improper fraction.

Example

Find $3\frac{1}{3} \div \frac{2}{9}$. Write in simplest form.

$$3\frac{1}{3} \div \frac{2}{9} = \frac{10}{3} \div \frac{2}{9} \quad \text{Rename } 3\frac{1}{3} \text{ as an improper fraction.}$$

$$= \frac{10}{3} \cdot \frac{9}{2} \quad \text{Multiply by the reciprocal of } \frac{2}{9}, \text{ which is } \frac{9}{2}.$$

$$= \frac{\overset{5}{\cancel{10}}}{\underset{1}{\cancel{3}}} \cdot \frac{\overset{3}{\cancel{9}}}{\underset{1}{\cancel{2}}} \quad \text{Divide out common factors.}$$

$$= 15 \quad \text{Multiply.}$$

Exercises

Divide. Write in simplest form.

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

$$2. \frac{2}{5} \cdot \frac{5}{6}$$

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

$$4. 5 \div \left(-\frac{1}{2}\right)$$

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

$$6. 7\frac{1}{3} \div 2$$

$$7. \frac{5}{6} \div 3\frac{1}{2}$$

$$8. 36 \div 1\frac{1}{2}$$

$$9. -2\frac{1}{2} \div (-10)$$

$$10. 5\frac{2}{5} \div 1\frac{4}{5}$$

$$11. 6\frac{2}{3} \div 3\frac{1}{9}$$

$$12. 4\frac{1}{4} \div \frac{2}{8}$$

$$13. 4\frac{6}{7} \div 2\frac{3}{7}$$

$$14. 12 \div \left(-2\frac{1}{2}\right)$$

$$15. 4\frac{1}{6} \div 3\frac{1}{6}$$

Solve One-Step Addition and Subtraction Equations

Remember, equations must always remain balanced. If you subtract the same number from each side of an equation, the two sides remain equal. Also, if you add the same number to each side of an equation, the two sides remain equal.

Example 1

Solve $x + 5 = 11$. Check your solution.

$$\begin{array}{r} x + 5 = 11 \\ - 5 = -5 \\ \hline x = 6 \end{array}$$

Write the equation.
Subtract 5 from each side.
Simplify.

Check $x + 5 = 11$ Write the original equation.
 $6 + 5 \stackrel{?}{=} 11$ Replace x with 6.
 $11 = 11 \checkmark$ This sentence is true.

The solution is 6.

Example 2

Solve $15 = t - 12$. Check your solution.

$$\begin{array}{r} 15 = t - 12 \\ + 12 = + 12 \\ \hline 27 = t \end{array}$$

Write the equation.
Add 12 to each side.
Simplify.

Check $15 = t - 12$ Write the original equation.
 $15 \stackrel{?}{=} 27 - 12$ Replace t with 27.
 $15 = 15 \checkmark$ This sentence is true.

The solution is 27.

Exercises

Solve each equation. Check your solution.

- | | | | |
|-------------------|-------------------|-------------------|-------------------|
| 1. $h + 3 = 14$ | 2. $m + 8 = 22$ | 3. $p + 5 = 15$ | 4. $17 = y + 8$ |
| 5. $w + 4 = -1$ | 6. $k + 5 = -3$ | 7. $25 = 14 + r$ | 8. $57 + z = 97$ |
| 9. $b - 3 = 6$ | 10. $7 = c - 5$ | 11. $j - 12 = 18$ | 12. $v - 4 = 18$ |
| 13. $-9 = w - 12$ | 14. $y - 8 = -12$ | 15. $14 = f - 2$ | 16. $23 = n - 12$ |

How Much Money?

This problem gives you the chance to:

- Work with simple fractions
 - Figure out a money problem
-

Chuck has \$5 and he spends $\frac{1}{5}$ of his money on candy.

1. How much money does Chuck have left?

_____ dollars and _____ cents

Show your work.

Rachelle buys a drink. She spends the same amount of money on her drink as Chuck spent on his candy. Rachelle now has only $\frac{1}{3}$ of the amount of money that she had before she bought the drink.

2. How much money did Rachelle have before she bought the drink?

_____ dollars and _____ cents

Show how you figured it out.

Smallest and Largest

This problem gives you the chance to:

- choose numbers and operations to give largest and smallest results

1. In this question, make up calculations with answers that are as large as possible.

For each calculation, choose two different numbers from this list.

$\frac{1}{2}$ 1 2 10 20 50

$$\square + \square = \underline{\hspace{2cm}}$$

$$\square - \square = \underline{\hspace{2cm}}$$

$$\square \times \square = \underline{\hspace{2cm}}$$

$$\square \div \square = \underline{\hspace{2cm}}$$

2. Now make the answers to your calculations as small as possible.

For each calculation, choose two different numbers from this list.

$\frac{1}{2}$ 1 2 10 20 50

$$\square + \square = \underline{\hspace{2cm}}$$

$$\square - \square = \underline{\hspace{2cm}}$$

$$\square \times \square = \underline{\hspace{2cm}}$$

$$\square \div \square = \underline{\hspace{2cm}}$$

3. Explain how to choose numbers to make the answer to a division question as small as possible.
