Interactive Classroom

Glencoe McGraw-Hill

Pre-Algebra

Chapter 5
Rational Numbers

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Lesson 5-1 Writing Fractions as Decimals

Lesson 5-2 Rational Numbers

Lesson 5-3 Multiplying Rational Numbers

Lesson 5-4 Dividing Rational Numbers

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Lesson 5-7 Adding and Subtracting Unlike Fractions

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Lesson Menu

Five-Minute Check (over Chapter 4)

Main Ideas and Vocabulary

Example 1: Write a Fraction as a Terminating Decimal

Example 2: Write a Mixed Number as a Decimal

Example 3: Write Fractions as Repeating Decimals

Example 4: Real-World Example

Example 5: Compare Fractions and Decimals

Example 6: Real-World Example

Main Ideas

- Write fractions as terminating or repeating decimals.
- Compare fractions and decimals.

New Vocabulary

- terminating decimal
- mixed number
- repeating decimal
- bar notation

EXAMPLE Write a Fraction as a Terminating Decimal

1 Write $\frac{1}{16}$ as a decimal.

Method 1 Use paper and pencil.

$$
\begin{array}{r}
0.0625 \\
16\overline{)1.0000} \\
\underline{-096} \\
40 \\
\underline{-32} \\
80 \\
\underline{-80} \\
0
\end{array}
$$

Division ends when the remainder is 0.

Answer: 0.0625 is a terminating decimal.

EXAMPLE Write a Fraction as a Terminating Decimal

1 **Write $\frac{1}{16}$ as a decimal.**

Method 2 Use a calculator.

1 ÷ 16 ENTER 0.0625

Answer: 0.0625 is a terminating decimal.

CHECK Your Progress

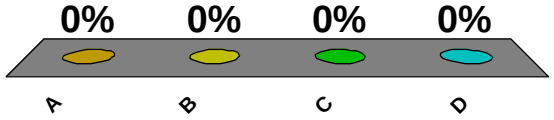
1 Write $\frac{5}{8}$ as a decimal.

A. 0.58

B. 0.625

C. 0.725

D. 5.8



EXAMPLE Write a Mixed Number as a Decimal

2 **Write $1\frac{1}{4}$ as a decimal.**

$$1\frac{1}{4} = 1 + \frac{1}{4}$$ Write as the sum of an integer and a fraction.

$$= 1 + 0.25$$ $\frac{1}{4} = 0.25$

$$= 1.25$$ Add.

Answer: 1.25

CHECK Your Progress

2 Write $2\frac{3}{5}$ as a decimal.

A. 0.6

B. 2.35

C. 2.6

D. 2.7

0%

A B C D

EXAMPLE 3 Write Fractions as Repeating Decimals

A. Write $-\frac{4}{33}$ as a decimal. Use a bar to show a repeating decimal.

$$-\frac{4}{33} \rightarrow 33\overline{)-4.0000\ldots}\quad \begin{array}{l} 0.1212\ldots \\ \\ \\ \end{array}$$

The digits 12 repeat.

Answer: $-\frac{4}{33} = -0.\overline{12}$

EXAMPLE 3 Write Fractions as Repeating Decimals

B. Write $\frac{2}{11}$ as a decimal. Use a bar to show a repeating decimal.

$$\frac{2}{11} \rightarrow 11\overline{)2.0000\ldots}\ \overline{0.1818\ldots}$$

The digits 18 repeat.

Answer: $\frac{2}{11} = 0.\overline{18}$

CHECK Your Progress

3 **A.** Write $-\frac{2}{3}$ as a decimal. Use a bar to show a repeating decimal.

A. $-0.\overline{6}$

B. -0.6

C. -0.23

D. $-0.0\overline{6}$

0%

A B C D

CheckPoint

CHECK Your Progress

3 **B.** Write $\frac{4}{15}$ as a decimal. Use a bar to show a repeating decimal.

A. 4.15

B. $2.\overline{6}$

0%

C. $0.\overline{3}$

D. $0.2\overline{6}$

A B C D

CheckPoint

Real-World EXAMPLE

4 **SOCCER** **Camille's soccer team won 32 out of 44 games to make it to the championships. To the nearest thousandth, find the team's rate of winning.**

Divide the number of games they won, 32, by the number of games they played, 44.

$$\frac{32}{44} = \frac{8}{11} \approx 0.727272\ldots \text{ or } 0.\overline{72}$$

Look to the digit to the right of the thousandths place. Round down since $2 < 5$.

Answer: Camille's soccer team won 0.727 of the time.

CHECK Your Progress

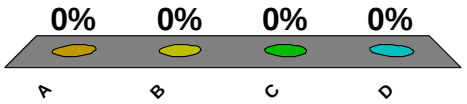
4 The results of a poll showed that 16 out of 24 students in Ms. Brown's class would prefer going to the planetarium rather than the arboretum. To the nearest thousandth, what part of the class preferred going to the planetarium?

A. 0.007

B. 0.667

C. 0.700

D. 16.24



CheckPoint

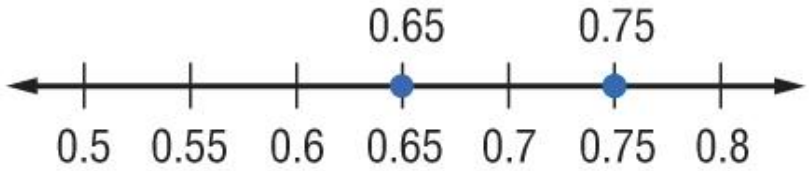
EXAMPLE Compare Fractions and Decimals

5 Replace • with $<$, $>$, or $=$ to make $0.7 \bullet \frac{13}{20}$ a true sentence.

$0.7 \bullet \frac{13}{20}$ Write the sentence.

$0.7 \bullet 0.65$ Write $\frac{13}{20}$ as a decimal.

$0.7 > 0.65$ In the tenths place, $7 > 6$.



Answer: On a number line, 0.7 is to the right of 0.65, so $0.7 > \frac{13}{20}$.

CHECK Your Progress

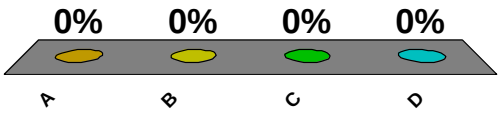
5 Replace • with $<$, $>$, or $=$ to make $\frac{3}{8}$ • 0.4 a true sentence.

A. $<$

B. $>$

C. $=$

D. none of the above



Real-World EXAMPLE

6 **GRADES** **Jeremy got a score of $\frac{16}{20}$ on his first quiz and $\frac{20}{25}$ on his second quiz. Which grade was the higher score?**

Write the fractions as decimals and then compare the decimals.

Quiz #1: $\frac{16}{20} = 0.80$ Quiz #2: $\frac{20}{25} = 0.80$

Answer: The scores were the same, 0.80.

CHECK Your Progress

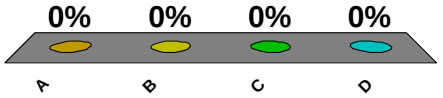
6 **BAKING** One recipe for cookies requires $\frac{5}{8}$ of a cup of butter, and a second recipe for cookies requires $\frac{3}{5}$ of a cup of butter. Which recipe uses less butter.

A. the first recipe

B. the second recipe

C. both use the same amount

D. cannot be determined



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End of the Lesson

Click the mouse button to return to the Chapter Menu.

Lesson Menu

Five-Minute Check (over Lesson 5-1)

Main Ideas and Vocabulary

Example 1: Write Mixed Numbers and Integers as Fractions

Example 2: Write Terminating Decimals as Fractions

Example 3: Write Repeating Decimals as Fractions

Concept Summary: Rational Numbers

Example 4: Classify Numbers

Main Ideas

- Write rational numbers as fractions.
- Identify and classify rational numbers.

New Vocabulary

- rational number

EXAMPLE 1 Write Mixed Numbers and Integers as Fractions

A. Write $-4\frac{3}{8}$ as a fraction.

$$-4\frac{3}{8} = -\frac{35}{8}$$

Write $-4\frac{3}{8}$ as an improper fraction.

Answer: $-\frac{35}{8}$

Concepts in MOtion
Animation:
Whole Numbers
Click here to view!

EXAMPLE Write Mixed Numbers and Integers as Fractions

1 B. Write 10 as a fraction.

Answer: $\frac{10}{1}$

CHECK Your Progress

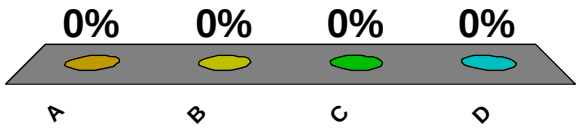
1 **A.** Write $2\frac{3}{5}$ as a fraction.

A. $\frac{13}{10}$

B. $\frac{10}{5}$

C. $\frac{13}{5}$

D. $\frac{13}{3}$



CHECK Your Progress

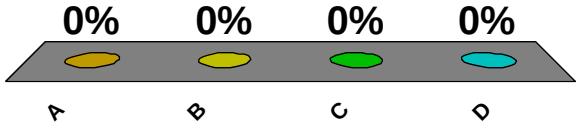
1 **B. Write –6 as a fraction.**

A. $-\frac{6}{1}$

B. $-\frac{6}{6}$

C. $-\frac{1}{6}$

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



CheckPoint

EXAMPLE 2 Write Terminating Decimals as Fractions

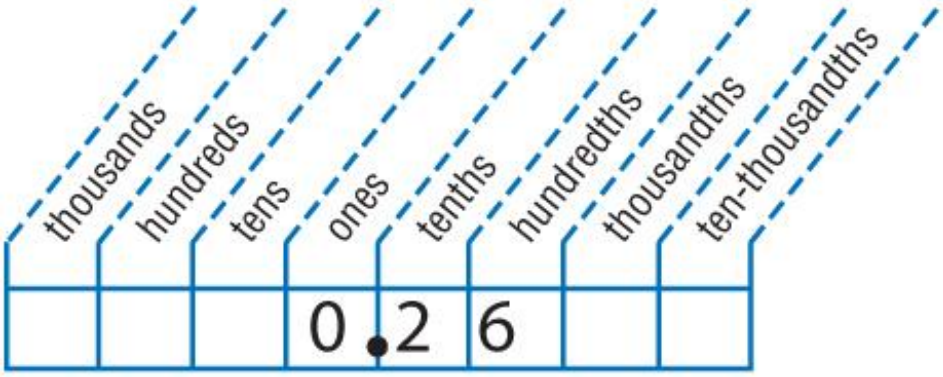
A. Write 0.26 as a fraction or mixed number in simplest form.

$$0.26 = \frac{26}{100}$$

0.26 is 26 hundredths.

Answer: $\frac{13}{50}$

Simplify. The GCF of 26 and 100 is 2.



EXAMPLE 2 Write Terminating Decimals as Fractions

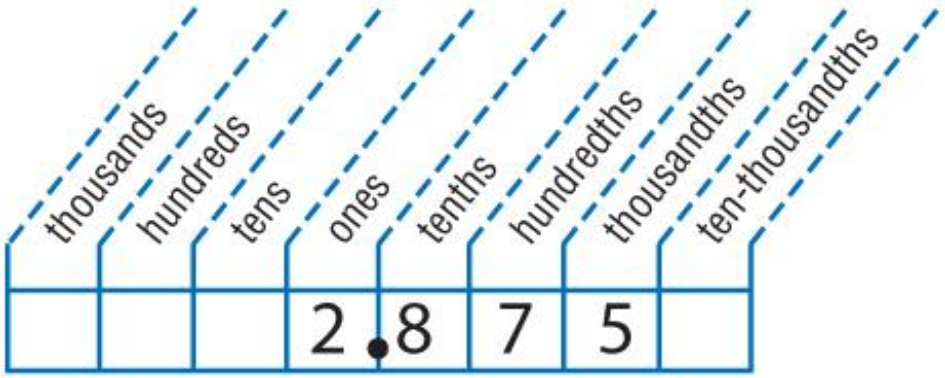
B. Write 2.875 as a fraction or mixed number in simplest form.

$$2.875 = 2\frac{875}{1000}$$

2.875 is 2 and 875 thousandths.

Answer: $= 2\frac{7}{8}$

Simplify. The GCF of 875 and 1000 is 125.



CHECK Your Progress

2 **A. Write 0.84 as a fraction or mixed number in simplest form.**

A. $\frac{21}{250}$

B. $\frac{41}{50}$

C. $\frac{21}{25}$

D. $\frac{84}{100}$

0%

A¤B¤C¤D B C D

CheckPoint

CHECK Your Progress

2 **B. Write 3.625 as a fraction or mixed number in simplest form.**

A. $3\frac{1}{16}$

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

C. $3\frac{625}{1000}$

D. $3\frac{5}{8}$

0%

A¤B¤C¤D B C D

EXAMPLE Write Repeating Decimals as Fractions

3 **Write $0.\overline{39}$ as a fraction in simplest form.**

N	$= 0.3939\ldots$	Let N represent the number.
$100N$	$= 100(0.3939\ldots)$	Multiply each side by 100 because two digits repeat.
$100N$	$= 39.39$	

Subtract N from $100N$ to eliminate the repeating part, $0.3939\ldots$

EXAMPLE Write Repeating Decimals as Fractions

3 $100N = 39.3939\ldots$

$-\ (N = 0.393939\ldots)$

$99N = 39$ $100N - N = 100N - 1N$ or $99N$

$\frac{99N}{99} = \frac{39}{99}$ Divide each side by 99.

$N = \frac{39}{99}$ or $\frac{13}{33}$ Simplify.

Answer: $0.\overline{39} = \frac{13}{33}$

Check 13 ÷ 33 ENTER 0.3939393939 ✓

CHECK Your Progress

3 Write $0.\overline{4}$ as a fraction in simplest form.

A. $\frac{4}{9}$

B. $\frac{44}{99}$

C. $\frac{11}{25}$

D. $\frac{2}{5}$

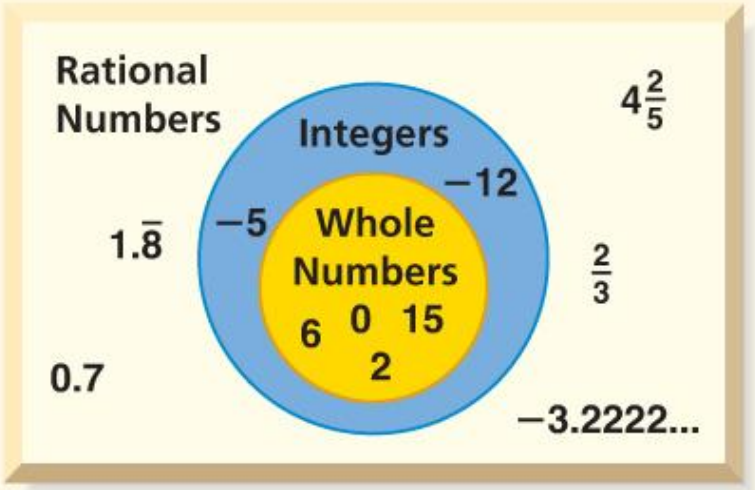
0%

A¤B¤C¤D B C D

CONCEPT SUMMARY — Rational Numbers

Words A rational number is any number that can be expressed as the quotient $\frac{a}{b}$ of two integers, a and b, where $b \neq 0$.

Model



EXAMPLE 4 Classify Numbers

A. Identify all sets to which the number 15 belongs.

Answer: 15 is a whole number, an integer, and a rational number.

EXAMPLE Classify Numbers

4 B. Identify all sets to which the number $7\frac{1}{8}$ belongs.

Answer: $7\frac{1}{8}$ is a rational number.

EXAMPLE Classify Numbers

4 **C. Identify all sets to which the number 0.30303030… belongs**

Answer: 0.30303030… is a nonterminating, repeating decimal. So, it is a rational number.

CHECK Your Progress

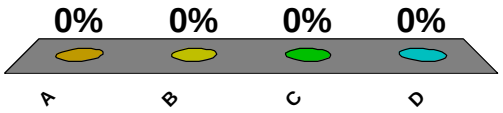
4 **A. Identify all sets to which –7 belongs.**

A. whole number, integer, rational

B. whole number, integer

C. integer, rational

D. integer



CheckPoint

CHECK Your Progress

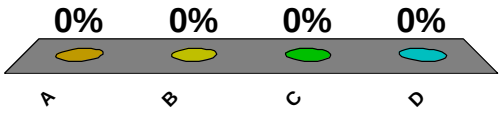
4 B. Identify all sets to which $3\frac{4}{5}$ belongs.

A. whole number, rational

B. integer, rational

C. not rational

D. rational



CHECK Your Progress

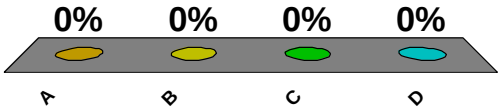
4 **C. Identify all sets to which 0.24242424… belongs.**

A. whole number, rational

B. integer, rational

C. not rational

D. rational



End of the Lesson

Click the mouse button to return to the Chapter Menu.

Lesson Menu

Five-Minute Check (over Lesson 5-2)

Main Ideas and Vocabulary

Key Concept: Multiplying Fractions

Example 1: Multiply Fractions

Example 2: Multiply Negative Fractions

Example 3: Multiply Mixed Numbers

Example 4: Real-World Example

Example 5: Multiply Algebraic Fractions

Example 6: Real-World Example

Main Ideas

- Multiply positive and negative fractions.
- Use dimensional analysis to solve problems.

New Vocabulary

- dimensional analysis

KEY CONCEPT — Multiplying Fractions

Words To multiply fractions, multiply the numerators and multiply the denominators.

Symbols $\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$, where $b, d \neq 0$

Example $\frac{1}{3} \cdot \frac{2}{5} = \frac{1 \cdot 2}{3 \cdot 5}$ or $\frac{2}{15}$

EXAMPLE Multiply Fractions

1 Find $\frac{2}{5} \cdot \frac{5}{8}$. Write the product in simplest form.

$$\frac{2}{5} \cdot \frac{5}{8} = \frac{2 \cdot 5}{5 \cdot 8}$$

← Multiply the numerators.

← Multiply the denominators.

Answer: $\frac{10}{40}$ or $\frac{1}{4}$

Simplify. The GCF of 10 and 40 is 10.

CHECK Your Progress

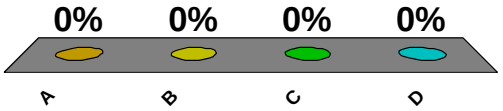
1 Find $\frac{3}{8} \cdot \frac{2}{9}$. Write the product in simplest form.

A. $\frac{5}{72}$

B. $\frac{6}{72}$

C. $\frac{1}{12}$

D. $\frac{6}{63}$



EXAMPLE Multiply Negative Fractions

2 Find $-\frac{1}{4} \cdot \frac{2}{7}$. Write the product in simplest form.

$$-\frac{1}{4} \cdot \frac{2}{7} = -\frac{1}{\cancel{4}_{2}} \cdot \frac{\cancel{2}^{1}}{7}$$

Divide 2 and 4 by their GCF, 2.

$$= -\frac{1 \cdot 1}{2 \cdot 7}$$

Multiply the numerators and multiply the denominators.

Answer: $= -\frac{1}{14}$

Simplify.

CHECK Your Progress

2 Find $\frac{6}{14} \cdot -\frac{21}{40}$. Write the product in simplest form.

A. $\frac{9}{40}$

B. $-\frac{9}{40}$

C. $-\frac{63}{280}$

D. $-\frac{126}{560}$

0%

A B C D

CheckPoint

EXAMPLE Multiply Mixed Numbers

3 Find $1\frac{1}{2} \cdot 3\frac{2}{3}$. Write the product in simplest form.

$1\frac{1}{2} \cdot 3\frac{2}{3} = \frac{3}{2} \cdot \frac{11}{3}$ Rename $1\frac{1}{2}$ as $\frac{3}{2}$ and rename $3\frac{2}{3}$ as $\frac{11}{3}$.

$= \frac{\cancel{3}^{1}}{2} \cdot \frac{11}{\cancel{3}_{1}}$ Divide by the GCF, 3.

$= \frac{1 \cdot 11}{2 \cdot 1}$ Multiply.

Answer: $= \frac{11}{2}$ or $5\frac{1}{2}$ Simplify.

CHECK Your Progress

3 Find $2\frac{2}{7} \cdot 3\frac{1}{4}$. Write the product in simplest form.

A. $\frac{27}{7}$

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

C. $\frac{208}{28}$

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

0%

A B C D

Real-World EXAMPLE

4 **DONATIONS** **Rasheed collected cash donations for underprivileged children every October. This October he collected $784. Last year he collected $\frac{5}{8}$ as much. How much did Rasheed collect last October?**

To find how much Rasheed collected last October multiply 784 by $\frac{5}{8}$.

Real-World EXAMPLE

4 $784 \cdot \frac{5}{8} = \frac{784}{1} \cdot \frac{5}{8}$ Rename 784 as $\frac{784}{1}$.

$= \frac{\overset{98}{\cancel{784}}}{1} \cdot \frac{5}{\underset{1}{\cancel{8}}}$ Divide by the GCF, 8.

$= \frac{98 \cdot 5}{1 \cdot 1}$ Multiply.

$= \frac{490}{1}$ or 490 Simplify.

Answer: Rasheed collected $490 last October.

CHECK Your Progress

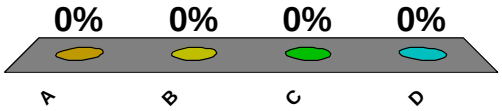
4 **SHOPPING** Melissa is buying a sweater originally priced for $81. The sweater is discounted by $\frac{2}{3}$. Find the amount of the discount.

A. $64.00

B. $54.00

C. $50.67

D. $27.00



EXAMPLE Multiply Algebraic Functions

5 Find $\frac{3p^2}{q} \bullet \frac{q^2}{r}$. Write the product in simplest form.

$$\frac{3p^2}{q} \bullet \frac{q^2}{r} = \frac{3p \bullet p}{\cancel{q}_{1}} \bullet \frac{\cancel{q}^{1} \bullet q}{r}$$

The GCF of q^2 and q is q.

Answer: $= \frac{3p^2q}{r}$

Simplify.

CHECK Your Progress

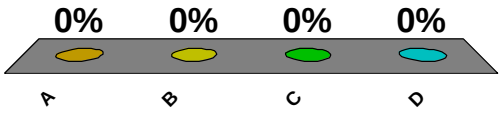
5 Find $\frac{5mn^3}{p^2} \cdot \frac{mp}{n^2}$. Write the product in simplest form.

A. $\frac{5mn}{p}$

B. $\frac{5m^2}{pn}$

C. $\frac{5m^2n}{p}$

D. $\frac{5m^2n^3p}{p^2n^2}$



Real-World EXAMPLE

6 **RUNNING TRACK** The track at Cole's school is $\frac{1}{4}$ mile around. If Cole runs one lap in two minutes, how far (in miles) does he run in 30 minutes?

Write as a fracton : $\dfrac{\frac{1}{4}\text{mile}}{2\text{ minutes}}$

Real-World EXAMPLE

6

$$d = \frac{\frac{1}{4} \text{ mile}}{2 \text{ minutes}} \bullet 30 \text{ minutes}$$

Distance = rate ● time

$$= \frac{\frac{1}{4} \text{ mile}}{2 \text{ min}} \times 30 \text{ min}$$

Divide by the common factors and units.

$$= \frac{1}{4} \bullet \frac{15}{1} \text{ miles}$$

Multiply.

$$= \frac{15}{4} \text{ or } 3\frac{3}{4} \text{ miles}$$

Simplify.

Answer: Cole runs $3\frac{3}{4}$ miles in 30 minutes.

CHECK Your Progress

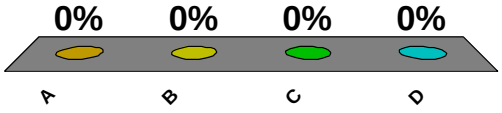
6 WALKING Bob walks $\frac{2}{3}$ mile in 12 minutes. How far does he walk in 30 minutes?

A. $3\frac{3}{4}$ miles

B. 2 miles

C. $1\frac{2}{3}$ miles

D. $1\frac{1}{3}$ miles



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End of the Lesson

Click the mouse button to return to the Chapter Menu.

Lesson Menu

Five-Minute Check (over Lesson 5-3)

Main Ideas and Vocabulary

Key Concept: Inverse Property of Multiplication

Example 1: Find Multiplicative Inverses

Key Concept: Dividing Fractions

Example 2: Divide by a Fraction or Whole Number

Example 3: Divide by a Mixed Number

Example 4: Divide by an Algebraic Function

Example 5: Real-World Example

Main Ideas

- Divide positive and negative fractions using multiplicative inverses.
- Use dimensional analysis to solve problems.

New Vocabulary

- multiplicative inverses
- reciprocals

KEY CONCEPT — Inverse Property of Multiplication

Words The product of a number and its multiplicative inverse is 1.

Symbols For every number $\frac{a}{b}$, where $a, b \neq 0$, there is exactly one number $\frac{b}{a}$ such that $\frac{a}{b} \cdot \frac{b}{a} = 1$.

EXAMPLE Find Multiplicative Inverse

1 A. Find the multiplicative inverse of $\frac{6}{7}$.

$$\frac{6}{7}\left(\frac{7}{6}\right) = 1$$

The product is 1.

Answer: The multiplicative inverse or reciprocal of $\frac{6}{7}$ is $\frac{7}{6}$.

EXAMPLE 1 Find Multiplicative Inverse

B. Find the multiplicative inverse of $3\frac{2}{5}$.

$$3\frac{2}{5} = \frac{17}{5}$$

Write as an improper fraction.

$$\frac{17}{5} \cdot \frac{5}{17} = 1$$

The product is 1.

Answer : The reciprocal of $3\frac{2}{5}$ is $\frac{5}{17}$.

CHECK Your Progress

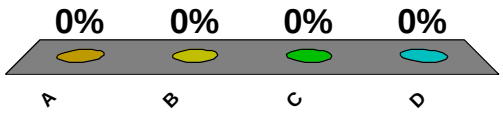
1 **A. Find the multiplicative inverse of $\frac{4}{9}$.**

A. $\frac{4}{9}$

B. $\frac{4}{4}$

C. $\frac{9}{9}$

D. $\frac{9}{4}$



CheckPoint

CHECK Your Progress

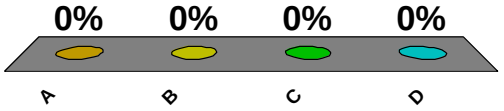
1 **B.** Find the multiplicative inverse of $2\frac{4}{7}$.

A. $\frac{7}{18}$

B. $\frac{7}{7}$

C. $\frac{18}{7}$

D. $2\frac{7}{4}$



KEY CONCEPT — Dividing Fractions

Words To divide by a fraction, multiply by its multiplicative inverse.

Symbols $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$, where $b, c, d \neq 0$

Example $\frac{1}{4} \div \frac{5}{7} = \frac{1}{4} \cdot \frac{7}{5}$ or $\frac{7}{20}$

EXAMPLE Divide by a Fraction or Whole Number

2 A. Find each quotient. Write in simplest form.

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

$$\frac{4}{5} \div \frac{3}{10} = \frac{4}{5} \bullet \frac{10}{3}$$

Multiply by the reciprocal of $\frac{3}{10}$, $\frac{10}{3}$.

$$= \frac{4}{\cancel{5}_{1}} \bullet \frac{\cancel{10}^{2}}{3}$$

Divide by the GCF, 5.

Answer: $\frac{8}{3}$ or $2\frac{2}{3}$

Simplify.

EXAMPLE Divide by a Fraction or Whole Number

2 B. Find each quotient. Write in simplest form.

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

$$\frac{5}{6} \div 3 = \frac{5}{6} \div \frac{3}{1}$$

Write 3 as $\frac{3}{1}$.

$$\frac{5}{6} \div \frac{3}{1} = \frac{5}{6} \cdot \frac{1}{3}$$

Multiply by the reciprocal of $\frac{3}{1}$, $\frac{1}{3}$.

$$= \frac{5}{18}$$

Multiply.

Answer: $\frac{5}{18}$

CHECK Your Progress

2 Find $\frac{3}{8} \div \frac{5}{6}$. Write the quotient in simplest form.

A. $\frac{18}{40}$

B. $\frac{9}{20}$

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

D. $\frac{1}{20}$

0%

A B C D

EXAMPLE Divide by a Mixed Number

3 Find $4\frac{2}{3} \div \left(-3\frac{1}{9}\right)$. Write the quotient in simplest form.

$$4\frac{2}{3} \div \left(-3\frac{1}{9}\right) = \frac{14}{3} \div \frac{-28}{9}$$

Rename the mixed numbers as improper fractions.

$$= \frac{14}{3} \bullet \left(-\frac{9}{28}\right)$$

Multiply by the multiplicative inverse of $-\frac{28}{9}$, $-\frac{9}{28}$.

$$= \frac{\overset{1}{\cancel{14}}}{\cancel{3}} \bullet -\frac{\overset{3}{\cancel{9}}}{\underset{2}{\cancel{28}}}$$

Divide by common factors.

Answer: $= -\frac{3}{2}$ or $-1\frac{1}{2}$

Simplify.

CHECK Your Progress

3 Find $3\frac{3}{4} \div 2\frac{5}{8}$. Write the quotient in simplest form.

A. $\frac{21}{25}$

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

C. $2\frac{7}{10}$

D. $9\frac{27}{32}$

0%

A B C D

EXAMPLE Divide by an Algebraic Fraction

4 Find $\frac{5x}{8y} \div \frac{10}{16y}$. Write the quotient in simplest form.

$$\frac{5x}{8y} \div \frac{10}{16y} = \frac{5x}{8y} \cdot \frac{16y}{10}$$

Multiply by the multiplicative inverse of $\frac{10}{16y}$, $\frac{16y}{10}$.

$$= \frac{\overset{1}{\cancel{5}}\, x}{\cancel{8}\,\underset{1}{\cancel{y}}} \cdot \frac{\overset{2}{\cancel{16}}\,\overset{1}{\cancel{y}}}{\underset{2}{\cancel{10}}}$$

Divide by common factors.

Answer: $= \frac{2x}{2}$ or x

Simplify.

CHECK Your Progress

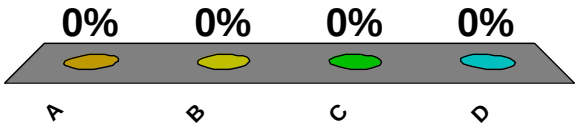
4 Find $\frac{6m}{10p} \div \frac{9m}{4}$. Write the quotient in simplest form.

A. $\frac{15p}{4}$

B. $\frac{4}{15p}$

C. $\frac{27m^2}{20p}$

D. $\frac{24m}{90mp}$



Real-World EXAMPLE

5 **TRAVEL** How many gallons of gas are needed to travel $78\frac{3}{4}$ miles if a car gets $25\frac{1}{2}$ miles per gallon?

To find how many gallons, divide $78\frac{3}{4}$ by $25\frac{1}{2}$.

Real-World EXAMPLE

5 $78\frac{3}{4} \div 25\frac{1}{2} = \frac{315}{4} \div \frac{51}{2}$ Write as improper fractions.

$= \frac{315}{4} \bullet \frac{2}{51}$ Multiply by the reciprocal of $\frac{51}{2}$, $\frac{2}{51}$.

$= \frac{\overset{105}{\cancel{315}}}{\underset{2}{\cancel{4}}} \bullet \frac{\overset{1}{\cancel{2}}}{\underset{17}{\cancel{51}}}$ Divide by common factors.

$= \frac{105}{34}$ or $3\frac{3}{34}$ Simplify.

Real-World EXAMPLE

5 **Answer :** $3\frac{3}{34}$ gallons of gas are needed.

Check Use dimensional analysis to examine the units.

$$\text{miles} \div \frac{\text{miles}}{\text{gallons}} = \cancel{\text{miles}} \times \frac{\text{gallons}}{\cancel{\text{miles}}}$$ Divide by common units.

$$= \text{gallons}$$ Simplify.

The result is expressed as gallons.

CHECK Your Progress

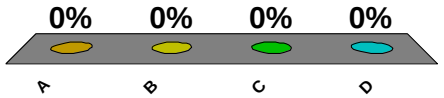
5 **SEWING** Emily has $32\frac{2}{3}$ yards of fabric. She wants to make pillows which each require $3\frac{5}{6}$ yards of fabric to complete. How many pillows can Emily make?

A. $3\frac{5}{23}$ or 3 pillows

B. $5\frac{2}{7}$ or 5 pillows

C. $8\frac{12}{23}$ or 8 pillows

D. $125\frac{2}{9}$ or 125 pillows



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End of the Lesson

Click the mouse button to return to the Chapter Menu.

Lesson Menu

Five-Minute Check (over Lesson 5-4)

Main Ideas

Key Concept: Adding Like Fractions

Example 1: Add Fractions

Example 2: Add Mixed Numbers

Key Concept: Subtracting Like Fractions

Example 3: Subtract Fractions

Example 4: Subtract Mixed Numbers

Example 5: Add Algebraic Fractions

Main Ideas

- Add like fractions.
- Subtract like fractions.

KEY CONCEPT — Adding Like Fractions

Words To add fractions with like denominators, add the numerators and write the sum over the denominator.

Symbols $\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$, where $c \neq 0$ **Example** $\frac{1}{5} + \frac{2}{5} = \frac{1+2}{5}$ or $\frac{3}{5}$

EXAMPLE Add Fractions

1 **Find $\frac{3}{4}+\frac{3}{4}$. Write the sum in simplest form.**

Estimate 1 + 1 = 2

$$\frac{3}{4}+\frac{3}{4}=\frac{3+3}{4}$$

The denominators are the same. Add the numerators.

Answer: $=\frac{6}{4}$ or $\frac{3}{2}$ or $1\frac{1}{2}$

Simplify and rename as a mixed number.

Compared to the estimate, the answer is reasonable.

CHECK Your Progress

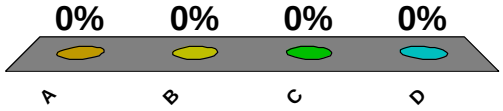
1 Find $\frac{2}{9} + \frac{8}{9}$. Write the sum in simplest form.

A. $\frac{5}{9}$

B. $1\frac{1}{9}$

C. $1\frac{2}{9}$

D. $1\frac{7}{9}$



EXAMPLE Add Mixed Numbers

2 **Find $3\frac{4}{9}+8\frac{2}{9}$. Write the sum in simplest form.**

Estimate $3\frac{1}{2}+8=11\frac{1}{2}$

$$3\frac{4}{9}+8\frac{2}{9}=(3+8)+\left(\frac{4}{9}+\frac{2}{9}\right)$$ Add the whole numbers and fractions separately.

$$=11+\frac{4+2}{9}$$ Add the numerators.

Answer: $=11\frac{6}{9}$ or $11\frac{2}{3}$ Simplify.

CHECK Your Progress

2 Find $5\frac{3}{14} + 2\frac{5}{14}$. Write the sum in simplest form.

A. $3\frac{1}{14}$

B. $7\frac{8}{14}$

C. $7\frac{4}{7}$

D. $8\frac{1}{14}$

0%

A B C D

KEY CONCEPT — Subtracting Like Fractions

Words To subtract fractions with like denominators, subtract the numerators and write the difference over the denominator.

Symbols $\frac{a}{c} - \frac{b}{c} = \frac{a - b}{c}$, where $c \neq 0$

Example $\frac{5}{7} - \frac{1}{7} = \frac{5 - 1}{7}$ or $\frac{4}{7}$

EXAMPLE Subtract Fractions

3 **Find $\frac{11}{12} - \frac{5}{12}$. Write the difference in simplest form.**

Estimate $1 - \frac{1}{2} = \frac{1}{2}$

$$\frac{11}{12} - \frac{5}{12} = \frac{11-5}{12}$$

The denominators are the same. Subtract the numerators.

Answer: $= \frac{6}{12}$ or $\frac{1}{2}$ Simplify.

CHECK Your Progress

3 Find $\frac{17}{20} - \frac{11}{20}$. Write the difference in simplest form.

A. $1\frac{2}{5}$

B. $\frac{7}{10}$

C. $\frac{6}{20}$

D. $\frac{3}{10}$

0%

A B C D

CheckPoint

EXAMPLE Subtract Mixed Numbers

4 **Evaluate $r - q$ if $r = 7\frac{3}{5}$ and $q = 9\frac{1}{5}$. Estimate $8 - 9 = -1$**

$r - q = 7\frac{3}{5} - 9\frac{1}{5}$ Replace r with $7\frac{3}{5}$ and q with $9\frac{1}{5}$.

$= \frac{38}{5} - \frac{46}{5}$ Write the mixed numbers as improper fractions.

$= \frac{-8}{5}$ Subtract the numerators.

Answer: $= -1\frac{3}{5}$ Simplify.

CHECK Your Progress

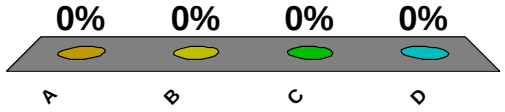
4 Evaluate $m - n$ if $m = 4\frac{7}{9}$ and $n = 8\frac{2}{9}$.

A. 13

B. $\frac{1}{9}$

C. $-3\frac{4}{9}$

D. $-4\frac{5}{9}$



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EXAMPLE Add Algebraic Fractions

5 Find $\frac{5}{2b} + \frac{3}{2b}$. Write the sum in simplest form.

$$\frac{5}{2b} + \frac{3}{2b} = \frac{5+3}{2b}$$ The denominators are the same. Add the numerators.

$$= \frac{8}{2b}$$ Add the numerators.

Answer: $= \frac{4}{b}$ Simplify.

CHECK Your Progress

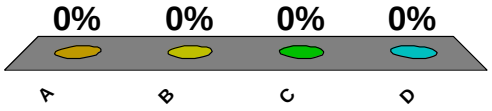
5 Find $\frac{3x}{16} + \frac{5x}{16}$. Write the sum in simplest form.

A. $\frac{x^2}{2}$

B. $\frac{x}{2}$

C. $\frac{x}{4}$

D. $-\frac{x}{8}$



End of the Lesson

Click the mouse button to return to the Chapter Menu.

Lesson Menu

Five-Minute Check (over Lesson 5-5)

Main Ideas and Vocabulary

Example 1: Find the LCM

Example 2: The LCM of Monomials

Example 3: Find the LCD

Example 4: Compare Fractions

Example 5: Order Rational Numbers

Main Ideas

- Find the least common multiple of two or more numbers.
- Find the least common denominator of two or more fractions.

New Vocabulary

- multiple
- common multiples
- least common multiple (LCM)
- least common denominator (LCD)

Concepts in MOtion
Interactive Lab:
Least Common Multiple
Click here to view!

EXAMPLE Find the LCM

1 **Find the LCM of 168 and 180.**

Number	Prime Factorization	Exponential Form
168	$2 \bullet 2 \bullet 2 \bullet 3 \bullet 7$	$2^3 \bullet 3 \bullet 7$
180	$2 \bullet 2 \bullet 3 \bullet 3 \bullet 5$	$2^2 \bullet 3^2 \bullet 5$

The prime factors of both numbers are 2, 3, 5, and 7. Multiply the greatest power of 2, 3, 5, and 7 appearing in either factorization.

$$\text{LCM} = 2^3 \bullet 3^2 \bullet 5 \bullet 7$$

$$= 2520$$

Answer: The LCM of 168 and 180 is 2520.

CHECK Your Progress

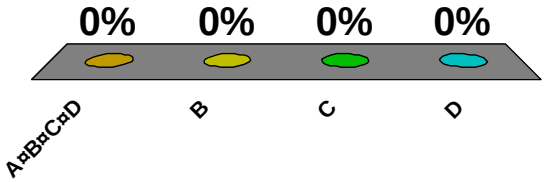
1 Find the LCM of 144 and 96.

A. 24

B. 144

C. 288

D. 13,824



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EXAMPLE The LCM of Monomials

2 **Find the LCM of $12x^2y^2$ and $6y^3$.**

$12x^2y^2 = 2^2 \cdot 3 \cdot x^2 \cdot y^2$ Find the prime factorization of each monomial.

$6y^3 = 2 \cdot 3 \cdot y^3$ Highlight the greatest power of each prime factor.

$\text{LCM} = 2^2 \cdot 3 \cdot x^2 \cdot y^3$ Multiply the greatest power of each prime factor.

$= 12x^2y^3$

Answer: The LCM of $12x^2y^2$ and $6y^3$ is $12x^2y^3$.

CHECK Your Progress

2 Find the LCM of $18ab^3$ and $24a^2b$.

A. $6ab$

B. $9a^2b^3$

C. $72a^2b^3$

D. $432a^3b^4$

0%

A B C D

CheckPoint

EXAMPLE Find the LCD

3 **Find the LCD of $\frac{7}{8}$ and $\frac{13}{20}$.**

$8 = 2^3$ Write the prime factorization of 8 and 20.

$20 = 2^2 \cdot 5$ Highlight the greatest power of each prime factor.

$\text{LCM} = 2^3 \cdot 5$ or 40 Multiply.

Answer: The LCD of $\frac{7}{8}$ and $\frac{13}{20}$ is 40.

CHECK Your Progress

3 Find the LCD of $\frac{5}{9}$ and $\frac{11}{12}$.

Answer: 36

EXAMPLE Compare Fractions

4 Replace • with $<$, $>$, or $=$ to make $\frac{7}{15} \bullet \frac{3}{7}$ a true statement.

The LCD of the fractions is 3 ● 5 ● 7 or 105. Rewrite the fractions using the LCD and then compare the numerators.

EXAMPLE Compare Fractions

4 $\frac{7}{15} = \frac{7 \cdot 7}{3 \cdot 5 \cdot 7} = \frac{49}{105}$ Multiply the fraction by $\frac{7}{7}$ to make the denominator 105.

$\frac{3}{7} = \frac{3 \cdot 3 \cdot 5}{7 \cdot 3 \cdot 5} = \frac{45}{105}$ Multiply the fraction by $\frac{3 \cdot 5}{3 \cdot 5}$ to make the denominator 105.

Answer: Since $\frac{49}{105} > \frac{45}{105}$, then $\frac{7}{15} > \frac{3}{7}$.

CHECK Your Progress

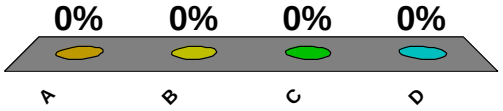
4 Replace • with $<$, $>$, or $=$ to make $\frac{5}{21} \bullet \frac{9}{14}$ a true statement.

A. $<$

B. $>$

C. $=$

D. none of the above



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Real-World EXAMPLE Order Rational Numbers

5 **FOOTBALL** Dane's football team usually practices for $2\frac{1}{2}$ hours. The table below shows how many hours from normal they practiced each day this week. Order the practices from shortest to longest.

Mon	Tues	Wed	Thurs
$-\frac{3}{8}$	$1\frac{3}{4}$	$-\frac{5}{6}$	$1\frac{2}{3}$

Real-World EXAMPLE Order Rational Numbers

5 **Step 1** Order the negative fractions first. The LCD of 6 and 8 is 24.

$$-\frac{5}{6} = -\frac{20}{24} \qquad -\frac{3}{8} = -\frac{9}{24}$$

Compare the negative fractions. Since $-\frac{20}{24} < -\frac{9}{24}$, then $-\frac{5}{6} < -\frac{3}{8}$.

Real-World EXAMPLE Order Rational Numbers

5 **Step 2** Order the positive fractions. The LCD of 3 and 4 is 12.

$$1\frac{2}{3} = 1\frac{8}{12} \qquad 1\frac{3}{4} = 1\frac{9}{12}$$

Compare the positive fractions. Since $1\frac{8}{12} < 1\frac{9}{12}$,

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

Answer: Since $-\frac{5}{6} < -\frac{3}{8} < 1\frac{2}{3} < 1\frac{3}{4}$, the order of the practices from shortest to longest is

Wednesday, Monday, Thursday, and Tuesday.

CHECK Your Progress

5 **WEATHER** The table shows the rainfall of four months compared to the overall yearly average of $3\frac{1}{5}$ inches of rainfall for Columbus, Ohio. Order the months from least rainfall to most rainfall.

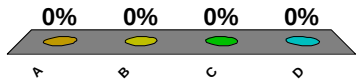
Month	Average Rainfall (inches)
Jan	$-\frac{7}{8}$
Apr	$-1\frac{3}{16}$
Jul	$-1\frac{7}{32}$
Oct	$-\frac{11}{16}$

A. Jul, Apr, Jan, Oct

B. Jan, Oct, Jul, Apr

C. Oct, Jan, Apr, Jul

D. Jan, Oct, Apr, Jul



End of the Lesson

Click the mouse button to return to the Chapter Menu.

Lesson Menu

Five-Minute Check (over Lesson 5-6)

Main Ideas

Key Concept: Adding Unlike Fractions

Example 1: Add Unlike Fractions

Example 2: Add Fractions and Mixed Numbers

Key Concept: Subtracting Unlike Fractions

Example 3: Subtract Fractions and Mixed Numbers

Example 4: Real-World Example

Main Ideas

- Add unlike fractions.
- Subtract unlike fractions.

KEY CONCEPT — Adding Unlike Fractions

Words To add fractions with unlike denominators, rename the fractions with a common denominator. Then add and simplify as with like fractions.

Example

$$\frac{1}{3} + \frac{2}{5} = \frac{1}{3} \cdot \frac{5}{5} + \frac{2}{5} \cdot \frac{3}{3}$$

$$= \frac{5}{15} + \frac{6}{15} \text{ or } \frac{11}{15}$$

EXAMPLE Add Unlike Fractions

1 Find $\frac{3}{4} + \frac{1}{7}$.

$$\frac{3}{4} + \frac{1}{7} = \frac{3}{4} \bullet \frac{7}{7} + \frac{1}{7} \bullet \frac{4}{4}$$

Use 4 ● 7 or 28 as the common denominator.

$$= \frac{21}{28} + \frac{4}{28}$$

Rename each fraction with the common denominator.

Answer: $= \frac{25}{28}$

Add the numerators.

CHECK Your Progress

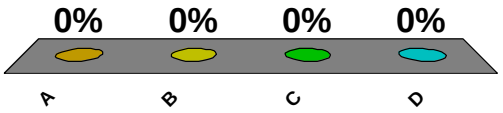
1 Find $\frac{2}{3} + \frac{1}{8}$.

A. $\frac{7}{11}$

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

C. $\frac{13}{24}$

D. $\frac{19}{24}$



EXAMPLE 2 Add Fractions and Mixed Numbers

A. Find $\frac{5}{6}+\left(-\frac{3}{10}\right)$. Write in simplest form.

Estimate: 1 + 0 = 1

$$\frac{5}{6}+\left(-\frac{3}{10}\right)=\frac{5}{6}\bullet\frac{5}{5}+\left(-\frac{3}{10}\right)\bullet\frac{3}{3}$$

The LCD is 2 • 3 • 5 or 30.

$$=\frac{25}{30}+\left(-\frac{9}{30}\right)$$

Rename each fraction with the LCD.

Answer: $=\frac{16}{30}$ or $\frac{8}{15}$

Compare to the estimate. Is the answer reasonable?

EXAMPLE 2 Add Fractions and Mixed Numbers

B. Find $2\frac{1}{8}+\left(-3\frac{2}{3}\right)$. Write in simplest form.

Estimate: $2+(-4)=-2$

$$2\frac{1}{8}+\left(-3\frac{2}{3}\right)=\frac{17}{8}+\left(-\frac{11}{3}\right)$$

Write the mixed numbers as improper fractions.

$$=\frac{17}{8}\cdot\frac{3}{3}+\left(-\frac{11}{3}\right)\frac{8}{8}$$

Rename fractions using the LCD, 24.

$$=\frac{51}{24}+\left(\frac{-88}{24}\right)$$

Simplify.

EXAMPLE Add Fractions and Mixed Numbers

2 **Answer :** $= \frac{-37}{24}$ or $-1\frac{13}{24}$

Compared to the estimate, the answer is reasonable.

CHECK Your Progress

2 **A.** Find $\frac{5}{12} + \frac{5}{9}$. Write in simplest form.

A. $1\frac{1}{24}$

B. $\frac{35}{36}$

C. $\frac{10}{21}$

D. $-\frac{5}{36}$

0%

A B C D

CHECK Your Progress

2 B. Find $4\frac{2}{5} + \left(-6\frac{2}{3}\right)$. Write in simplest form.

A. $11\frac{1}{15}$

B. $-2\frac{2}{15}$

C. $-2\frac{4}{15}$

D. $-2\frac{14}{15}$

0%

A B C D

CheckPoint

KEY CONCEPT — Subtracting Unlike Fractions

To subtract fractions with unlike denominators, rename the fractions with a common denominator. Then subtract and simplify as with like fractions.

EXAMPLE 3 Subtract Fractions and Mixed Numbers

A. Find $\frac{9}{16} - \frac{5}{8}$. Write in simplest form.

$$\frac{9}{16} - \frac{5}{8} = \frac{9}{16} - \frac{5}{8} \cdot \frac{2}{2}$$ The LCD is 16.

$$= \frac{9}{16} - \frac{10}{16}$$ Rename using the LCD.

Answer: $= -\frac{1}{16}$ Subtract.

EXAMPLE 3 Subtract Fractions and Mixed Numbers

B. Find $4\frac{2}{3} - 3\frac{6}{7}$. Write in simplest form.

$$4\frac{2}{3} - 3\frac{6}{7} = \frac{14}{3} - \frac{27}{7}$$ Write as improper fractions.

$$= \frac{14}{3} \cdot \frac{7}{7} - \frac{27}{7} \cdot \frac{3}{3}$$ Rename using the LCD.

$$= \frac{98}{21} - \frac{81}{21}$$ Simplify.

Answer: $= \frac{17}{21}$ Subtract.

CHECK Your Progress

3 **A.** Find $\frac{11}{12} - \frac{2}{9}$. Write in simplest form.

A. $\frac{2}{3}$

B. $\frac{25}{36}$

C. $1\frac{5}{36}$

D. 3

0%

A B C D

CHECK Your Progress

3 B. Find $3\frac{5}{6} - 2\frac{1}{8}$. Write in simplest form.

A. $1\frac{17}{24}$

B. $1\frac{13}{16}$

C. $2\frac{11}{24}$

D. $5\frac{23}{24}$

0%

A B C D

CheckPoint

Real-World EXAMPLE

4 JOGGING **Juyong jogged three days this week for a total of $11\frac{17}{20}$ miles. If she jogged $3\frac{1}{2}$ miles and $4\frac{1}{4}$ miles another, how many miles did she jog on the third day?**

Explore You know the total distance Juyong jogged and the distances on two days.

Plan Add the known distances and subtract that sum from $11\frac{17}{20}$. Estimate your answer.

$$11\frac{1}{2} - \left(3\frac{1}{2} + 4\right) = 4$$

Real-World EXAMPLE

4 Solve $3\frac{1}{2} + 4\frac{1}{4} = 3\frac{2}{4} + 4\frac{1}{4} = 7\frac{3}{4}$ Simplify.

Rename the fractions with LCD, 4.

$11\frac{17}{20} - 7\frac{3}{4} = 11\frac{17}{20} - 7\frac{15}{20}$ Rename $7\frac{3}{4}$ with the LCD, 20.

$= 4\frac{2}{20}$ or $4\frac{1}{10}$ Simplify.

Real-World EXAMPLE

4 **Answer :** Juyong jogged $4\frac{1}{10}$ miles on the third day.

Examine Since $4\frac{1}{10}$ is close to 4, the answer is reasonable.

CHECK Your Progress

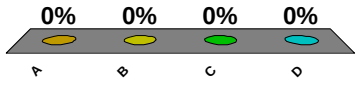
4 **GARDENING** Howard's tomato plants grew a total of $7\frac{11}{24}$ inches during the first three weeks after sprouting. If they grew $2\frac{1}{4}$ inches during the first week and $1\frac{7}{8}$ inches during the second week, how much did they grow during the third week after sprouting?

A. $3\frac{1}{3}$

B. $3\frac{19}{24}$

C. $4\frac{1}{8}$

D. $11\frac{7}{12}$



End of the Lesson

Click the mouse button to return to the Chapter Menu.

Lesson Menu

Five-Minute Check (over Lesson 5-7)

Main Idea

Example 1: Solve by Using Addition and Subtraction

Example 2: Solve by Using Division

Example 3: Solve by Using Multiplication

Example 4: Real-World Example

Main Idea

- Solve equations containing rational numbers.

EXAMPLE Solve by Using Addition and Subtraction

1 A. Solve $m + 8.6 = 11.2$.

$m + 8.6$	$=$	11.2	Write the equation.
$m + 8.6 - 8.6$	$=$	$11.2 - 8.6$	Subtract 8.6 from each side.
m	$=$	2.6	Simplify.

Answer: 2.6

EXAMPLE 1 Solve by Using Addition and Subtraction

B. Solve $y - \frac{3}{8} = \frac{3}{4}$. Check your solution.

$$y - \frac{3}{8} = \frac{3}{4}$$ Write the equation.

$$y - \frac{3}{8} + \frac{3}{8} = \frac{3}{4} + \frac{3}{8}$$ Add $\frac{3}{8}$ to each side.

$$y = \frac{6}{8} + \frac{3}{8}$$ Rename the fractions using the LCD and add.

Answer: $y = \frac{9}{8}$ or $1\frac{1}{8}$ Simplify.

CHECK Your Progress

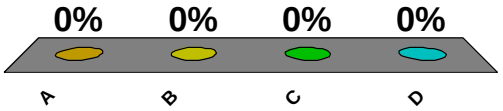
1 **A. Solve $4.2 = x - 9.5$**

A. –5.3

B. 1.37

C. 5.3

D. 13.7



CheckPoint

CHECK Your Progress

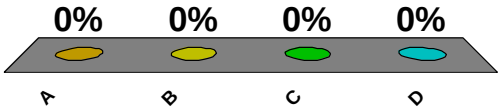
1 B. Solve $\frac{2}{3} = x - \frac{1}{2}$.

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

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

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

D. $1\frac{2}{5}$



EXAMPLE Solve by Using Division

2 **Solve $9a = 3.6$. Check your solution.**

$$9a = 3.6$$ Write the equation.

$$\frac{9a}{9} = \frac{3.6}{9}$$ Divide each side by 9.

Answer: $a = 0.4$ Simplify. Check the solution.

CHECK Your Progress

2 Solve $-6m = -4.8$. Check your solution.

A. –0.8

B. 0.8

C. 1.2

D. 28.8

0%

A B C D

CheckPoint

EXAMPLE Solve by Using Multiplication

3 Solve $\frac{-3}{5}t = -6$. Check your solution.

$$\frac{-3}{5}t = -6$$ Write the equation.

$$\frac{-5}{3}\left(\frac{-3}{5}t\right) = \frac{-5}{3}(-6)$$ Multiply each side by $\frac{-5}{3}$.

Answer: $t = \frac{30}{3}$ or 10 Simplify. Check the solution.

CHECK Your Progress

3 Solve $\frac{-5}{8}a = -10$. Check your solution.

A. -16

B. $-9\frac{3}{8}$

C. $6\frac{1}{4}$

D. 16

0%

A B C D

CheckPoint

Real-World EXAMPLE

4 **CEREAL** Torrey eats $\frac{5}{6}$ cup of cereal each morning and another $\frac{2}{3}$ cup as a snack after school. If one box of cereal contains 10 cups of cereal, how many days will the box last?

The amount of cereal that Torrey eats each day is

$$\frac{5}{6} + \frac{2}{3} = \frac{5}{6} + \frac{4}{6} = \frac{9}{6} \text{ or } 1\frac{1}{2} \text{ cups.}$$

Real-World EXAMPLE

4 **Words** $1\frac{1}{2}$ cups per day | times | the number of days | equals | 10 cups of cereal

Variable Let d = the number of days

Equation $1\frac{1}{2} \cdot d = 10$

$1\frac{1}{2} \cdot d = 10$ Write the equation.

$\frac{3}{2} \cdot d = 10$ Rename $1\frac{1}{2}$ as an improper fraction.

Real-World EXAMPLE

4

$$\frac{2}{3} \cdot d = 10 \cdot \frac{2}{3}$$ Multiply each side by $\frac{2}{3}$.

$$d = \frac{20}{3} \approx 6.67$$ Simplify.

Answer: The box of cereal will last approximately $6\frac{2}{3}$ days.

CHECK Your Progress

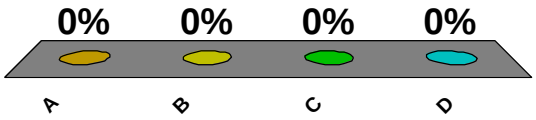
4 Each morning Michael buys a cappuccino for $4.50 and each afternoon he buys a regular coffee for $1.25. If he put aside $30 to buy coffee drinks, how many days will the money last?

A. 3 days

B. 5 days

C. 6 days

D. 9 days



End of the Lesson

Click the mouse button to return to the Chapter Menu.

Lesson Menu

Five-Minute Check (over Lesson 5-8)

Main Ideas and Vocabulary

Key Concept: Measures of Central Tendency

Example 1: Real-World Example

Concept Summary: Using Mean, Median, and Mode

Example 2: Choose an Appropriate Measure

Example 3: Real-World Example

Example 4: Standardized Test Example

Main Ideas

- Use the mean, median, and mode as measures of central tendency.
- Choose an appropriate measure of central tendency and recognize measures of statistics.

New Vocabulary

- measures of central tendency
- mean
- median
- mode

KEY CONCEPT — Measures of Central Tendency

mean	the sum of the data divided by the number of items in the data set
median	the middle number of the ordered data, or the mean of the middle two numbers
mode	the number or numbers that occur most often

Real-World EXAMPLE

1 **A. MOVIES** **The revenue of the 10 highest grossing movies as of 2004 are given in the table. Find the mean, median, and mode of the revenues.**

Top 10 Movie Revenues (millions of $)	
436	249
373	187
371	176
279	173
261	163

$$\text{mean} = \frac{\text{sum of revenues}}{\text{number of movies}}$$

$$= \frac{436 + 373 + 371 + \ldots + 163}{10}$$

$$= \frac{2668}{10} \text{ or } 266.8$$

Answer: The mean revenue is $266.8 million.

Real-World EXAMPLE

1 To find the median, order the numbers from least to greatest.

163, 173, 176, 187, 249, 261, 279, 371, 373, 436

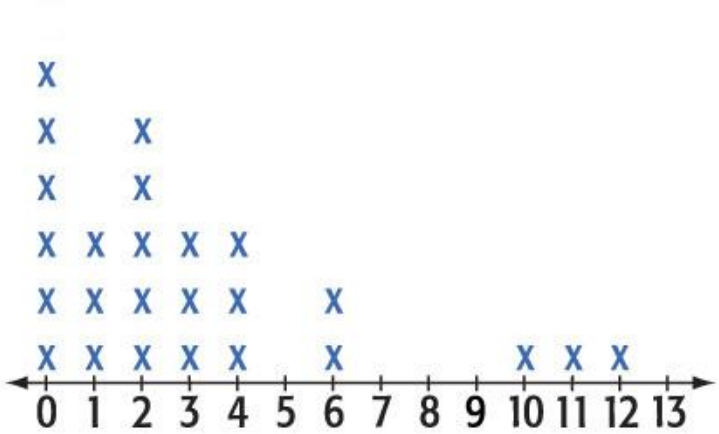
$$\frac{249 + 261}{2} = 255$$

There is an even number of items. Find the mean of the two middle numbers.

Answer: The median revenue is $255 million. There is no mode because each number in the set occurs once.

Real-World EXAMPLE

1 **B. OLYMPICS** The line plot shows the number of gold medals earned by each country that participated in the 2002 Winter Olympic games in Salt Lake City, Utah. Find the mean, median, and mode for the gold medals won.



$$\text{mean} = \frac{6(0)+3(1)+5(2)+3(3)+3(4)+2(6)+1(10)+1(11)+1(12)}{24} = 3.16$$

Answer: The mean is 3.16.

Real-World EXAMPLE

1 There are 24 numbers. The median number is the average of the 12^{th} and 13^{th} numbers.

Answer: The median is 2.

The number 0 occurs most frequently in the set of data.

Answer: The mode is 0.

CHECK Your Progress

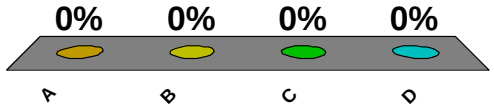
1 **A. TEST SCORES** The test scores for a class of nine students are 85, 93, 78, 99, 62, 83, 90, 75, 85. Find the mean, median, and mode of the test scores.

A. mean, 73.9; median, 85; mode, no mode

B. mean, 83.3; median, 85; mode, 85

C. mean, 750; median, 62; mode, 85

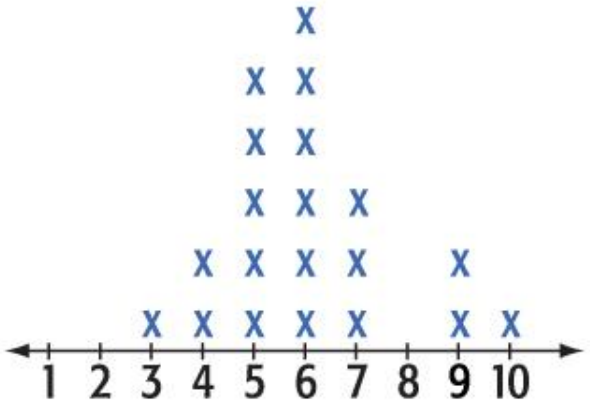
D. mean, 83.3; median, 62; mode, 85



CheckPoint

CHECK Your Progress

1 **B. FAMILIES** A survey of school-age children shows the family sized displayed in the line plot. Find the mean, median, and mode.

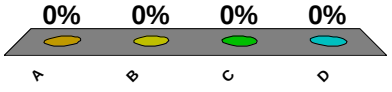


A. mean, 5.1; median, 5; mode, 3, 4, 5, 6, 8

B. mean, 102; median, 5; mode, 5

C. mean, 6.05; median, 6; mode, 6

D. mean, 4.3; median, 5.5; mode, 4.5



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CONCEPT SUMMARY — Using Mean, Median, and Mode

mean	• the data set has no *extreme values* (values that are much greater or much less than the rest of the data)
median	• the data set has extreme values • there are no big gaps in the middle of the data
mode	• the data set has many repeated numbers

Real-World EXAMPLE Choose an Appropriate Measure

2 **SURVEYS** **Eleanor took a poll in her class to see how many times her classmates had visited the local amusement park during summer vacation. What measure of central tendency best represents the data?**

The data is: 5, 0, 2, 3, 2, 4, 1, 2, 1, 3, 8, 2, 2, 0.

Since there is an extreme value of 8, the median would best represent the data.

0, 0, 1, 1, 2, 2, 2, 2, 2, 3, 3, 4, 5, 8

Answer: The median is 2. This is also the mode.

CHECK Your Progress

2 **BOWLING** Jenny's bowling scores are 146, 138, 140, 142, 139, 138, and 145. Which measure of central tendency best represents the data?

A. mean

B. median

C. mode

D. cannot be determined

0%

A B C D

CheckPoint

Real-World EXAMPLE

3 **QUIZ SCORES** **The quiz scores for students in a math class are 8, 7, 6, 10, 8, 8, 9, 8, 7, 9, 8, 0, and 10. Which measure of central tendency best represents the data? Then find the measure of central tendency.**

The data value 0 appears to be an extreme value. So, the median and mode would best represent the data.

0, 6, 7, 7, 8, 8, 8, 8, 8, 9, 9, 10, 10

Answer: The median and mode are 8.

Real-World EXAMPLE

3 **Check** You can check whether the median best represents the data by finding the mean with and without the extreme value.

mean with extreme value

$$\frac{\text{sum of values}}{\text{number of values}} = \frac{98}{13} \approx 7.5$$

mean without extreme value

$$\frac{\text{sum of values}}{\text{number of values}} = \frac{98}{12} \approx 8.2$$

The mean without the extreme value is closer to the median. The extreme value decreases the mean by about 0.7. Therefore, the median best represents the data.

CHECK Your Progress

3 **BIRTH WEIGHT** The birth weights of ten newborn babies are given in pounds: 7.3, 8.4, 9.1, 7.9, 8.8, 6.5, 7.9, 4.1, 8.0, 7.5. Tell which measure of central tendency best represents the data. Then find the measure of central tendency.

A. mean, 7.53

B. median, 7.9 0%

C. mode, 7.9

D. cannot be determined

A B C D

CheckPoint

Standardized Test EXAMPLE

4 **SALARIES** **The monthly salaries for the employees at Bob's Book Store are: $1290, $1400, $1400, $1600, $2650. Which measure of central tendency should Bob's Book Store's manager use to show new employees that the salaries are high?**

A mode

B median

C mean

D cannot be determined

Read the Test Item

To find which measure of central tendency to use, find the mean, median, and mode of the data and select the greatest measure.

Standardized Test EXAMPLE

4 **Solve the Test Item**

Mean: $\frac{\$1290 + \$1400 + \ldots + \$2650}{5} = \frac{\$8340}{5} = \$1668$

Mode: $1400

Median: $1290, $1400, $1400, $1600, $2650

Answer: The mean is the highest measure, so the answer is C.

CHECK Your Progress

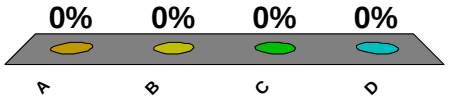
4 **EXERCISE** **The number of hours spent exercising each week by women are: 1, 6, 4, 2, 1, and 8. Which measure of central tendency should a person use to show that women do not spend enough time exercising?**

A. mode

B. median

C. mean

D. cannot be determined



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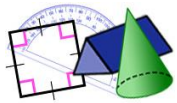
End of the Lesson

Click the mouse button to return to the Chapter Menu.

Chapter Resources Menu

CheckPoint [Five-Minute Checks]

 [Image Bank]

 [Math Tools]

Concepts in Motion

Animation [Whole Numbers]

Interactive Lab [Least Common Multiple]

Five-Minute CHECK

Lesson 5-1 (over Chapter 4)

Lesson 5-2 (over Lesson 5-1)

Lesson 5-3 (over Lesson 5-2)

Lesson 5-4 (over Lesson 5-3)

Lesson 5-5 (over Lesson 5-4)

Lesson 5-6 (over Lesson 5-5)

Lesson 5-7 (over Lesson 5-6)

Lesson 5-8 (over Lesson 5-7)

Lesson 5-9 (over Lesson 5-8)

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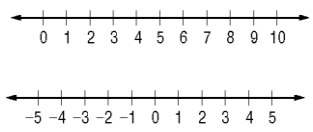
Image Bank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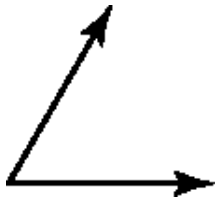

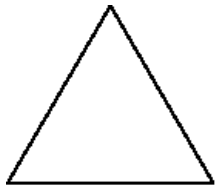

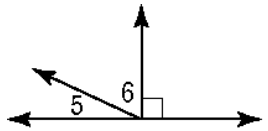
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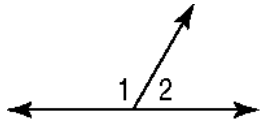
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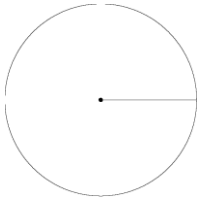

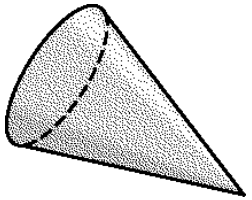

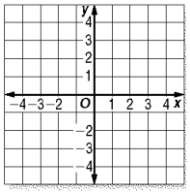
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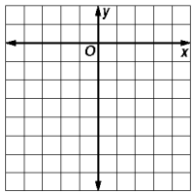
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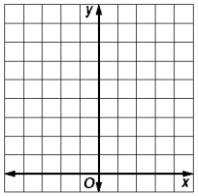
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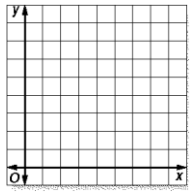
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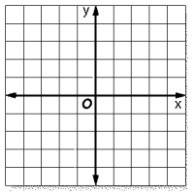
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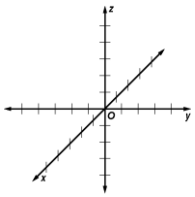
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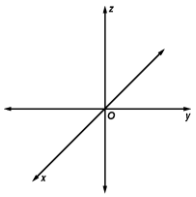
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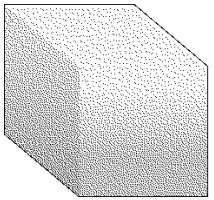

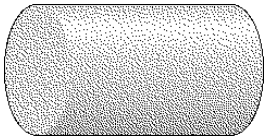

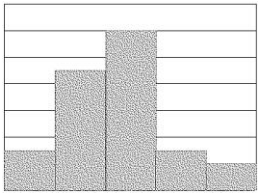

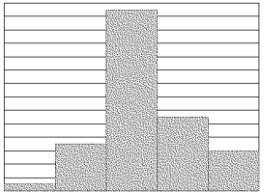

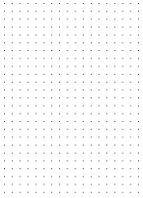

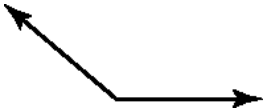

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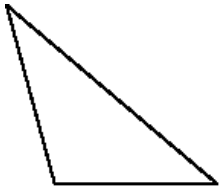
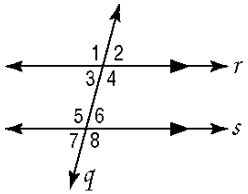
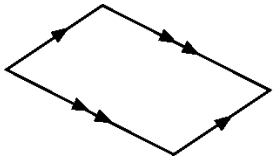
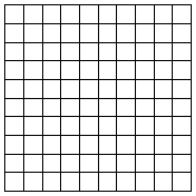
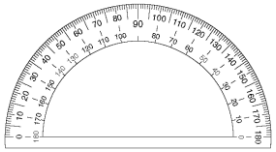
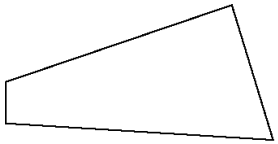


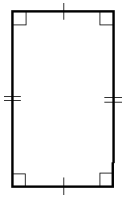


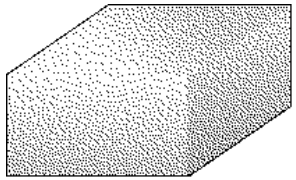


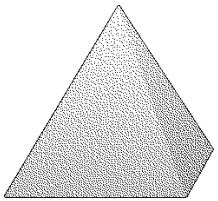


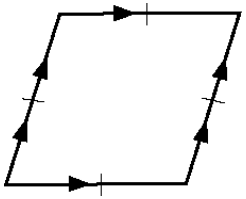


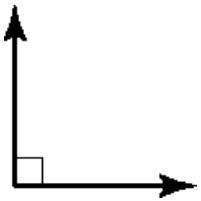


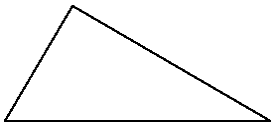


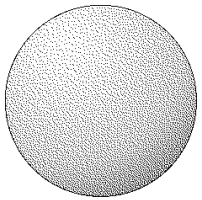


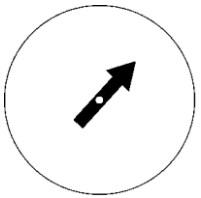


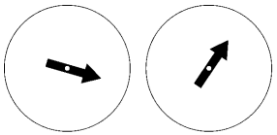


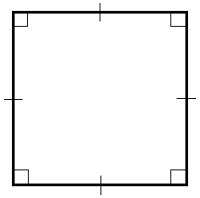












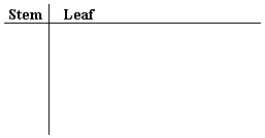
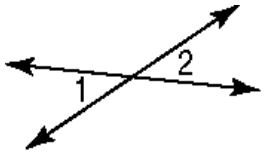
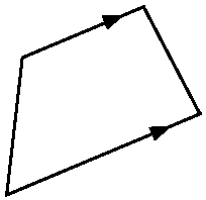
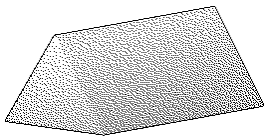
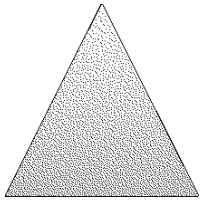


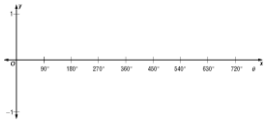
Image Bank

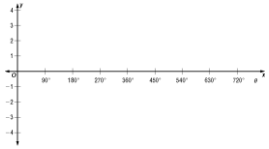


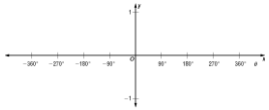


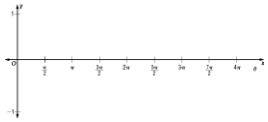


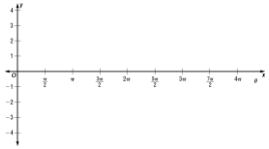












Concepts in Motion Animation

Five-Minute CHECK (over Chapter 4)

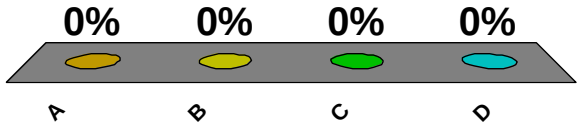
1 Find the GCF of the numbers 12 and 30.

A. 3

B. 6

C. 10

D. 60



CheckPoint

Five-Minute CHECK (over Chapter 4)

2 Find the GCF of the monomials $9a^3$ and $15ab$.

A. $45a^4b$

B. $3a^2b$

C. $5a^2$

D. $3a$

0%

A B C D

Five-Minute CHECK (over Chapter 4)

3 Find the product of $3^5 \bullet 3^4$ using positive exponents.

A. 3^9

B. 9^9

C. 3^{20}

D. 9^{20}

0%

A B C D

CheckPoint

Five-Minute CHECK (over Chapter 4)

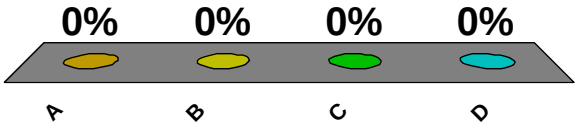
4 Find the product of $(5a^2)(-7a^3)$ using positive exponents.

A. $-35a^6$

B. $-35a^5$

C. $-2a^6$

D. $-2a^6$



CheckPoint

Five-Minute CHECK (over Chapter 4)

5 Find the quotient of $\frac{x^2}{x^6}$ using positive exponents.

A. x^4

B. x^{-4}

C. $\frac{1}{x^4}$

D. $\frac{1}{x^{-4}}$

0%

A B C D

CheckPoint

Five-Minute CHECK (over Chapter 4)

Standardized Test Practice

6 The population of the world is estimated to be 6,148,000,000 people. What is 6,148,000,000 expressed in scientific notation?

A. 6148×10^6 0%

B. 6148×10^9

C. 6.148×10^6

D. 6.148×10^9

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-1)

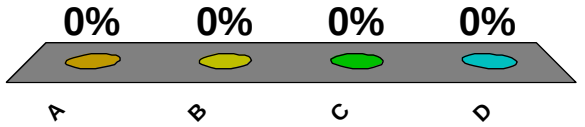
1 Write the fraction $-\frac{9}{20}$ as a decimal. Use … to show a repeating decimal.

A. –4.5

B. –2.22...

C. –0.45

D. –0.18



CheckPoint

Five-Minute CHECK (over Lesson 5-1)

2 Write the mixed number $2\frac{1}{8}$ as a decimal. Use … to show a repeating decimal.

A. 2.215

B. 2.125

C. 0.25

D. 0.125...

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-1)

3 Write the fraction $\frac{7}{9}$ as a decimal. Use … to show a repeating decimal.

A. 0.77...

B. 0.8

C. 1.2857...

D. 1.3

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-1)

4 Use <, >, or = to make $0.7 \_\_ \frac{2}{3}$ a true sentence.

A. <

B. >

C. =

0%

A B C

Five-Minute CHECK (over Lesson 5-1)

5 Use <, >, or = to make $2\frac{5}{6}$ __ 2.88… a true sentence.

A. <

B. >

C. =

0%

A B C

Five-Minute CHECK (over Lesson 5-1)

Standardized Test Practice

6 Which number is less than $5\frac{1}{4}$?

A. $5\frac{1}{3}$

B. $5\frac{1}{2}$

C. 5.22...

D. 5.44...

0%

A B C D

Five-Minute CHECK (over Lesson 5-2)

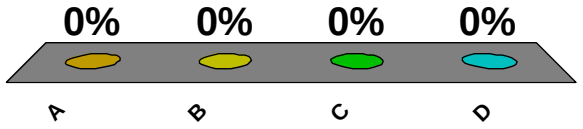
1 Write the number $-2\frac{3}{4}$ as an improper fraction.

A. $-\frac{11}{4}$

B. $-\frac{6}{4}$

C. $-\frac{5}{4}$

D. $-\frac{3}{4}$



CheckPoint

Five-Minute CHECK (over Lesson 5-2)

2 Write the number 29 as an improper fraction.

A. $\frac{1}{29}$

B. $\frac{29}{10}$

C. $\frac{100}{29}$

D. $\frac{29}{1}$

0%

A B C D

Five-Minute CHECK (over Lesson 5-2)

3 Write the decimal 0.6 as a fraction in simplest form.

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

B. $\frac{2}{5}$

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

D. $\frac{2}{3}$

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-2)

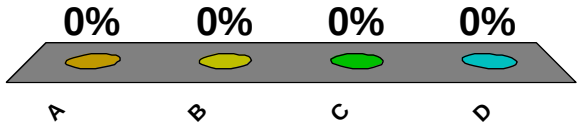
4 **Write the decimal 3.25 as a fraction or mixed number in simplest form.**

A. $\frac{13}{40}$

B. $\frac{4}{13}$

C. $3\frac{1}{13}$

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



CheckPoint

Five-Minute CHECK (over Lesson 5-2)

5 Write the decimal $0.\overline{3}$ as a fraction in simplest form.

A. $\frac{33}{10}$

B. $\frac{1}{3}$

C. $\frac{10}{3}$

D. $\frac{3}{10}$

0%

A B C D

Five-Minute CHECK (over Lesson 5-2)

Standardized Test Practice

6 **Which is not a rational number?**

A. $\frac{2}{7}$

B. 0.43

C. 2.3333...

D. π

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-3)

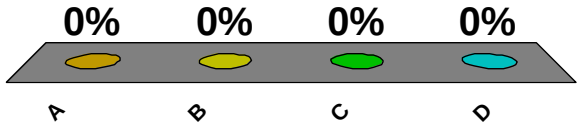
1 Find the product and write in simplest form. $\frac{5}{9} \cdot \frac{2}{3}$

A. $\frac{10}{27}$

B. $\frac{7}{12}$

C. $\frac{5}{6}$

D. $\frac{10}{3}$



CheckPoint

Five-Minute CHECK (over Lesson 5-3)

2 Find the product and write in simplest form. $\frac{3}{8} \cdot \frac{16}{21}$

A. $\frac{48}{168}$

B. $\frac{168}{48}$

C. $\frac{2}{7}$

D. $\frac{7}{2}$

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-3)

3 Find the product and write in simplest form. $\frac{9}{10} \cdot (-5)$

A. $\frac{45}{50}$

B. $\frac{2}{5}$

C. $-\frac{9}{50}$

D. $-4\frac{1}{2}$

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-3)

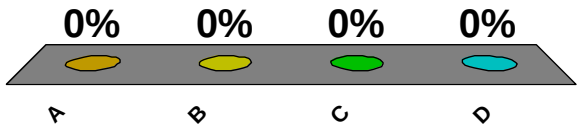
4 Find the product and write in simplest form. $\frac{2x}{3} \cdot \frac{4}{x}$

A. $\frac{x^2}{-6}$

B. $\frac{8}{3}x$

C. $2\frac{2}{3}$

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



CheckPoint

Five-Minute CHECK (over Lesson 5-3)

5 Find the product and write in simplest form. $\frac{5b}{a} \cdot \frac{6a^4}{c}$

A. $\frac{5bc}{6a^5}$

B. $\frac{3bc}{a^5}$

C. $\frac{11a^3b}{c}$

D. $\frac{30ba^3}{c}$

0%

A B C D

Five-Minute CHECK (over Lesson 5-3)

Standardized Test Practice

6 The product of $\frac{7}{8}$ and 2 is a number

A. less than 1.

B. between 1 and 2.

C. between 2 and 3.

D. greater than 3.

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-4)

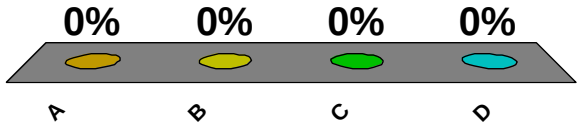
1 Find the multiplicative inverse of $\frac{5}{11}$.

A. $\frac{11}{5}$

B. $\frac{5}{11}$

C. $-\frac{11}{5}$

D. $-\frac{5}{11}$



CheckPoint

Five-Minute CHECK (over Lesson 5-4)

2 Find the quotient and write in simplest form. $\frac{1}{3} \div \frac{9}{10}$

A. $\frac{27}{10}$

B. $\frac{11}{12}$

C. $\frac{3}{10}$

D. $\frac{10}{27}$

0%

A B C D

Five-Minute CHECK (over Lesson 5-4)

3 Find the quotient and write in simplest form. $(-6) \div \frac{3}{8}$

A. 16

B. $\frac{4}{9}$

C. $-\frac{9}{4}$

D. –16

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-4)

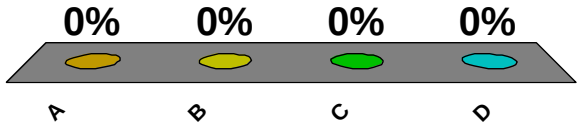
4 Find the quotient and write in simplest form. $\frac{y}{28} \div \frac{2y}{7}$

A. $\frac{y^2}{68}$

B. $\frac{7y}{30}$

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

D. $\frac{1}{2}$



CheckPoint

Five-Minute CHECK (over Lesson 5-4)

5 How many $\frac{1}{2}$-pound bags of potting soil can be filled from a 12-pound container of potting soil?

A. 48

B. 24

C. 12

D. 6

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-4)

Standardized Test Practice

6 What property of mathematics is shown in the problem $\frac{5}{6} \cdot \frac{6}{5} = 1$?

A. Distributive Property 0%

B. Multiplication Property of Equality

C. Inverse Property of Multiplication

D. Associative Property

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-5)

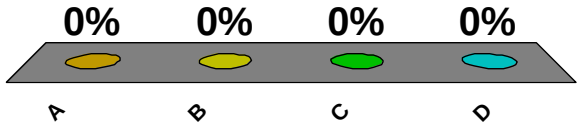
1 Find the difference and write in simplest form. $\frac{4}{5} - \frac{1}{5}$

A. $-\frac{1}{5}$

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

C. $\frac{9}{5}$

D. $\frac{19}{5}$



CheckPoint

Five-Minute CHECK (over Lesson 5-5)

2 Find the sum and write in simplest form. $2\frac{3}{8} + 1\frac{3}{8}$

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

B. $1\frac{1}{4}$

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

D. $3\frac{3}{4}$

0%

A B C D

Five-Minute CHECK (over Lesson 5-5)

3 Find the difference and write in simplest form.

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

A. 6

B. 3

C. $2\frac{2}{3}$

D. $1\frac{1}{2}$

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-5)

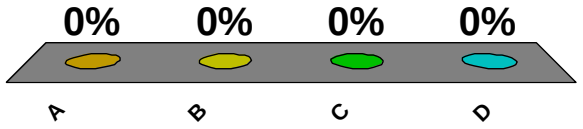
4 Find the sum and write in simplest form. $\frac{a}{12} + \frac{2a}{12}$

A. $\frac{a}{12}$

B. $\frac{a}{4}$

C. $\frac{7a}{6}$

D. $\frac{23a}{12}$



CheckPoint

Five-Minute CHECK (over Lesson 5-5)

5 Find the difference and write in simplest form.

$$\frac{6}{y} - \frac{1}{y}, y \neq 0$$

A. $\frac{5}{y}$

B. $\frac{6-y}{y}$

C. $\frac{6y-1}{y}$

D. $6y - y$

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-5)

Standardized Test Practice

6 What is the value of $2\frac{1}{3} + 5\frac{2}{3} - 3\frac{1}{3}$?

A. $11\frac{1}{3}$

B. $10\frac{2}{3}$

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

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

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-6)

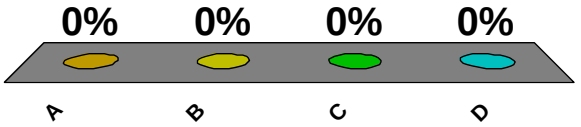
1 Find the least common multiple (LCM) of 8 and 20.

A. 160

B. 40

C. 8

D. 4



CheckPoint

Five-Minute CHECK (over Lesson 5-6)

2 **Find the least common multiple (LCM) of 6, 12, and 15.**

A. 3

B. 6

C. 30

D. 60

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-6)

3 Find the least common multiple (LCM) of $9d$ and $12d$.

A. $3d$

B. $36d$

C. $3d^2$

D. $36d^2$

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-6)

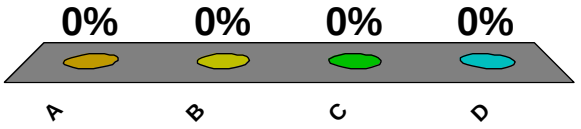
4 Find the least common multiple (LCM) of $6a^2$ and $8ab$.

A. $24a^2b$

B. $48a^3b$

C. $12ab$

D. $2a$



CheckPoint

Five-Minute CHECK (over Lesson 5-6)

5 Use <, >, or = to make $\frac{12}{19} \_\_ \frac{36}{57}$ a true statement.

A. <

B. >

C. =

0%

A B C

Five-Minute CHECK (over Lesson 5-6)

Standardized Test Practice

6 **Which of the following size buttons is the smallest?**

A. $\frac{1}{2}$ inch

B. $\frac{1}{4}$ inch

C. $\frac{3}{8}$ inch

D. $\frac{5}{16}$ inch

0%

A B C D

Five-Minute CHECK (over Lesson 5-7)

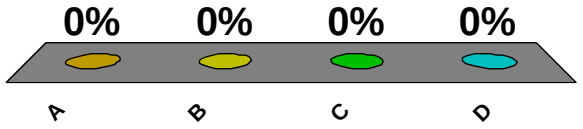
1 Find the sum and write in simplest form. $\frac{7}{15} + \frac{1}{3}$

A. $\frac{2}{15}$

B. $\frac{8}{15}$

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

D. $\frac{4}{5}$



CheckPoint

Five-Minute CHECK (over Lesson 5-7)

2 Find the difference and write in simplest form. $\frac{3}{4} - \frac{11}{12}$

A. $-\frac{1}{6}$

B. $-\frac{2}{3}$

C. $-\frac{5}{6}$

D. $-\frac{5}{2}$

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-7)

3 Find the sum and write in simplest form. $6\frac{1}{4}+3\frac{5}{6}$

A. $2\frac{1}{12}$

B. $2\frac{5}{12}$

C. $5\frac{1}{12}$

D. $10\frac{1}{12}$

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-7)

4 Find the difference and write in simplest form.

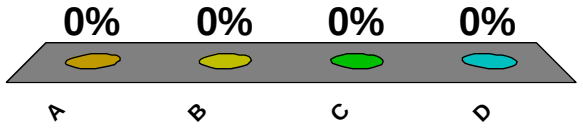
$$1\frac{9}{10} - \frac{2}{5}$$

A. $2\frac{3}{10}$

B. $1\frac{3}{5}$

C. $1\frac{1}{2}$

D. $\frac{1}{2}$



CheckPoint

Five-Minute CHECK (over Lesson 5-7)

5 A candy shop had $9\frac{3}{4}$ pounds of fancy chocolates, but sold $2\frac{1}{2}$ pounds to a customer. How many pounds of the chocolates were left?

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

B. $7\frac{1}{2}$

C. $12\frac{1}{4}$

D. $24\frac{3}{8}$

0%

A B C D

Five-Minute CHECK (over Lesson 5-7)

Standardized Test Practice

6 Choose the best estimate for $2\frac{4}{9} + 5\frac{7}{12}$.

A. 7

B. 8

C. 9

D. 10

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-8)

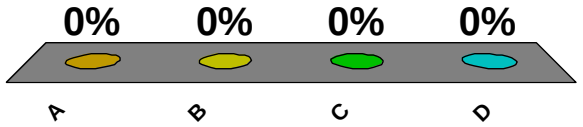
1 Solve $n + 6.3 = 11.2$.

A. 1.77

B. 4.9

C. 5.1

D. 17.5



CheckPoint

Five-Minute CHECK (over Lesson 5-8)

2 Solve $9.4 = w - 9.4$.

A. –1

B. 0

C. 1

D. 18.8

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-8)

3 Solve $k - \frac{3}{4} = -\frac{2}{3}$.

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

B. $\frac{1}{12}$

C. $-\frac{1}{12}$

D. $-\frac{17}{12}$

0%

A B C D

CheckPoint

Five-Minute CHECK (over Lesson 5-8)

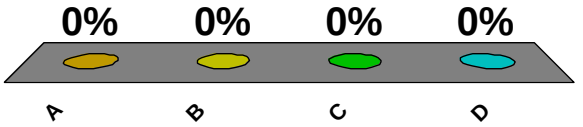
4 Solve $-0.5a = 20$.

A. $-\frac{1}{10}$

B. $-\frac{2}{5}$

C. –10

D. –40



CheckPoint

Five-Minute CHECK (over Lesson 5-8)

5 Solve $\frac{5}{6} = \frac{1}{9}c$.

A. $10\frac{4}{5}$

B. $7\frac{1}{2}$

C. $\frac{13}{18}$

D. $\frac{5}{54}$

0%

A B C D

Five-Minute CHECK (over Lesson 5-8)

Standardized Test Practice

6 **What is the length of the rectangular mat shown in the figure?**

$\frac{5}{8}$ yd

Area = 2 yd^2

A. $1\frac{1}{4}$ yd

B. $\frac{5}{16}$ yd

C. $3\frac{1}{5}$ yd

D. $1\frac{3}{8}$ yd

0%

A B C D

CheckPoint