Module 2

Anchor	Lessons
A1.2.1 – Functions	4.8 – Determine Whether a Relation is a Function 4.8 – Identify Domain and Range 4.8 – Create, Graph, and Interpret the Equation of a Linear Function
A1.2.2 – Coordinate Geometry	4.5, 4.7 – Identify, Describe, and/or Apply Constant Rates of Change 5.1 – 5.4 – Write and/or Identify a Linear Equation when Given in Various Forms 4.1 – Create a Scatter Plot
A1.2.3 – Data Analysis	Find Probabilities of Simple and Compound Events Measures of Central Tendency Analyze Data, Make Predictions, and/or Answer Questions Based on Displayed Data (box-and-whisker plots, stem-and-leaf plots, scatter plots, measures of central tendency)

LESSON **4.8**

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Practice with Examples

For use with pages 252–258

GOAL **Identify when a relation is a function and use function notation.**

VOCABULARY

A **relation** is any set of ordered pairs. A relation is a function if for each input there is exactly one output.

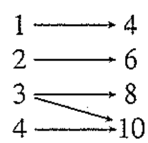
Using **function notation,** the equation $y = 3x - 4$ becomes the function $f(x) = 3x - 4$ (the symbol $f(x)$ replaces y). Just as (x, y) is a solution of $y = 3x - 4$, $(x, f(x))$ is a solution of $f(x) = 3x - 4$.

A function is called a **linear function** if it is of the form $f(x) = mx + b$.

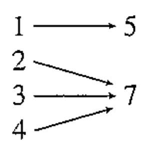
EXAMPLE 1 *Identifying Functions*

Decide whether the relation shown in the input-output diagram is a function. If it is a function, give the domain and the range.

a. Input Output



b. Input Output



SOLUTION

a. The relation is not a function, because the input 3 has two outputs: 8 and 10.

b. The relation is a function. For each input there is exactly one output. The domain of the function is the set of input values 1, 2, 3, and 4. The range is the set of output values 5 and 7.

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Practice with Examples

For use with pages 252–258

Exercises for Example 1

Decide whether the relation is a function. If it is a function, give the domain and the range.

1.

Input	Output
2 →	1
4 →	3
4 →	5
8 →	7

2.

Input	Output
1 →	1
2 →	4
3 →	9
4 →	16

3.

Input	Output
1 →	4
2 →	4
3 →	6
4 →	8

EXAMPLE 2 *Evaluating a Function*

Evaluate the function $f(x) = -4x + 5$ when $x = -1$.

SOLUTION

$f(x) = -4x + 5$	Write original function.
$f(-1) = -4(-1) + 5$	Substitute -1 for x.
$= 9$	Simplify.

Exercises for Example 2

Evaluate the function when $x = 3$, $x = 0$, and $x = -2$.

4. $f(x) = 9x + 2$

5. $f(x) = 0.5x + 4$

6. $f(x) = -7x + 3$

LESSON 4.8 CONTINUED

NAME ______________________ DATE ____________

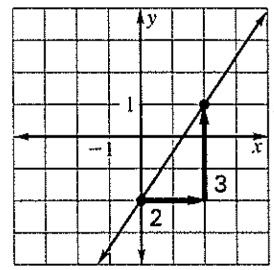
Practice with Examples

For use with pages 252–258

EXAMPLE 3 Graphing a Linear Function

Graph $f(x) = \frac{3}{2}x - 2.$.

SOLUTION



1. **Rewrite** the function as $y = \frac{3}{2}x - 2.$
2. **Find** the slope and the y-intercept.

   $m = \frac{3}{2}$ and $b = -2$
3. **Use** the slope to locate a second point.
4. **Draw** a line through the two points.

Exercises for Example 3

Graph the function.

7. $f(x) = 2x + 4$

8. $f(x) = -\frac{1}{3}x + 2$

9. $f(x) = -\frac{1}{2}x - 5$

LESSON 4.5

NAME ______________________________ DATE ____________

Practice with Examples

For use with pages 228–235

GOAL Find the slope of a line.

VOCABULARY

The **slope** m of a line is the ratio of the vertical **rise** to the horizontal **run** between any two points on the line.

The slope of a line that passes through the points (x_1, y_1) and (x_2, y_2) is given by $m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$.

EXAMPLE 1 *Finding the Slope of a Line*

Find the slope of the line passing through $(-3, 2)$ and $(1, 5)$.

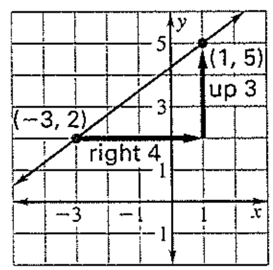
SOLUTION

Let $(x_1, y_1) = (-3, 2)$ and $(x_2, y_2) = (1, 5)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$ ← Rise: Difference of y-values; ← Run: Difference of x-values

$$= \frac{5 - 2}{1 - (-3)}$$ Substitute values.

$$= \frac{3}{1 + 3} = \frac{3}{4}$$ Simplify. Slope is positive.



Because the slope in Example 1 is positive, the line rises from left to right. If a line has negative slope, then the line falls from left to right.

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Practice with Examples

For use with pages 228–235

Exercises for Example 1

Plot the points and find the slope of the line passing through them.

1. $(-4, 0), (3, 3)$ **2.** $(-1, -2), (2, -6)$ **3.** $(-3, -1), (1, 3)$

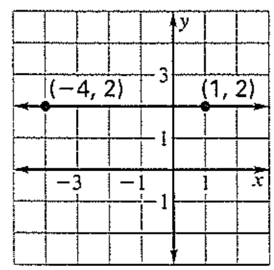
Find the slope of the line that passes through the points.

4. $(5, 4), (3, 1)$ **5.** $(-2, 3), (0, 2)$ **6.** $(2, 4), (-1, -1)$

EXAMPLE 2 *Finding the Slope of a Line*

Find the slope of the line passing through $(-4, 2)$ and $(1, 2)$.

SOLUTION



Let $(x_1, y_1) = (-4, 2)$ and $(x_2, y_2) = (1, 2)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \begin{array}{l}\leftarrow \text{Rise: Difference of } y\text{-values} \\ \leftarrow \text{Run: Difference of } x\text{-values}\end{array}$$

$$= \frac{2 - 2}{1 - (-4)} \qquad \text{Substitute values.}$$

$$= \frac{0}{5} = 0 \qquad \text{Simplify. Slope is zero.}$$

Because the slope in Example 2 is zero, the line is horizontal. If the slope of a line is undefined, the line is vertical.

LESSON 4.5 CONTINUED

NAME ______________________________ DATE ____________

Practice with Examples

For use with pages 228–235

Exercises for Example 2

Plot the points and find the slope of the line passing through the points.

7. $(-4, 0), (-4, 3)$

8. $(1, -1), (1, 3)$

9. $(-3, 0), (1, 0)$

10. $(-4, 3), (1, 3)$

11. $(2, -2), (2, -6)$

12. $(-1, -6), (2, -6)$

LESSON 4.7

NAME ______________________ DATE ________

Practice with Examples

For use with pages 242–251

GOAL Graph a linear equation in slope-intercept form.

VOCABULARY

The linear equation $y = mx + b$ is written in **slope-intercept form.** The slope of the line is m. The y-intercept is b.

Two different lines in the same plane are **parallel** if they do not intersect. Any two nonvertical lines are parallel if and only if they have the same slope and different y-intercepts. (All vertical lines are parallel.)

EXAMPLE 1 *Finding the Slope and y-Intercept*

EQUATION	SLOPE-INTERCEPT FORM	SLOPE	y-INTERCEPT
a. $y = 3x$	$y = 3x + 0$	$m = 3$	$b = 0$
b. $y = -\frac{3}{5} + \frac{2}{5}x$	$y = \frac{2}{5}x - \frac{3}{5}$	$m = \frac{2}{5}$	$b = -\frac{3}{5}$
c. $4x + 8y = 24$	$y = -0.5x + 3$	$m = -0.5$	$b = 3$

Exercises for Example 1

Write the equation in slope-intercept form. Find the slope and the y-intercept

1. $y = -3x$

2. $x + y - 5 = 0$

3. $3x + y = 5$

4. $y = \frac{7}{3} - \frac{1}{3}x$

5. $y = 2$

6. $x + 4y - 4 = 0$

7. Which two lines in Exercises 1–6 are parallel? Explain.

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Practice with Examples

For use with pages 242–251

EXAMPLE 2 Graphing Using Slope and y-Intercept

Graph the equation $5x - y = 3$.

SOLUTION

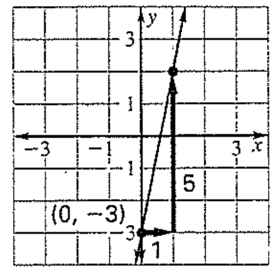
Write the equation in slope-intercept form: $y = 5x - 3$

Find the slope and the y-intercept: $m = 5$ and $b = -3$.

Plot the point $(0, b)$ when $b = -3$. Use the slope to locate a second point on the line.

$$m = \frac{5}{1} = \frac{\text{rise}}{\text{run}} \rightarrow \frac{\text{move 5 units up}}{\text{move 1 unit right}}$$

Draw a line through the two points.



Exercises for Example 2

Write the equation in slope-intercept form. Then graph the equation.

8. $6x - y = 0$

9. $x + 3y - 3 = 0$

10. $5x + y = 4$

11. $x + 3y - 6 = 0$

12. $2x + y - 9 = 0$

13. $x + 2y + 8 = 0$

Practice with Examples

For use with pages 242–251

EXAMPLE 3 Using a Linear Model

During the summer you work for a lawn care service. You are paid \$5 per day, plus an hourly rate of \$1.50.

a. Using w to represent daily wages and h to represent the number of hours worked daily, write an equation that models your total wages for one day's work.

b. Find the slope and the y-intercept of the equation.

c. What does the slope represent?

d. Graph the equation, using the slope and the y-intercept.

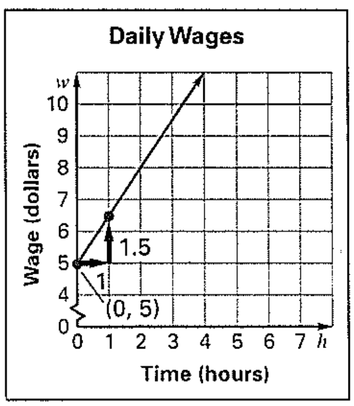
SOLUTION

a. Using w to represent daily wages and h to represent the number of hours worked daily, the equation that models your total wages for one day's work is $w = 1.50h + 5$.

b. The slope of the equation is 1.50 and the y-intercept is 5.

c. The slope represents the hourly rate.

d.



Exercises for Example 3

14. Rework Example 3 if you are paid \$4 per day, plus an hourly rate of \$1.75.

15. Rework Example 3 if you are paid \$6 per day, plus an hourly rate of \$1.25.

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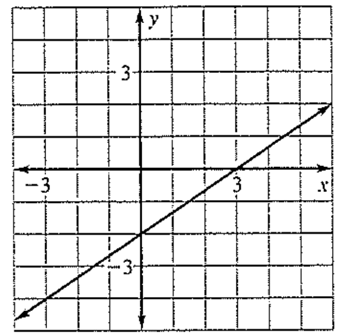
Practice with Examples

For use with pages 269–275

EXAMPLE 2 *Using a Graph to Write an Equation*

Write an equation of the line shown using slope-intercept form.



SOLUTION

Write the slope-intercept form $y = mx + b$.

Find the slope of the line. Let (0, –2) be (x_1, y_1) and (3, 0) be (x_2, y_2).

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - (-2)}{3 - 0} = \frac{2}{3}$$

Use the graph to find the y-intercept b. The y-intercept is -2.

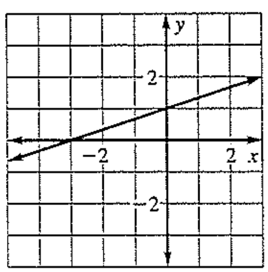
Substitute $\frac{2}{3}$ for m and -2 for b in $y = mx + b$.

$$y = \frac{2}{3}x - 2$$

Exercises for Example 2

Write the equation of the line in slope-intercept form.

5.



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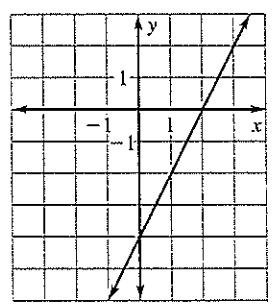


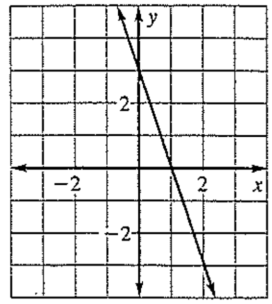
NAME ______________________ DATE ________

Practice with Examples

For use with pages 269–275

EXAMPLE 3 Modeling Negative Slope

Write an equation of the line shown using slope-intercept form.



SOLUTION

Write the slope-intercept form $y = mx + b$.

Find the slope of the line. Let (0, 3) be (x_1, y_1) and (1, 0) be (x_2, y_2).

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 3}{1 - 0} = \frac{-3}{1} = -3$$

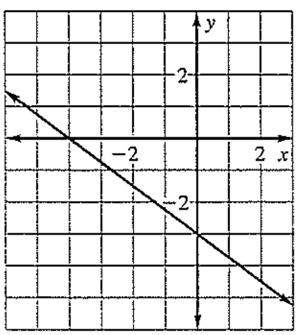
Use the graph to find the y-intercept b. The y-intercept is 3.

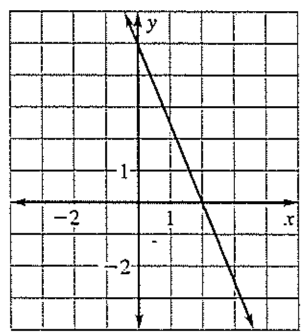
Substitute -3 for m and 3 for b in $y = mx + b$.

$$y = -3x + 3$$

Exercises for Example 3

Write the equation of the line in slope-intercept form.

7. 

8. 

LESSON 5.2

NAME ______________________ DATE __________

Practice with Examples

For use with pages 276–284

GOAL Use point-slope form to write the equation of a line.

VOCABULARY

The **point-slope form** of the equation of the line through (x_1, y_1) with slope m is $y - y_1 = m(x - x_1)$.

EXAMPLE 1 *Using the Point-Slope Form*

Use the point-slope form of a line to write an equation of the line that passes through the point $(3, -1)$ and has a slope of -1.

SOLUTION

Use the slope of -1 and the point $(3, -1)$ as (x_1, y_1) in the point-slope form.

$y - y_1 = m(x - x_1)$	Write point-slope form.
$y - (-1) = -1(x - 3)$	Substitute -1 for m, 3 for x_1, and -1 for y_1.
$y + 1 = -1(x - 3)$	Simplify.

Using the distributive property, you can write an equation in point-slope form in slope-intercept form.

$y + 1 = -x + 3$	Use distributive property.
$y = -x + 2$	Subtract 1 from each side.

NAME ______________________ DATE __________

Practice with Examples

For use with pages 276–284

Exercises for Example 1

Write in slope-intercept form the equation of the line that passes through the given point and has the given slope.

1. $(4, 5), m = 2$

2. $(-1, 6), m = -3$

3. $(-2, 8), m = -4$

NAME ______________________ DATE __________

Practice with Examples

For use with pages 276–284

EXAMPLE 2 Writing an Equation of a Parallel Line

Write in slope-intercept form the equation of the line that is parallel to the line $y = 3x - 5$ and passes through the point $(-5, -2)$.

SOLUTION

The slope of the original line is $m = 3$. So the slope of the parallel line is also $m = 3$. The line passes through the point $(x_1, y_1) = (-5, -2)$.

$y - y_1 = m(x - x_1)$	Write point-slope form.
$y - (-2) = 3(x - (-5))$	Substitute -2 for y_1, 3 for m, and -5 for x_1.
$y + 2 = 3(x + 5)$	Simplify.
$y + 2 = 3x + 15$	Use the distributive property.
$y = 3x + 13$	Subtract 2 from each side.

Exercises for Example 2

4. Write in slope-intercept form the equation of the line that is parallel to the line $y = -4x + 1$ and passes through the point $(2, -1)$.

5. Write in slope-intercept form the equation of the line that is parallel to the line $y = -x - 7$ and passes through the point $(-4, -4)$.

LESSON 5.3

NAME ________________________ DATE ____________

Practice with Examples

For use with pages 285–290

GOAL **Write an equation of a line given two points on the line.**

EXAMPLE 1 *Writing an Equation Given Two Points*

Write an equation of the line that passes through the points (1, 5) and (2, 3).

SOLUTION

Find the slope of the line. Let $(x_1, y_1) = (1, 5)$ and $(x_2, y_2) = (2, 3)$.

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Write formula for slope.

$= \frac{3 - 5}{2 - 1}$ Substitute.

$= \frac{-2}{1} = -2$ Simplify.

Write the equation of the line and let $m = -2$, $x_1 = 1$, and $y_1 = 5$ and solve for b.

$y - y_1 = m(x - x_1)$ Write point-slope form.

$y - 5 = -2(x - 1)$ Substitute -2 for m, 1 for x_1, and 5 for y_1.

$y = -2x + 7$ Distribute and simplify.

Exercises for Example 1

Write an equation in slope-intercept form of the line that passes through the points.

1. (4, 9) and (1, 6)

2. (0, 7) and (1, −1)

3. (−2, −3) and (0, 3)

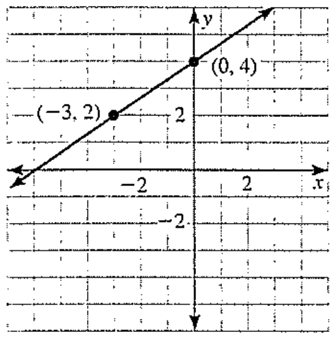
NAME ______________________ DATE ________

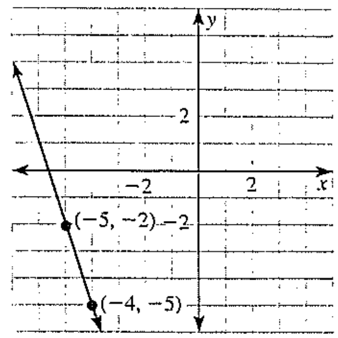
Practice with Examples

For use with pages 285–290

EXAMPLE 2 Decide Which Form to Use

Write the equation of the line in slope-intercept form.

a. 

b. 

SOLUTION

a. Find the slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 2}{0 - (-2)} = \frac{2}{3}$$

The y-intercept is $b = 4$.

$y = mx + b$

$y = \frac{2}{3}x + 4$

b. Find the slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5 - (-2)}{-4 - (-5)} = \frac{-3}{1} = -3$$

Since you do not know the y-intercept, use the point slope form.

$y - y_1 = m(x - x_1)$

$y - (-2) = -3(x - (-5))$

$y - 2 = -3x - 15$

$y = -3x - 17$

LESSON 5.3 CONTINUED

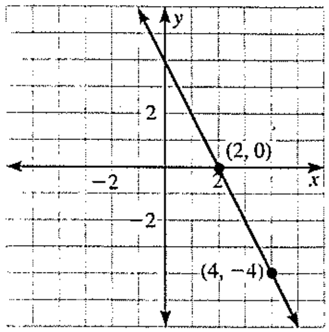
NAME ______________________ DATE __________

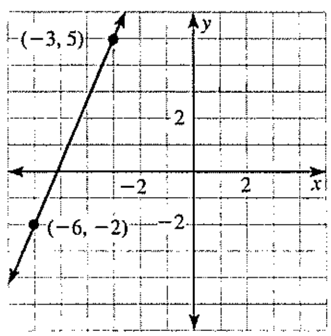
Practice with Examples

For use with pages 285–290

Exercises for Example 2

Write the equation of the line in slope-intercept form.

4. 

5. 

LESSON 5.4

NAME ______________________ DATE __________

Practice with Examples

For use with pages 291–297

GOAL Write an equation of a line in standard form.

VOCABULARY

The **standard form** of the equation of a line is $Ax + By = C$, where A and B are not both zero.

EXAMPLE 1 Converting to Standard Form

Write $y = -\frac{3}{4}x + 5$ in standard form with integer coefficients.

SOLUTION

To write the equation in standard form, isolate the variable terms on the left and the constant term on the right.

$y = -\frac{3}{4}x + 5$	Write original equation.
$4y = 4\left(-\frac{3}{4}x + 5\right)$	Multiply each side by 4.
$4y = -3x + 20$	Use distributive property.
$3x + 4y = 20$	Add $3x$ to each side.

Exercises for Example 1

Write the equation in standard form with integer coefficients.

1. $y = \frac{2}{3}x - 7$

2. $y = 8 + 2x$

3. $y = 6 - \frac{1}{4}x$

NAME ______________________ DATE __________

Practice with Examples

For use with pages 291–297

EXAMPLE 2 Writing a Linear Equation in Standard Form

Write the standard form of the equation passing through (3, 7) with a slope of 2.

SOLUTION

Write the point-slope form of the equation of the line.

$y - y_1 = m(x - x_1)$	Write point-slope form.
$y - 7 = 2(x - 3)$	Substitute 7 for y_1, 2 for m, and 3 for x_1.
$y - 7 = 2x - 6$	Use distributive property.
$y = 2x + 1$	Add 7 to each side.
$-2x + y = 1$	Subtract $2x$ from each side.

Exercises for Example 2

Write the standard form of the equation of the line that passes through the given point and has the given slope.

4. $(1, 4),\ m = -2$

5. $(-3, 1),\ m = 3$

6. $(5, -2),\ m = -1$

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Practice with Examples

For use with pages 291–297

EXAMPLE 3 Writing an Equation in Standard Form

A line passes through the points (0, 2) and (−4, −1). Write an equation of the line in standard form. Use integer coefficients.

❶ Find the slope. Use $(x_1, y_1) = (0, 2)$ and $(x_2, y_2) = (-4, -1)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{-1 - 2}{-4 - 0}$$

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

❷ Write an equation of the line, using slope-intercept form.

$y = mx + b$	Write slope-intercept form.
$y = \frac{3}{4}x + 2$	Substitute $\frac{3}{4}$ for m and 2 for b.
$4y = 4\left(\frac{3}{4}x + 2\right)$	Multiply each side by 4.
	$4y = 3x + 8$ Use distributive property.
$-3x + 4y = 8$	Subtract $3x$ from each side.

Exercise for Example 3

7. Write in standard form an equation of the line that passes through the points (1, 3) and (0, 8). Use integer coefficients.

LESSON 4.1

NAME ______________________________ DATE __________

Practice with Examples

For use with pages 203–208

GOAL Plot points in a coordinate plane.

VOCABULARY

A **coordinate plane**, which is divided into four regions called quadrants, is formed by two real number lines that intersect at a right angle. The point of intersection is the **origin**. The horizontal line is the ***x*-axis** and the vertical line is the ***y*-axis**.

Each point in a coordinate plane corresponds to an **ordered pair** of real numbers. The first number is the ***x*-coordinate** and the second number is the ***y*-coordinate.**

A **scatter plot** is a coordinate graph containing points that represent real-life data.

EXAMPLE 1 *Plotting Points in a Coordinate Plane*

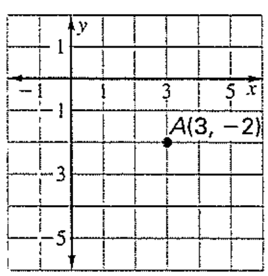
Plot and label the following ordered pairs in a coordinate plane.

a. $(3, -2)$ b. $(-4, 3)$

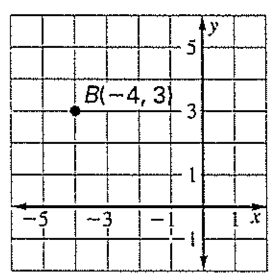
SOLUTION

To plot a point, you move along the horizontal and vertical lines in the coordinate plane and mark the location that corresponds to the ordered pair.

a. To plot the point $(3, -2)$, start at the origin. Move 3 units to the right and 2 units down.



b. To plot the point $(-4, 3)$, start at the origin. Move 4 units to the left and 3 units up.



Exercises for Example 1

Plot and label the ordered pairs in a coordinate plane.

1. $A(5, 4)$, $B(-3, 0)$, $C(-1, -2)$

2. $A(-3, 2)$, $B(0, 0)$, $C(2, -2)$

NAME ______________________ DATE __________

Practice with Examples

For use with pages 203–208

Plot and label the ordered pairs in a coordinate plane.

3. $A(0, -4), B(3, 5), C(3, -1)$

4. $A(-1, -2), B(5, -2), C(-4, 0)$

5. $A(-1, 3), B(2, 0), C(3, -2)$

6. $A(2, 4), B(-2, 5), C(0, 3)$

EXAMPLE 2 *Sketching a Scatter Plot*

The table below gives the U.S. postal rates (in cents) for first-class mail, based on the weight (in ounces) of the mail. Draw a scatter plot of the data and predict the postal rate for a piece of mail that weighs 8 ounces.

Weight (ounces)	1	2	3	4	5
Rate (cents)	33	55	77	99	121

SOLUTION

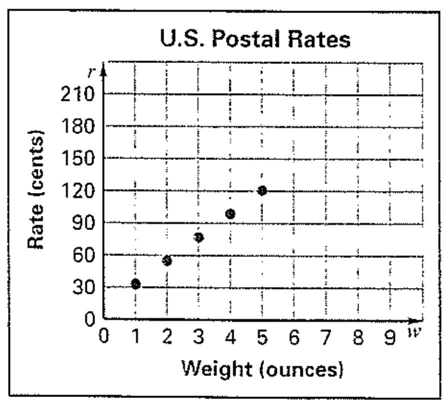
1. Rewrite the data in the table as a list of ordered pairs.

   (1, 33), (2, 55), (3, 77), (4, 99), (5, 121)

2. Draw a coordinate plane. Put weight w on the horizontal axis and rate r on the vertical axis.

3. Plot the points.

4. From the scatter plot, you can see that the points follow a pattern. By extending the pattern, you can predict that the postal rate for an 8 ounce piece of mail is about 187 cents, or $1.87.



NAME ______________________ DATE __________

Practice with Examples

For use with pages 203–208

Exercises for Example 2

In Exercises 7 and 8, make a scatter plot of the data. Use the horizontal axis to represent time.

7.

Year	1997	1998	1999	2000
Members	74	81	89	95

8.

Month	Jan.	Apr.	Aug.	Dec.
Adults	22	30	15	42

In Exercises 9 and 10, make a scatter plot of the data. Use the horizontal axis to represent quarts in Exercise 9 and hours in Exercise 10.

9.

Quarts	3.0	4.0	5.0	6.0
Gallons	0.75	1.0	1.25	1.5

10.

Hours	3	5	6	8
Rental charge (dollars)	12	20	24	32

Name ______________________________ Date ______________

Probabilities of Simple and Compound Events (pp. 119–123)

The **probability of an event** is a measure of the likelihood that the event will occur. The following examples describe how to find a **theoretical probability** and **odds** of an event occurring, and how to find the probabilities of **compound** events that are **independent** and **dependent**.

1. Find a Theoretical Probability

Vocabulary

Outcome A possible result of an experiment.

Event An outcome or a collection of outcomes.

Sample space The set of all possible outcomes.

Favorable outcomes The outcomes for a specified event.

Theoretical probability When all outcomes are equally likely, the theoretical probability $P(A)$ of event A is found by: $P(A) = \dfrac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$.

EXAMPLE **A bag contains 5 red, 6 blue, 4 green, and 9 yellow marbles. A student reaches in the bag and chooses a marble at random. What is the probability that the student chooses a yellow marble?**

When an object is chosen *at random*, all choices are equally likely.

Solution:

The bag holds a total of $5 + 6 + 4 + 9 = 24$ marbles. So, there are 24 possible outcomes. Of all the marbles, 9 are yellow. There are 9 favorable outcomes.

$$P(\text{yellow marble}) = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$$

$$= \frac{\text{Number of yellow marbles}}{\text{Total number of marbles}} = \frac{9}{24} = \frac{3}{8}$$

PRACTICE **A soccer coach has a box that contains 3 small, 6 medium, 7 large, and 4 extra-large soccer jerseys. A player chooses a jersey at random. Find the probability that the player chooses a jersey of the given size.**

1. small **2.** medium **3.** large **4.** extra-large

2. Find the Odds

Vocabulary

Odds The odds of an event compare the number of favorable and unfavorable outcomes when all outcomes are equally likely.

$$\text{Odds in favor} = \frac{\text{Number of favorable outcomes}}{\text{Number of unfavorable outcomes}}$$

$$\text{Odds against} = \frac{\text{Number of unfavorable outcomes}}{\text{Number of favorable outcomes}}$$

Odds are read as the ratio of one number to another. The odds here are read as "five to one." Odds are usually written as $a : b$.

EXAMPLE **A number cube is rolled. Find the odds against a 4 being rolled.**

Solution:

The 6 possible outcomes are all equally likely. The one favorable outcome is a roll of 4. Rolling the other numbers are unfavorable outcomes.

$$\text{Odds against rolling a } 4 = \frac{\text{Number of unfavorable outcomes}}{\text{Number of favorable outcomes}} = \frac{5}{1} \text{ or } 5 : 1$$

PRACTICE **A standard deck of 52 cards is shuffled and a card is drawn at random. Find the odds in favor of and against each of the following events.**

5. a red ace is drawn

6. a 6 is drawn

7. a spade is drawn

8. a face card is drawn

3. Compare Measures of Central Tendency

Vocabulary

The median of a data set with an even number of values is the mean of the two middle values.

Mean For the data set $x_1, x_2, ..., x_n$ the mean, or *average*, is

$$\bar{x} = \frac{x_1 + x_2 + \cdots + x_n}{n}.$$

Median The middle number of a numerical data set when the values are written in numerical order.

Mode The value of a data set is that occurs most frequently; there may be one, more than one, or no mode.

EXAMPLE **The daily high temperatures (in degrees Fahrenheit) for a city during one week are listed below. Which measure of central tendency best represents the data?**

Solution:

35, 35, 45, 48, 64, 69, 75

$$\bar{x} = \frac{35 + 35 + 45 + 48 + 64 + 67 + 75}{7} = \frac{371}{7} = 53$$

The median is 48. The mode is 35.

The mean best represents the data. The mode is significantly less than most of the data. The mean and median both fall near the middle of the data, but the median is much closer to the lowest value than the highest value.

Name ______________________________ Date ______________

PRACTICE **The wingspans (in inches) of the birds in the zoo's raptor exhibit are listed below.**

10, 10, 39, 41, 42, 46, 48, 52

6. Find the mode of the data.

7. Find the median of the data.

8. Find the mean of the data.

9. Which measure of central tendency best represents the data?

5. Make a Stem-and-Leaf Plot

Vocabulary

A stem-and-leaf plot shows how data are distributed.

Stem-and-leaf plot A data display that organizes data based on their digits. Each value is separated into a *stem* (the leading digit(s)) and a *leaf* (the last digit). The plot also has a key that tells you how to read the data.

EXAMPLE **The final scores for a basketball team in 20 games are listed below. Make a stem-and-leaf plot of the data.**

Each stem defines an interval. For example, the stem 4 represents the interval 40–49. The data values in this interval are 44, 46, and 49.

65, 59, 63, 72, 84, 70, 51, 46, 50, 44, 66, 49, 58, 62, 77, 82, 73, 55, 63, 61

Solution:

Step 1: Separate the data into stems and leaves.

Final Scores

Stem	Leaves
4	6 4 9
5	9 1 0 8 5
6	5 3 6 2 3 1
7	2 0 7 3
8	4 2

Key: 6 | 5 = 65 points

Step 2: Write the leaves in increasing order.

Final Scores

Stem	Leaves
4	4 6 9
5	0 1 5 8 9
6	1 2 3 3 5 6
7	0 2 3 7
8	2 4

Key: 6 | 5 = 65 points

PRACTICE **The scores for 20 players in a charity golf tournament are listed below.**

101, 113, 82, 96, 74, 106, 102, 94, 110, 91, 105, 115, 78, 109, 114, 105, 97, 80, 94, 112

12. Make a stem-and-leaf plot of the data.

13. Describe the distribution of the data on the intervals represented by the stems. Are the data clustered together in a noticeable way? Explain.

Name ________________________________ Date ______________

BENCHMARK 6

(Chapters 11, 12, and 13)

6. Make a Histogram

Vocabulary

Since intervals have equal size, the bars of a histogram have equal width. There is no space between bars.

Frequency The number of data values in an interval.

Frequency table Groups data values into equal intervals, with no gaps between intervals and no intervals overlapping.

Histogram A bar graph that displays data from a frequency table. Each bar represents an interval. A bar's length indicates the frequency.

EXAMPLE **The prices (in dollars) of paperback books at a book fair are listed below. Make a histogram of the data.**

5.25, 5.50, 5.75, 5.75, 6.25, 6.50, 7.00, 7.00, 7.25, 7.75, 7.75, 8.25

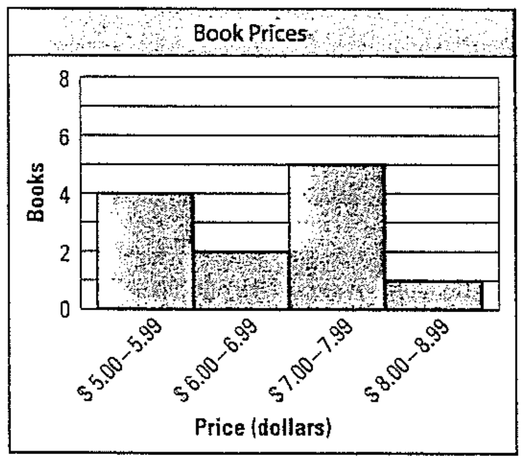
Solution:

Choose the interval size for the frequency by dividing the range of the data by the number of intervals you want in the table. Use the quotient as an approximate interval size.

Step 1: **Choose** intervals of equal size that cover all of the data values. Organize the data using a frequency table.

Price	Books
$5.00–5.99	IIII
$6.00–6.99	II
$7.00–7.99	𝍸
$8.00–8.99	I

Step 2: Draw the bars of the histogram using the intervals from the frequency table.



PRACTICE **Make a histogram.**

14. The average monthly high temperatures (in degrees Fahrenheit) of San Jose, California, are 59, 63, 67, 72, 77, 82, 84, 84, 82, 76, 65, and 59. Make a histogram of the data.

7. Make a Box-and-Whisker Plot

Vocabulary

Ordered data is divided into two halves by the median.

Lower quartile The median of the lower half of ordered data.

Upper quartile The median of the upper half of ordered data.

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EXAMPLE **The lengths of movies (in minutes) playing at a theater are listed below. Make a box-and-whisker plot of the movie lengths.**

132, 95, 86, 89, 105, 117, 128, 101, 107, 101, 127

Name ______________________ Date ____________

BENCHMARK 6
(Chapters 11, 12, and 13)

Solution:

Step 1: **Order** the data. Then find the median and the quartiles.

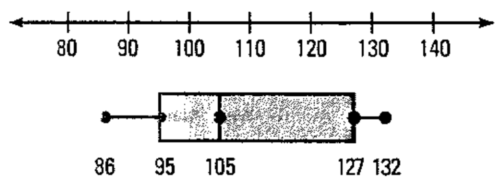
Median

Lower half ↓ Upper half

86, 89, 95, 101, 101, 105, 107, 117, 127, 128, 132

Lower quartile Upper quartile

Step 2: **Plot** the median, the quartiles, the maximum value, and the minimum value below a number line.



Step 3: **Draw** a box from the lower quartile to the upper quartile. Draw a vertical line through the median. Draw a line segment (a "whisker") from the box to the maximum and another from the box to the minimum.

Name ______________________________ Date ______________

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Name ____________________ Date ____________

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Solution:

Step 1: **Separate** the data into stems and leaves.

Final Scores

Stem	Leaves					
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5	9	1	0	8	5	
6	5	3	6	2	3	1
7	2	0	7	3		
8	4	2				

Key: 6 | 5 = 65 points

Step 2: **Write** the leaves in increasing order.

Final Scores

Stem	Leaves					
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5	0	1	5	8	9	
6	1	2	3	3	5	6
7	0	2	3	7		
8	2	4				

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BENCHMARK 6
F. Analyzing Data

Name ______________________________ Date ________________

BENCHMARK 6
(Chapters 11, 12, and 13)

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</table>

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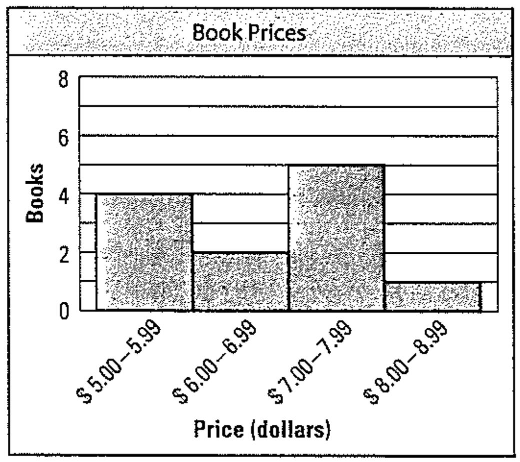

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Name ______________________________ Date ______________

BENCHMARK 6

(Chapters 11, 12, and 13)

Solution:

Step 1: Order the data. Then find the median and the quartiles.

Median

Lower half | Upper half

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Lower quartile | Upper quartile

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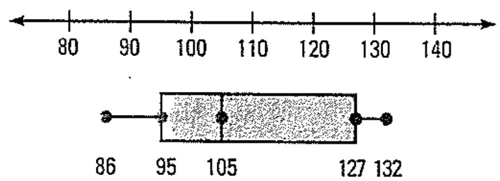

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