CHAPTER 6 ALGEBRA

DECIMALS AND FRACTIONS

This lesson introduces the basics of decimals and fractions. It also demonstrates changing decimals to fractions, changing fractions to decimals, and converting between fractions, decimals, and percentages.

Introduction to Fractions

A fraction represents part of a whole number. The top number of a fraction is the **numerator**, and the bottom number of a fraction is the **denominator.** The numerator is smaller than the denominator for a **proper fraction.** The numerator is larger than the denominator for an **improper fraction.**

Proper Fractions	Improper Fractions
$\frac{2}{5}$	$\frac{5}{2}$
$\frac{7}{12}$	$\frac{12}{7}$
$\frac{19}{20}$	$\frac{20}{19}$

KEEP IN MIND

When comparing fractions, the denominators of the fractions must be the same.

An improper fraction can be changed to a **mixed number**. A mixed number is a whole number and a proper fraction. To write an improper fraction as a mixed number, divide the denominator into the numerator. The result is the whole number. The remainder is the numerator of the proper fraction, and the value of the denominator does not change. For example, $\frac{5}{2}$ is $2\frac{1}{2}$ because 2 goes into 5 twice with a remainder of 1. To write an improper fraction as a mixed number, multiply the whole number by the denominator and add the result to the numerator. The results become the new numerator. For example, $2\frac{1}{2}$ is $\frac{5}{2}$ because 2 times 2 plus 1 is 5 for the new numerator.

When comparing fractions, the denominators must be the same. Then, look at the numerator to determine which fraction is larger. If the fractions have different denominators, then a **least common denominator** must be found. This number is the smallest number that can be divided evenly into the denominators of all fractions being compared.

To determine the largest fraction from the group $\frac{1}{3}, \frac{3}{5}, \frac{2}{3}, \frac{2}{5}$, the first step is to find a common denominator. In this case, the least common denominator is 15 because 3 times 5 and 5 times 3 is 15. The second step is to convert the fractions to a denominator of 15. The fractions with a denominator of 3 have the numerator and denominator multiplied by 5, and the fractions with a denominator of 5 have the numerator and denominator multiplied by 3, as shown below:

$\frac{1}{3} \times \frac{5}{5} = \frac{5}{15}$, $\frac{3}{5} \times \frac{3}{3} = \frac{9}{15}$, $\frac{2}{3} \times \frac{5}{5} = \frac{10}{15}$, $\frac{2}{5} \times \frac{3}{3} = \frac{6}{15}$

Now, the numerators can be compared. The largest fraction is $\frac{2}{3}$ because it has a numerator of 10 after finding the common denominator.

Examples

1. **Which fraction is the least?**

   A. $\frac{3}{5}$ B. $\frac{3}{4}$ C. $\frac{1}{5}$ D. $\frac{1}{4}$

   The correct answer is **C.** The correct solution is $\frac{1}{5}$ because it has the smallest numerator compared to the other fractions with the same denominator. The fractions with a common denominator of 20 are $\frac{3}{5} = \frac{12}{20}, \frac{3}{4} = \frac{15}{20}, \frac{1}{5} = \frac{4}{20}, \frac{1}{4} = \frac{5}{20}$.

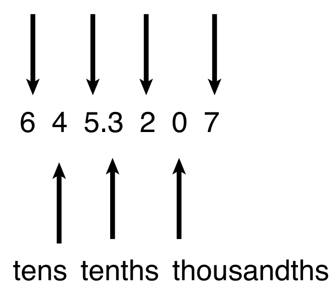
2. **Which fraction is the greatest?**

   A. $\frac{5}{6}$ B. $\frac{1}{2}$ C. $\frac{2}{3}$ D. $\frac{1}{6}$

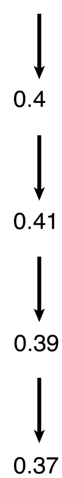
   The correct answer is **A.** The correct solution is $\frac{5}{6}$ because it has the largest numerator compared to the other fractions with the same denominator. The fractions with a common denominator of 6 are $\frac{5}{6} = \frac{5}{6}, \frac{1}{2} = \frac{3}{6}, \frac{2}{3} = \frac{4}{6}, \frac{1}{6} = \frac{1}{6}$.

Introduction to Decimals

A **decimal** is a number that expresses part of a whole. Decimals show a portion of a number after a decimal point. Each number to the left and right of the decimal point has a specific place value. Identify the place values for 645.3207.



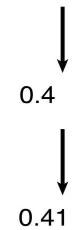
When comparing decimals, compare the numbers in the same place value. For example, determine the greatest decimal from the group 0.4, 0.41, 0.39, and 0.37. In these numbers, there is a value to the right of the decimal point. Comparing the tenths places, the numbers with 4 tenths (0.4 and 0.41) are greater than the numbers with three tenths (0.39 and 0.37).



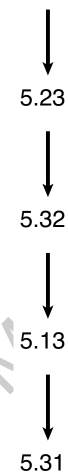
KEEP IN MIND

When comparing decimals, compare the place value where the numbers are different.

Then, compare the hundredths in the 4 tenths numbers. The value of 0.41 is greater because there is a 1 in the hundredths place versus a 0 in the hundredths place.



Here is another example: determine the least decimal of the group 5.23, 5.32, 5.13, and 5.31. In this group, the ones value is 5 for all numbers. Then, comparing the tenths values, 5.13 is the smallest number because it is the only value with 1 tenth.



Examples

1. **Which decimal is the greatest?**

   A. 0.07 B. 0.007 C. 0.7 D. 0.0007

   The correct answer is **C.** The solution is 0.7 because it has the largest place value in the tenths.

2. **Which decimal is the least?**

   A. 0.0413 B. 0.0713 C. 0.0513 D. 0.0613

   The correct answer is **A.** The correct solution is 0.0413 because it has the smallest place value in the hundredths place.

Changing Decimals and Fractions

Three steps change a decimal to a fraction.

STEP BY STEP

Step 1. Write the decimal divided by 1 with the decimal as the numerator and 1 as the denominator.

Step 2. Multiply the numerator and denominator by 10 for every number after the decimal point. (For example, if there is 1 decimal place, multiply by 10. If there are 2 decimal places, multiply by 100).

Step 3. Reduce the fraction completely.

To change the decimal 0.37 to a fraction, start by writing the decimal as a fraction with a denominator of one, $\frac{0.37}{1}$. Because there are two decimal places, multiply the numerator and denominator by 100, $\frac{0.37 \times 100}{1 \times 100} = \frac{37}{100}$. The fraction does not reduce, so $\frac{37}{100}$ is 0.37 in fraction form.

Similarly, to change the decimal 2.4 to a fraction start by writing the decimal as a fraction with a denominator of one, $\frac{0.4}{1}$, and ignore the whole number. Because there is one decimal place, multiply the numerator and denominator by 10, $\frac{0.4 \times 10}{1 \times 10} = \frac{4}{10}$. The fraction does reduce: $2\frac{4}{10} = 2\frac{2}{5}$ is 2.4 in fraction form.

The decimal $0.\overline{3}$ as a fraction is $\frac{0.\overline{3}}{1}$. In the case of a repeating decimal, let $n = 0.\overline{3}$ *and* $10 = 3.\overline{3}$. Then, $10n - n = 3.\overline{3} - 0.\overline{3}$, resulting in $9n = 3$ and solution of $n = \frac{3}{9} = \frac{1}{3}$. The decimal $0.\overline{3}$ is $\frac{1}{3}$ as a fraction.

Examples

1. Change 0.38 to a fraction. Simplify completely.

A. $\frac{3}{10}$ B. $\frac{9}{25}$ C. $\frac{19}{50}$ D. $\frac{2}{5}$

The correct answer is **C.** The correct solution is $\frac{19}{50}$ because $\frac{0.38}{1} = \frac{38}{100} = \frac{19}{50}$.

2. Change $1.\overline{1}$ to a fraction. Simplify completely.

A. $1\frac{1}{11}$ B. $1\frac{1}{9}$ C. $1\frac{1}{6}$ D. $1\frac{1}{3}$

The correct answer is **B.** The correct solution is $1\frac{1}{9}$. Let $n = 1.\overline{1}$ and $10n = 11.\overline{1}$. Then, $10n - n = 11.\overline{1} - 1.\overline{1}$, resulting in $9n = 10$ and solution of $n = \frac{10}{9} = 1\frac{1}{9}$.

Two steps change a fraction to a decimal.

> **STEP BY STEP**
>
> **Step 1.** Divide the denominator by the numerator. Add zeros after the decimal point as needed.
>
> **Step 2.** Complete the process when there is no remainder or the decimal is repeating.

To convert $\frac{1}{5}$ to a decimal, rewrite $\frac{1}{5}$ as a long division problem and add zeros after the decimal point, $1.0 \div 5$. Complete the long division and $\frac{1}{5}$ as a decimal is 0.2. The division is complete because there is no remainder.

To convert $\frac{8}{9}$ to a decimal, rewrite $\frac{8}{9}$ as a long division problem and add zeros after the decimal point, $8.00 \div 9$. Complete the long division, and $\frac{8}{9}$ as a decimal is $0.\overline{8}$. The process is complete because the decimal is complete.

To rewrite the mixed number $2\frac{3}{4}$ as a decimal, the fraction needs changed to a decimal. Rewrite $\frac{3}{4}$ as a long division problem and add zeros after the decimal point, $3.00 \div 4$. The whole number is needed for the answer and is not included in the long division. Complete the long division, and $2\frac{3}{4}$ as a decimal is 2.75.

Examples

1. Change $\frac{9}{10}$ to a decimal. Simplify completely.

A. 0.75 B. 0.8 C. 0.85 D. 0.9

The correct answer is **D.** The correct answer is 0.9 because $\frac{9}{10} = 9.0 \div 10 = 0.9$.

2. Change $\frac{5}{6}$ to a decimal. Simplify completely.

A. 0.73 B. $0.7\overline{6}$ C. $0.8\overline{3}$ D. 0.86

The correct answer is **C.** The correct answer is $0.8\overline{3}$ because $\frac{5}{6} = 5.000 \div 6 = 0.8\overline{3}$.

Convert among Fractions, Decimals, and Percentages

Fractions, decimals, and percentages can change forms, but they are equivalent values.

There are two ways to change a decimal to a percent. One way is to multiply the decimal by 100 and add a percent sign. 0.24 as a percent is 24%.

Another way is to move the decimal point two places to the right. The decimal 0.635 is 63.5% as a percent when moving the decimal point two places to the right.

Any decimal, including repeating decimals, can change to a percent. $0.\overline{3}$ as a percent is $0.\overline{3} \times 100 = 33.\overline{3}\%$.

Example

Write 0.345 as a percent.

A. 3.45% B. 34.5% C. 345% D. 3450%

The correct answer is **B.** The correct answer is 34.5% because 0.345 as a percent is 34.5%.

There are two ways to change a percent to a decimal. One way is to remove the percent sign and divide the decimal by 100. For example, 73% as a decimal is 0.73.

Another way is to move the decimal point two places to the left. For example, 27.8% is 0.278 as a decimal when moving the decimal point two places to the left.

Any percent, including repeating percents, can change to a decimal. For example, $44.\overline{4}\%$ as a decimal is $44.\overline{4} \div 100 = 0.\overline{4}$.

Example

Write 131% as a decimal.

A. 0.131 B. 1.31 C. 13.1 D. 131

The correct answer is **B.** The correct answer is 1.31 because 131% as a decimal is 131 ÷ 100 = 1.31.

Two steps change a fraction to a percent.

STEP BY STEP

Step 1. Divide the numerator and denominator.

Step 2. Multiply by 100 and add a percent sign.

To change the fraction $\frac{3}{5}$ to a decimal, perform long division to get 0.6. Then, multiply 0.6 by 100 and $\frac{3}{5}$ is the same as 60%.

To change the fraction $\frac{7}{8}$ to a decimal, perform long division to get 0.875. Then, multiply 0.875 by 100 and $\frac{7}{8}$ is the same as 87.5%.

Fractions that are repeating decimals can also be converted to a percent. To change the fraction $\frac{2}{3}$ to a decimal, perform long division to get $0.\overline{6}$. Then, multiply $0.\overline{6}$ by 100 and the percent is $66.\overline{6}\%$.

Example

Write $2\frac{1}{8}$ as a percent.

A. 21.2% B. 21.25% C. 212% D. 212.5%

The correct answer is **D.** The correct answer is 212.5% because $2\frac{1}{8}$ as a percent is 2.125 x 100 = 212.5%.

Two steps change a percent to a fraction.

STEP BY STEP

Step 1. Remove the percent sign and write the value as the numerator with a denominator of 100.

Step 2. Simplify the fraction.

Remove the percent sign from 45% and write as a fraction with a denominator of 100, $\frac{45}{100}$. The fraction reduces to $\frac{9}{20}$.

Remove the percent sign from 22.8% and write as a fraction with a denominator of 100, $\frac{22.8}{100}$. The fraction reduces to $\frac{228}{1000} = \frac{57}{250}$.

Repeating percentages can change to a fraction. Remove the percent sign from $16.\overline{6}\%$ and write as a fraction with a denominator of 100, $\frac{16.\overline{6}}{100}$. The fraction simplifies to $\frac{0.1\overline{6}}{1} = \frac{1}{6}$.

Example

Write 72% as a fraction.

A. $\frac{27}{50}$ B. $\frac{7}{10}$ C. $\frac{18}{25}$ D. $\frac{3}{4}$

The correct answer is **C.** The correct answer is $\frac{18}{25}$ because 72% as a fraction is $\frac{72}{100} = \frac{18}{25}$.

Let's Review!

- A fraction is a number with a numerator and a denominator. A fraction can be written as a proper fraction, an improper fraction, or a mixed number. Changing fractions to a common denominator enables you to determine the least or greatest fraction in a group of fractions.
- A decimal is a number that expresses part of a whole. By comparing the same place values, you can find the least or greatest decimal in a group of decimals.
- A number can be written as a fraction, a decimal, and a percent. These are equivalent values. Numbers can be converted between fractions, decimals, and percents by following a series of steps.

MULTIPLICATION AND DIVISION OF FRACTIONS

This lesson introduces how to multiply and divide fractions.

Multiplying a Fraction by a Fraction

The multiplication of fractions does not require changing any denominators like adding and subtracting fractions do. To multiply a fraction by a fraction, multiply the numerators together and multiply the denominators together. For example, $\frac{2}{3} \times \frac{4}{5}$ is $\frac{2 \times 4}{3 \times 5}$, which is $\frac{8}{15}$.

Sometimes, the final solution reduces. For example, $\frac{3}{5} \times \frac{1}{9} = \frac{3 \times 1}{5 \times 9} = \frac{3}{45}$. The fraction $\frac{3}{45}$ reduces to $\frac{1}{15}$.

Simplifying fractions can occur before completing the multiplication. In the previous problem, the numerator of 3 can be simplified with the denominator of 9: $\frac{13}{5} \times \frac{1}{39} = \frac{1}{15}$. This method of simplifying only occurs with the multiplication of fractions.

KEEP IN MIND
The product of multiplying a fraction by a fraction is always less than 1.

Examples

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

   A. $\frac{1}{4}$ B. $\frac{1}{2}$ C. $\frac{3}{8}$ D. $\frac{2}{3}$

   The correct answer is **C.** The correct solution is $\frac{3}{8}$ because $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$.

2. **Multiply $\frac{2}{3} \times \frac{5}{6}$.**

   A. $\frac{1}{9}$ B. $\frac{5}{18}$ C. $\frac{5}{9}$ D. $\frac{7}{18}$

   The correct answer is **C.** The correct solution is $\frac{5}{9}$ because $\frac{2}{3} \times \frac{5}{6} = \frac{10}{18} = \frac{5}{9}$.

Multiply a Fraction by a Whole or Mixed Number

Multiplying a fraction by a whole or mixed number is similar to multiplying two fractions. When multiplying by a whole number, change the whole number to a fraction with a denominator of 1. Next, multiply the numerators together and the denominators together. Rewrite the final answer as a mixed number. For example: $\frac{9}{10} \times 3 = \frac{9}{10} \times \frac{3}{1} = \frac{27}{10} = 2\frac{7}{10}$.

When multiplying a fraction by a mixed number or multiplying two mixed numbers, the process is similar.

KEEP IN MIND
Always change a mixed number to an improper fraction when multiplying by a mixed number.

For example, multiply $\frac{10}{11} \times 3\frac{1}{2}$. Change the mixed number to an improper fraction, $\frac{10}{11} \times \frac{7}{2}$. Multiply the numerators together and multiply the denominators together, $\frac{70}{22}$. Write the improper fraction as a mixed number, $3\frac{4}{22}$. Reduce if necessary, $3\frac{2}{11}$.

This process can also be used when multiplying a whole number by a mixed number or multiplying two mixed numbers.

Examples

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

   A. $\frac{5}{24}$ B. $2\frac{3}{4}$ C. $3\frac{1}{3}$ D. $4\frac{5}{6}$

   The correct answer is **C.** The correct solution is $3\frac{1}{3}$ because $\frac{4}{1} \times \frac{5}{6} = \frac{20}{6} = 3\frac{2}{6} = 3\frac{1}{3}$.

2. **Multiply $1\frac{1}{2} \times 1\frac{1}{6}$.**

   A. $1\frac{1}{12}$ B. $1\frac{1}{4}$ C. $1\frac{3}{8}$ D. $1\frac{3}{4}$

   The correct answer is **D.** The correct solution is $1\frac{3}{4}$ because $\frac{3}{2} \times \frac{7}{6} = \frac{21}{12} = 1\frac{9}{12} = 1\frac{3}{4}$.

Dividing a Fraction by a Fraction

Some basic steps apply when dividing a fraction by a fraction. The information from the previous two sections is applicable to dividing fractions.

STEP BY STEP

Step 1. Leave the first fraction alone.

Step 2. Find the reciprocal of the second fraction.

Step 3. Multiply the first fraction by the reciprocal of the second fraction.

Step 4. Rewrite the fraction as a mixed number and reduce the fraction completely.

Divide, $\frac{3}{10} \div \frac{1}{2}$. Find the reciprocal of the second fraction, which is $\frac{2}{1}$.

Now, multiply the fractions, $\frac{3}{10} \times \frac{2}{1} = \frac{6}{10}$. Reduce $\frac{6}{10}$ to $\frac{3}{5}$.

Divide, $\frac{4}{5} \div \frac{3}{8}$. Find the reciprocal of the second fraction, which is $\frac{8}{3}$.

Now, multiply the fractions, $\frac{4}{5} \times \frac{8}{3} = \frac{32}{15}$. Rewrite the fraction as a mixed number, $\frac{32}{15} = 2\frac{2}{15}$.

Examples

1. **Divide $\frac{1}{2} \div \frac{5}{6}$.**

   A. $\frac{5}{12}$ B. $\frac{3}{5}$ C. $\frac{5}{6}$ D. $1\frac{2}{3}$

   The correct answer is **B.** The correct solution is $\frac{3}{5}$ because $\frac{1}{2} \times \frac{6}{5} = \frac{6}{10} = \frac{3}{5}$.

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

A. $\frac{2}{15}$ B. $\frac{2}{5}$ C. $1\frac{1}{15}$ D. $1\frac{1}{9}$

The correct answer is **D.** The correct solution is $1\frac{1}{9}$ because $\frac{2}{3} \times \frac{5}{3} = \frac{10}{9} = 1\frac{1}{9}$.

Dividing a Fraction and a Whole or Mixed Number

Some basic steps apply when dividing a fraction by a whole number or a mixed number.

STEP BY STEP

Step 1. Write any whole number as a fraction with a denominator of 1. Write any mixed numbers as improper fractions.

Step 2. Leave the first fraction (improper fraction) alone.

Step 3. Find the reciprocal of the second fraction.

Step 4. Multiply the first fraction by the reciprocal of the second fraction.

Step 5. Rewrite the fraction as a mixed number and reduce the fraction completely.

Divide, $\frac{3}{10} \div 3$. Rewrite the expression as $\frac{3}{10} \div \frac{3}{1}$. Find the reciprocal of the second fraction, which is $\frac{1}{3}$. Multiply the fractions, $\frac{3}{10} \times \frac{1}{3} = \frac{3}{30} = \frac{1}{10}$. Reduce $\frac{3}{30}$ to $\frac{1}{10}$.

Divide, $2\frac{4}{5} \div 1\frac{3}{8}$. Rewrite the expression as $\frac{14}{5} \div \frac{11}{8}$. Find the reciprocal of the second fraction, which is $\frac{8}{11}$.

Multiply the fractions, $\frac{14}{5} \times \frac{8}{11} = \frac{112}{55} = 2\frac{2}{55}$. Reduce $\frac{112}{55}$ to $2\frac{2}{55}$.

Examples

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

A. $\frac{1}{12}$ B. $\frac{1}{10}$ C. $\frac{1}{8}$ D. $\frac{1}{6}$

The correct answer is **D.** The correct answer is $\frac{1}{6}$ because $\frac{2}{3} \times \frac{1}{4} = \frac{2}{12} = \frac{1}{6}$.

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

A. $\frac{17}{18}$ B. $1\frac{5}{24}$ C. $1\frac{5}{6}$ D. $2\frac{1}{8}$

The correct answer is **A.** The correct answer is $\frac{17}{18}$ because $\frac{17}{12} \div \frac{3}{2} = \frac{17}{12} \times \frac{2}{3} = \frac{34}{36} = \frac{17}{18}$.

Let's Review!

- The process to multiply fractions is to multiply the numerators together and multiply the denominators together. When there is a mixed number, change the mixed number to an improper fraction before multiplying.
- The process to divide fractions is to find the reciprocal of the second fraction and multiply the fractions. As with multiplying, change any mixed numbers to improper fractions before dividing.

Equations with One Variable

This lesson introduces how to solve linear equations and linear inequalities.

One-Step Linear Equations

A **linear equation** is an equation where two expressions are set equal to each other. The equation is in the form $ax + b = c$, where a is a non-zero constant and b and c are constants. The exponent on a linear equation is always 1, and there is no more than one solution to a linear equation.

There are four properties to help solve a linear equation.

Property	Definition	Example with Numbers	Example with Variables
Addition Property of Equality	Add the same number to both sides of the equation.	$x–3 = 9$ $x–3 + 3 = 9 + 3$ $x = 12$	$x–a = b$ $x–a + a = b + a$ $x = a + b$
Subtraction Property of Equality	Subtract the same number from both sides of the equation.	$x + 3 = 9$ $x + 3–3 = 9–3$ $x = 6$	$x + a = b$ $x + a–a = b–a$ $x = b–a$
Multiplication Property of Equality	Multiply both sides of the equation by the same number.	$\frac{x}{3} = 9$ $\frac{x}{3} \times 3 = 9 \times 3$ $x = 27$	$\frac{x}{a} = b$ $\frac{x}{a} \times a = b \times a$ $x = ab$
Division Property of Equality	Divide both sides of the equation by the same number.	$3x = 9$ $\frac{3x}{3} = \frac{9}{3}$ $x = 3$	$ax = b$ $\frac{ax}{a} = \frac{b}{a}$ $x = \frac{b}{a}$

Example

Solve the equation for the unknown, $\frac{w}{2} = –6$.

A. –12 B. –8 C. –4 D. –3

The correct answer is **A.** The correct solution is –12 because both sides of the equation are multiplied by 2.

Two-Step Linear Equations

A two-step linear equation is in the form $ax + b = c$, where a is a non-zero constant and b and c are constants. There are two basic steps in solving this equation.

STEP BY STEP

Step 1. Use addition and subtraction properties of an equation to move the variable to one side of the equation and all number terms to the other side of the equation.

Step 2. Use multiplication and division properties of an equation to remove the value in front of the variable.

Examples

1. **Solve the equation for the unknown, $\frac{x}{-2}-3 = 5$.**

   A. –16 B. –8 C. 8 D. 16

   The correct answer is **A.** The correct solution is –16.

   $\frac{x}{-2} = 8$ Add 3 to both sides of the equation.

   $x = -16$ Multiply both sides of the equation by –2.

2. **Solve the equation for the unknown, $4x + 3 = 8$.**

   A. –2 B. $-\frac{5}{4}$ C. $\frac{5}{4}$ D. 2

   The correct answer is **C.** The correct solution is $\frac{5}{4}$.

   $4x = 5$ Subtract 3 from both sides of the equation.

   $x = \frac{5}{4}$ Divide both sides of the equation by 4.

3. **Solve the equation for the unknown w, $P = 2l + 2w$.**

   A. $2P-2l = w$ B. $\frac{P-2l}{2} = w$ C. $2P + 2l = w$ D. $\frac{P+2l}{2} = w$

   The correct answer is **B.** The correct solution is $\frac{P-2l}{2} = w$.

   $P-2l = 2w$ Subtract 2l from both sides of the equation.

   $\frac{P-2l}{2} = w$ Divide both sides of the equation by 2.

Multi-Step Linear Equations

In these basic examples of linear equations, the solution may be evident, but these properties demonstrate how to use an opposite operation to solve for a variable. Using these properties, there are three steps in solving a complex linear equation.

STEP BY STEP

Step 1. Simplify each side of the equation. This includes removing parentheses, removing fractions, and adding like terms.

Step 2. Use addition and subtraction properties of an equation to move the variable to one side of the equation and all number terms to the other side of the equation.

Step 3. Use multiplication and division properties of an equation to remove the value in front of the variable.

In Step 2, all of the variables may be placed on the left side or the right side of the equation. The examples in this lesson will place all of the variables on the left side of the equation.

When solving for a variable, apply the same steps as above. In this case, the equation is not being solved for a value, but for a specific variable.

Examples

1. **Solve the equation for the unknown, $2(4x+1)–5=3–(4x–3)$.**

   A. $\frac{1}{4}$ B. $\frac{3}{4}$ C. $\frac{4}{3}$ D. 4

   The correct answer is **B.** The correct solution is $\frac{3}{4}$.

$8x+2–5=3–4x+3$	Apply the distributive property.
$8x–3=–4x+6$	Combine like terms on both sides of the equation.
$12x–3=6$	Add $4x$ to both sides of the equation.
$12x=9$	Add 3 to both sides of the equation.
$x=\frac{3}{4}$	Divide both sides of the equation by 12.

2. **Solve the equation for the unknown, $\frac{2}{3}x+2=–\frac{1}{2}x+2(x+1)$.**

   A. 0 B. 1 C. 2 D. 3

   The correct answer is **A.** The correct solution is 0.

$\frac{2}{3}x+2=–\frac{1}{2}x+2x+2$	Apply the distributive property.
$4x+12=–3x+12x+12$	Multiply all terms by the least common denominator of 6 to eliminate the fractions.
$4x+12=9x+12$	Combine like terms on the right side of the equation.
$–5x=12$	Subtract $9x$ from both sides of the equation.
$–5x=0$	Subtract 12 from both sides of the equation.
$x=0$	Divide both sides of the equation by –5.

3. Solve the equation for the unknown for x, $y - y_1 = m(x - x_1)$.

A. $y - y_1 + mx_1$ B. $my - my_1 + mx_1$ C. $\frac{y - y_1 + x_1}{m}$ D. $\frac{y - y_1 + mx_1}{m}$

The correct answer is **D.** The correct solution is $\frac{y - y_1 + mx_1}{m}$.

$y - y_1 = mx - mx_1$	Apply the distributive property.
$y - y_1 + mx_1 = mx$	Add mx_1 to both sides of the equation.
$\frac{y - y_1 + mx_1}{m} = x$	Divide both sides of the equation by m.

Solving Linear Inequalities

A **linear inequality** is similar to a linear equation, but it contains an inequality sign (<, >, ≤, ≥). Many of the steps for solving linear inequalities are the same as for solving linear equations. The major difference is that the solution is an infinite number of values. There are four properties to help solve a linear inequality.

Property	Definition	Example
Addition Property of Inequality	Add the same number to both sides of the inequality.	$x - 3 < 9$ $x - 3 + 3 < 9 + 3$ $x < 12$
Subtraction Property of Inequality	Subtract the same number from both sides of the inequality.	$x + 3 > 9$ $x + 3 - 3 > 9 - 3$ $x > 6$
Multiplication Property of Inequality (when multiplying by a positive number)	Multiply both sides of the inequality by the same number.	$\frac{x}{3} \geq 9$ $\frac{x}{3} \times 3 \geq 9 \times 3$ $x \geq 27$
Division Property of Inequality (when multiplying by a positive number)	Divide both sides of the inequality by the same number.	$3x \leq 9$ $\frac{3x}{3} \leq \frac{9}{3}$ $x \leq 3$
Multiplication Property of Inequality (when multiplying by a negative number)	Multiply both sides of the inequality by the same number.	$\frac{x}{-3} \geq 9$ $\frac{x}{-3} \times -3 \geq 9 \times -3$ $x \leq -27$
Division Property of Inequality (when multiplying by a negative number)	Divide both sides of the inequality by the same number.	$-3x \leq 9$ $\frac{-3x}{-3} \leq \frac{9}{-3}$ $x \geq -3$

Multiplying or dividing both sides of the inequality by a negative number reverses the sign of the inequality.

In these basic examples, the solution may be evident, but these properties demonstrate how to use an opposite operation to solve for a variable. Using these properties, there are three steps in solving a complex linear inequality.

STEP BY STEP

Step 1. Simplify each side of the inequality. This includes removing parentheses, removing fractions, and adding like terms.

Step 2. Use addition and subtraction properties of an inequality to move the variable to one side of the equation and all number terms to the other side of the equation.

Step 3. Use multiplication and division properties of an inequality to remove the value in front of the variable. Reverse the inequality sign if multiplying or dividing by a negative number.

In Step 2, all of the variables may be placed on the left side or the right side of the inequality. The examples in this lesson will place all of the variables on the left side of the inequality.

Examples

1. **Solve the inequality for the unknown, $3(2 + x) < 2(3x - 1)$.**

   A. $x < -\frac{8}{3}$ B. $x > -\frac{8}{3}$ C. $x < \frac{8}{3}$ D. $x > \frac{8}{3}$

   The correct answer is **D.** The correct solution is $x > \frac{8}{3}$.

$6 + 3x < 6x - 2$	Apply the distributive property.
$6 - 3x < -2$	Subtract $6x$ from both sides of the inequality.
$-3x < -8$	Subtract 6 from both sides of the inequality.
$x > \frac{8}{3}$	Divide both sides of the inequality by 3.

2. **Solve the inequality for the unknown, $\frac{1}{2}(2x - 3) \geq \frac{1}{4}(2x + 1) - 2$.**

   A. $x > -7$ B. $x > -3$ C. $x \geq -\frac{3}{2}$ D. $x \geq -\frac{1}{2}$

   The correct answer is **D.** The correct solution is $x \geq -\frac{1}{2}$.

$2(2x - 3) \geq 2x + 1 - 8$	Multiply all terms by the least common denominator of 4 to eliminate the fractions.
$4x - 6 \geq 2x + 1 - 8$	Apply the distributive property.
$4x - 6 \geq 2x - 7$	Combine like terms on the right side of the inequality.
$2x - 6 \geq -7$	Subtract $2x$ from both sides of the inequality.
$2x \geq -1$	Add 6 to both sides of the inequality.
$x \geq -\frac{1}{2}$	Divide both sides of the inequality by 2.

Let's Review!

- A linear equation is an equation with one solution. Using opposite operations solves a linear equation.
- The process to solve a linear equation or inequality is to eliminate fractions and parentheses and combine like terms on the same side of the sign. Then, solve the equation or inequality by using inverse operations.

EQUATIONS WITH TWO VARIABLES

This lesson discusses solving a system of linear equations by substitution, elimination, and graphing, as well as solving a simple system of a linear and a quadratic equation.

Solving a System of Equations by Substitution

A **system of linear equations** is a set of two or more linear equations in the same variables. A solution to the system is an ordered pair that is a solution in all the equations in the system. The ordered pair (1, -2) is a solution for the system of equations $\begin{matrix} 2x + y = 0 \\ -x + 2y = -5 \end{matrix}$ because $\begin{matrix} 2(1) + (-2) = 0 \\ -1 + 2(-2) = -5 \end{matrix}$ makes both equations true.

One way to solve a system of linear equations is by substitution.

STEP BY STEP

Step 1. Solve one equation for one of the variables.

Step 2. Substitute the expression from Step 1 into the other equation and solve for the other variable.

Step 3. Substitute the value from Step 2 into one of the original equations and solve.

All systems of equations can be solved by substitution for any one of the four variables in the problem. The most efficient way of solving is locating the $1x$ or $1y$ in the equations because this eliminates the possibility of having fractions in the equations.

Examples

1. **Solve the system of equations, $\begin{matrix} x = y + 6 \\ 4x + 5y = 60 \end{matrix}$.**

   A. (10, 12) B. (6, 12) C. (6, 4) D. (10, 4)

   The correct answer is **D.** The correct solution is (10, 4).

   The first equation is already solved for x.

$4(y + 6) + 5y = 60$	Substitute $y + 6$ in for x in the first equation.
$4y + 24 + 5y = 60$	Apply the distributive property.
$9y + 24 = 60$	Combine like terms on the left side of the equation.
$9y = 36$	Subtract 24 from both sides of the equation.
$y = 4$	Divide both sides of the equation by 9.
$x = 4 + 6$	Substitute 4 in the first equation for y.
$x = 10$	Simplify using order of operations

2. Solve the system of equations, $\begin{matrix} \mathbf{3x + 2y = 41} \\ \mathbf{-4x + y = -18} \end{matrix}$.

A. (5, 13) B. (6, 6) C. (7, 10) D. (10, 7)

The correct answer is **C.** The correct solution is (7, 10).

$y = 4x – 18$	Solve the second equation for y by adding $4x$ to both sides of the equation.
$3x + 2(4x – 18) = 41$	Substitute $4x – 18$ in for y in the first equation.
$3x + 8x – 36 = 41$	Apply the distributive property.
$11x – 36 = 41$	Combine like terms on the left side of the equation.
$11x = 77$	Add 36 to both sides of the equation.
$x = 7$	Divide both sides of the equation by 11.
$–4(7) + y = –18$	Substitute 7 in the second equation for x.
$–28 + y = –18$	Simplify using order of operations.
$y = 10$	Add 28 to both sides of the equation.

Solving a System of Equations by Elimination

Another way to solve a system of linear equations is by elimination.

STEP BY STEP

Step 1. Multiply, if necessary, one or both equations by a constant so at least one pair of like terms has opposite coefficients.

Step 2. Add the equations to eliminate one of the variables.

Step 3. Solve the resulting equation.

Step 4. Substitute the value from Step 3 into one of the original equations and solve for the other variable.

All system of equations can be solved by the elimination method for any one of the four variables in the problem. One way of solving is locating the variables with opposite coefficients and adding the equations. Another approach is multiplying one equation to obtain opposite coefficients for the variables.

Examples

1. Solve the system of equations, $\begin{matrix} 3x + 5y = 28 \\ -4x - 5y = -34 \end{matrix}$.

A. (12, 6) B. (6, 12) C. (6, 2) D. (2, 6)

The correct answer is **C.** The correct solution is (6, 2).

$-x = -6$	Add the equations.
$x = 6$	Divide both sides of the equation by -1.
$3(6) + 5y = 28$	Substitute 6 in the first equation for *x*.
$18 + 5y = 28$	Simplify using order of operations.
$5y = 10$	Subtract 18 from both sides of the equation.
$y = 2$	Divide both sides of the equation by 5.

2. Solve the system of equations, $\begin{matrix} -5x + 5y = 0 \\ 2x - 3y = -3 \end{matrix}$.

A. (2, 2) B. (3, 3) C. (6, 6) D. (9, 9)

The correct answer is **B.** The correct solution is (3, 3).

$-10x + 10y = 0$	Multiply all terms in the first equation by 2.
$10x - 15y = -15$	Multiply all terms in the second equation by 5.
$-5y = -15$	Add the equations.
$y = 3$	Divide both sides of the equation by -5.
$2x - 3(3) = -3$	Substitute 3 in the second equation for *y*.
$2x - 9 = -3$	Simplify using order of operations.
$2x = 6$	Add 9 to both sides of the equation.
$x = 3$	Divide both sides of the equation by 2.

Solving a System of Equations by Graphing

Graphing is a third method of a solving system of equations. The point of intersection is the solution for the graph. This method is a great way to visualize each graph on a coordinate plane.

STEP BY STEP

Step 1. Graph each equation in the coordinate plane.

Step 2. Estimate the point of intersection.

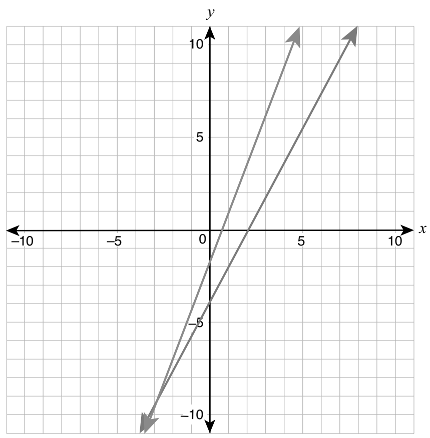
Step 3. Check the point by substituting for *x* and *y* in each equation of the original system.

The best approach to graphing is to obtain each line in slope-intercept form. Then, graph the *y*-intercept and use the slope to find additional points on the line.

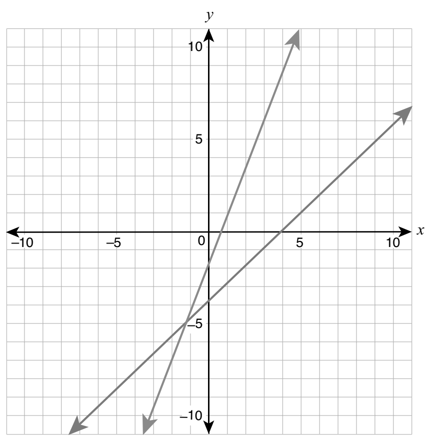
Example

Solve the system of equations by graphing, $\begin{matrix} y = 3x-2 \\ y = x-4 \end{matrix}$.

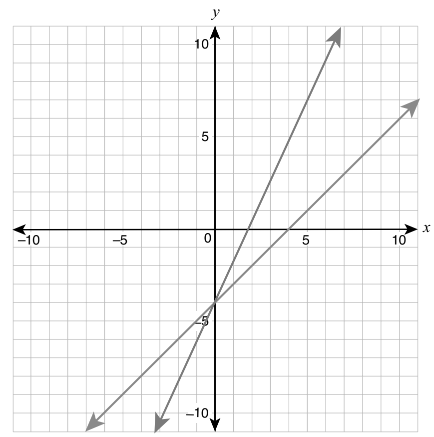
A.



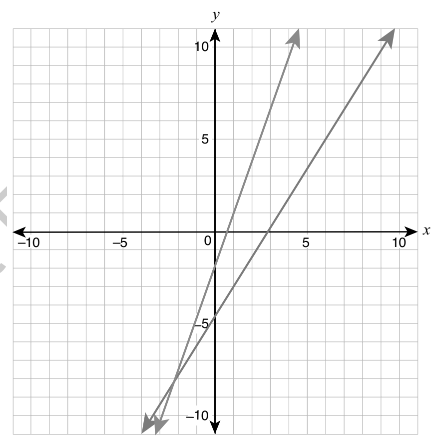
B.



C.



D.



The correct answer is **B.** The correct graph has the two lines intersect at (-1, -5).

Solving a System of a Linear Equation and an Equation of a Circle

There are many other types of systems of equations. One example is the equation of a line $y = mx$ and the equation of a circle $x^2 + y^2 = r^2$ where r is the radius. With this system of equations, there can be two ordered pairs that intersect between the line and the circle. If there is one ordered pair, the line is tangent to the circle.

This system of equations is solved by substituting the expression mx in for y in the equation of a circle. Then, solve the equation for x. The values for x are substituted into the linear equation to find the value for y.

KEEP IN MIND

There will be two solutions in many cases with the system of a linear equation and an equation of a circle.

Example

Solve the system of equations, $\begin{array}{c} y = -3x \\ x^2 + y^2 = 10 \end{array}$.

A. (1, 3) and (–1, –3)

B. (1, –3) and (–1, 3)

C. (–3, 10) and (3, –10)

D. (3, 10) and (–3, –10)

The correct answer is **B.** The correct solutions are (1, –3) and (–1, 3).

$x^2 + (-3x)^2 = 10$	Substitute $-3x$ in for y in the second equation.
$x^2 + 9x^2 = 10$	Apply the exponent.
$10x^2 = 10$	Combine like terms on the left side of the equation.
$x^2 = 1$	Divide both sides of the equation by 10.
$x = \pm 1$	Apply the square root to both sides of the equation.
$y = -3(1) = -3$	Substitute 1 in the first equation and multiply.
$y = -3(-1) = 3$	Substitute –1 in the first equation and multiply.

Let's Review!

- There are three ways to solve a system of equations: graphing, substitution, and elimination. Using any method will result in the same solution for the system of equations.
- Solving a system of a linear equation and an equation of a circle uses substitution and usually results in two solutions.

Solving Real-World Mathematical Problems

This lesson introduces solving real-world mathematical problems by using estimation and mental computation. This lesson also includes real-world applications involving integers, fractions, and decimals.

Estimating

Estimations are rough calculations of a solution to a problem. The most common use for estimation is completing calculations without a calculator or other tool. There are many estimation techniques, but this lesson focuses on integers, decimals, and fractions.

> **KEEP IN MIND**
> An estimation is an educated guess at the solution to a problem.

To round a whole number, round the value to the nearest ten or hundred. The number 142 rounds to 140 for the nearest ten and to 100 for the nearest hundred. The context of the problem determines the place value to which to round.

In most problems with fractions and decimals, the context of the problem requires rounding to the nearest whole number. Rounding these values makes calculation easier and provides an accurate estimation to the solution of the problem.

Other estimation strategies include the following:

- Using friendly or compatible numbers
- Using numbers that are easy to compute
- Adjusting numbers after rounding

Example

There are 168 hours in a week. Carson does the following:

- Sleeps 7.5 hours each day of the week
- Goes to school 6.75 hours five days a week
- Practices martial arts and basketball 1.5 hours each three times a week
- Reads and studies 1.75 hours every day
- Eats 1.5 hours every day

Estimate the remaining number of hours.

A. 30 B. 35 C. 40 D. 45

The correct answer is **C.** The correct solution is 40. He sleeps about 56 hours, goes to school for 35 hours, practices for 9 hours, read and studies for about 14 hours, and eats about 14 hours. This is 128 hours. Therefore, Carson has about 40 hours remaining.

Real-World Integer Problems

The following five steps can make solving word problems easier:

1. Read the problem for understanding.
2. Visualize the problem by drawing a picture or diagram.
3. Make a plan by writing an expression to represent the problem.
4. Solve the problem by applying mathematical techniques.
5. Check the answer to make sure it answers the question asked.

> **BE CAREFUL!**
> Make sure that you read the problem fully before visualizing and making a plan.

In basic problems, the solution may be evident, but make sure to demonstrate knowledge of writing the expression. In multi-step problems, first make a plan with the correct expression. Then, apply the correct calculation.

Examples

1. **The temperature on Monday was –9°F, and on Tuesday it was 8°F. What is the difference in temperature, in °F?**

   A. –17° B. –1° C. 1° D. 17°

   The correct answer is **D.** The correct solution is 17° because 8–(–9) = 17°F.

2. **A golfer's last 12 rounds were –2, +4, –3, –1, +5, +3, –4, –5, –2, –6, –1, and 0. What is the average of these rounds?**

   A. –12 B. –1 C. 1 D. 12

   The correct answer is **B.** The correct solution is –1. The total of the scores is –12. The average is –12 divided by 12, which is –1.

Real-World Fraction and Decimal Problems

The five steps in the previous section are applicable to solving real-world fraction and decimal problems. The expressions with one step require only one calculation: addition, subtraction, multiplication, or division. The problems with multiple steps require writing out the expressions and performing the correct calculations.

> **KEEP IN MIND**
> Estimating the solution first can help determine if a calculation is completed correctly.

Examples

1. **The length of a room is $7\frac{2}{3}$ feet. When the length of the room is doubled, what is the new length in feet?**

   A. $14\frac{2}{3}$ B. $15\frac{1}{3}$ C. $15\frac{2}{3}$ D. $16\frac{1}{3}$

   The correct answer is **B.** The correct solution is $15\frac{1}{3}$. The length is multiplied by 2, $7\frac{2}{3} \times 2 = \frac{23}{3} \times \frac{2}{1} = \frac{46}{3} = 15\frac{1}{3}$ feet.

2. **A fruit salad is a mixture of $1\frac{3}{4}$ pounds of apples, $2\frac{1}{4}$ pounds of grapes, and $1\frac{1}{4}$ pounds of bananas. After the fruit is mixed, $1\frac{1}{2}$ pounds are set aside, and the rest is divided into three containers. What is the weight in pounds of one container?**

   A. $1\frac{1}{5}$ B. $1\frac{1}{4}$ C. $1\frac{1}{3}$ D. $1\frac{1}{2}$

   The correct answer is **B.** The correct solution is $1\frac{1}{4}$. The amount available for the containers is $1\frac{3}{4} + 2\frac{1}{4} + 1\frac{1}{4} – 1\frac{1}{2} = 5\frac{1}{4} – 1\frac{1}{2} = 5\frac{1}{4} – 1\frac{2}{4} = 4\frac{5}{4} – 1\frac{2}{4} = 3\frac{3}{4}$. This amount is divided into three containers, $3\frac{3}{4} \div 3 = \frac{15}{4} \times \frac{15}{12} = 1\frac{3}{12} = 1\frac{1}{4}$ pounds.

3. **In 2016, a town had 17.4 inches of snowfall. In 2017, it had 45.2 inches of snowfall. What is the difference in inches?**

   A. 27.2 B. 27.8 C. 28.2 D. 28.8

   The correct answer is **B.** The correct solution is 27.8 because 45.2–17.4 = 27.8 inches.

4. **Mike bought items that cost $4.78, $3.49, $6.79, $9.78, and $14.05. He had a coupon worth $5.00. If he paid with a $50.00 bill, then how much change does he receive?**

   A. $16.11 B. $18.11 C. $21.11 D. $23.11

   The correct answer is **A.** The correct solution is $16.11. The total bill is $38.89, less the coupon is $33.89. The amount of change is $50.00–$33.89 = $16.11.

Let’s Review!

- Using estimation is beneficial to determine an approximate solution to the problem when the numbers are complex.
- When solving a word problem with integers, fractions, or decimals, first read and visualize the problem. Then, make a plan, solve, and check the answer.’

Chapter 6 Algebra Practice Quiz

1. **Which decimal is the greatest?**

   A. 1.7805
   B. 1.5807
   C. 1.7085
   D. 1.8057

2. **Change $0.\overline{63}$ to a fraction. Simplify completely.**

   A. $\frac{5}{9}$
   B. $\frac{7}{11}$
   C. $\frac{2}{3}$
   D. $\frac{5}{6}$

3. **Write $0.\overline{1}$ as a percent.**

   A. $0.\overline{1}\%$
   B. $1.\overline{1}\%$
   C. $11.\overline{1}\%$
   D. $111.\overline{1}\%$

4. **Solve the equation for the unknown, $4x + 3 = 8$.**

   A. -2
   B. $-\frac{5}{4}$
   C. $\frac{5}{4}$
   D. 2

5. **Solve the inequality for the unknown, $3x + 5 - 2(x + 3) > 4(1 - x) + 5$.**

   A. $x > 2$
   B. $x > 9$
   C. $x > 10$
   D. $x > 17$

6. **Solve the equation for h, $SA = 2\pi rh + 2\pi r^2$.**

   A. $2\pi rSA - 2\pi r^2 = h$
   B. $2\pi rSA + 2\pi r^2 = h$
   C. $\frac{SA - 2\pi r^2}{2\pi r} = h$
   D. $\frac{SA + 2\pi r^2}{2\pi r} = h$

7. **Solve the system of equations,**
   $$\begin{aligned} y &= -2x + 3 \\ y + x &= 5 \end{aligned}.$$

   A. (-2, 7)
   B. (-2, -7)
   C. (2, -7)
   D. (2, 7)

8. **Solve the system of equations,**
   $$\begin{aligned} 2x - 3y &= -1 \\ x + 2y &= 24 \end{aligned}.$$

   A. (7, 10)
   B. (10, 7)
   C. (6, 8)
   D. (8, 6)

9. **Divide $1\frac{5}{6} \div 1\frac{1}{3}$.**

   A. $1\frac{5}{18}$
   B. $1\frac{3}{8}$
   C. $2\frac{4}{9}$
   D. $3\frac{1}{6}$

10. **Multiply $1\frac{1}{4} \times 1\frac{1}{2}$.**

    A. $1\frac{1}{8}$
    B. $1\frac{1}{3}$
    C. $1\frac{2}{3}$
    D. $1\frac{7}{8}$

11. **Divide $\frac{1}{10} \div \frac{2}{3}$.**

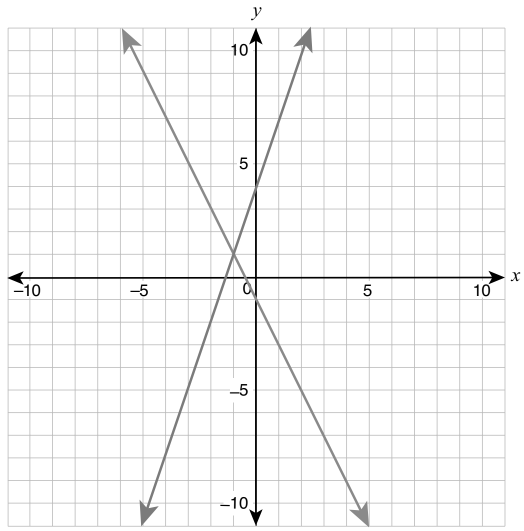
    A. $\frac{1}{15}$
    B. $\frac{1}{10}$
    C. $\frac{3}{20}$
    D. $\frac{3}{5}$

12. **A store has 75 pounds of bananas. Eight customers buy 3.3 pounds, five customers buy 4.25 pounds, and one customer buys 6.8 pounds. How many pounds are left in stock?**

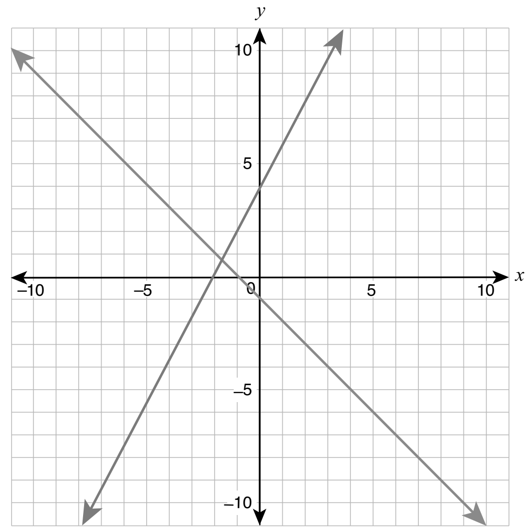
    A. 19.45
    B. 19.55
    C. 20.45
    D. 20.55

13. Solve the system of equations by graphing, $\begin{matrix} 3x + y = -1 \\ 2x - y = -4 \end{matrix}$.

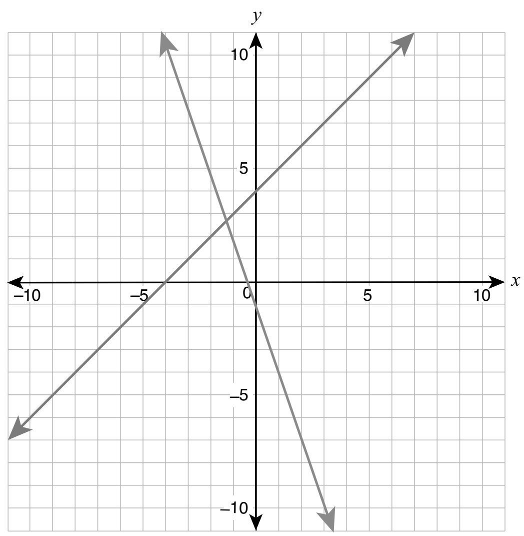
A.



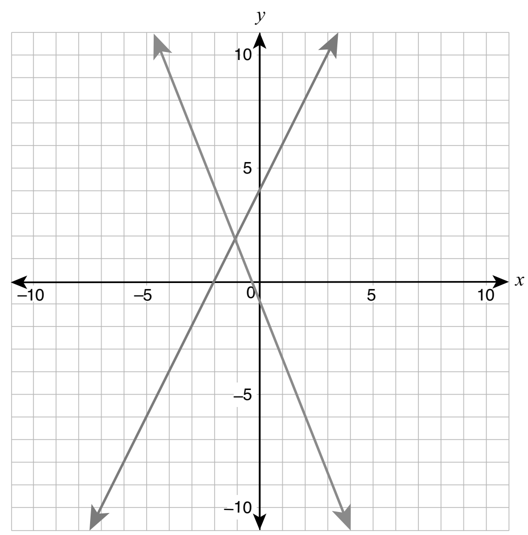
C.



B.



D.



14. A rectangular garden needs a border. The length is $15\frac{3}{5}$ feet, and the width is $3\frac{2}{3}$ feet. What is the perimeter in feet?

A. $18\frac{5}{8}$

C. $37\frac{1}{4}$

B. $19\frac{4}{15}$

D. $38\frac{8}{15}$

15. A historical society has 8 tours daily 5 days a week, with 32 people on each tour. Estimate the number of people who can be on the tour in 50 weeks.

A. 25,000

C. 75,000

B. 50,000

D. 100,000

Chapter 6 Algebra Practice Quiz — Answer Key

1. D. The correct solution is 1.8057 because 1.8057 contains the largest value in the tenths place. **See Lesson: Decimals and Fractions.**

2. B. The correct solution is $\frac{7}{11}$. Let $n = 0.\overline{63}$ and $100n = 63.\overline{63}$. Then, $100n - n = 63.\overline{63} - 0.\overline{63}$ resulting in $99n = 63$ and solution of $n = \frac{63}{99} = \frac{7}{11}$. **See Lesson: Decimals and Fractions.**

3. C. The correct answer is $11.\overline{1}\%$ because $0.\overline{1}$ as a percent is $0.\overline{1} \times 100 = 11.\overline{1}\%$. **See Lesson: Decimals and Fractions.**

4. C. The correct solution is $\frac{5}{4}$.

$4x = 5$	Subtract 3 from both sides of the equation.
$x = \frac{5}{4}$	Divide both sides of the equation by 4.

See Lesson: Equations with One Variable.

5. A. The correct solution is $x > 2$.

$3x + 5 - 2x - 6 > 4 - 4x + 5$	Apply the distributive property.
$x - 1 > -4x + 9$	Combine like terms on both sides of the inequality.
$5x - 1 > 9$	Add $4x$ to both sides of the inequality.
$5x > 10$	Add 1 to both sides of the inequality.
$x > 2$	Divide both sides of the inequality by 5.

See Lesson: Equations with One Variable.

6. C. The correct solution is $\frac{SA - 2\pi r^2}{2\pi r} = h$.

$SA - 2\pi r^2 = 2\pi rh$	Subtract $2\pi r^2$ from both sides of the equation.
$\frac{SA - 2\pi r^2}{2\pi r} = h$	Divide both sides of the equation by $2\pi r$.

See Lesson: Equations with One Variable.

7. A. The correct solution is (-2, 7).

	The first equation is already solved for y.
$-2x + 3 + x = 5$	Substitute $-2x + 3$ in for y in the second equation.
$-x + 3 = 5$	Combine like terms on the left side of the equation.
$-x = 2$	Subtract 3 from both sides of the equation.
$x = -2$	Divide both sides of the equation by -1.
$y = -2(-2) + 3$	Substitute -2 in the first equation for x.

$y = 4 + 3 = 7$	Simplify using order of operations.

See Lesson: Equations with Two Variables.

8. B. The correct solution is (10, 7).

$-2x-4y = -48$	Multiply all terms in the second equation by -2.
$-7y = -49$	Add the equations.
$y = 7$	Divide both sides of the equation by -7.
$x + 2(7) = 24$	Substitute 7 in the second equation for *y*.
$x + 14 = 24$	Simplify using order of operations.
$x = 10$	Subtract 14 from both sides of the equation.

See Lesson: Equations with Two Variables.

9. B. The correct answer is $1\frac{3}{8}$ because $\frac{11}{6} \div \frac{4}{3} = \frac{11}{6} \times \frac{3}{4} = \frac{33}{24} = 1\frac{9}{24} = 1\frac{3}{8}$. **See Lesson: Multiplication and Division of Fractions.**

10. D. The correct solution is $1\frac{7}{8}$ because $\frac{5}{4} \times \frac{3}{2} = \frac{15}{8} = 1\frac{7}{8}$. **See Lesson: Multiplication and Division of Fractions.**

11. C. The correct solution is $\frac{3}{20}$ because $\frac{1}{10} \times \frac{3}{2} = \frac{3}{20}$. **See Lesson: Multiplication and Division of Fractions.**

12. D. The correct solution is 20.55 because the number of pounds purchased is $8(3.3) + 5(4.25) + 6.8 = 26.4 + 21.25 + 6.8 = 54.45$ pounds. The number of pounds remaining is $75-54.45 = 20.55$ pounds. **See Lesson: Solving Real-World Mathematical Problems.**

13. D. The correct graph has the two lines intersect at (-1, 2). **See Lesson: Equations with Two Variables.**

14. D. The correct solution is $38\frac{8}{15}$ because $15\frac{3}{5} + 3\frac{2}{3} = 15\frac{9}{15} + 3\frac{10}{15} = 18\frac{19}{15}(2) = \frac{289}{15} \times \frac{2}{1} = \frac{578}{15} = 38\frac{8}{15}$ feet. **See Lesson: Solving Real-World Mathematical Problems.**

15. C. The correct solution is 75,000 because by estimation $10(5)(30)(50) = 75{,}000$ people can be on the tour in 50 weeks. **See Lesson: Solving Real-World Mathematical Problems.**