

Chapter Audio Summary for McDougal Littell *Algebra 1*

Chapter 4 Graphing Linear Equations and Functions

In Chapter 4 you saw that a relationship between variables can be expressed in algebraic form as an *equation* or in geometric form as a *graph*. Understanding the connection between equations and graphs is an important skill. This skill will help you to solve real-life problems.

Turn to the lesson-by-lesson Chapter Review that starts on p. 264 of the textbook.

Lesson 4.1 Coordinates and Scatter Plots

Important words to know are: *coordinate plane, ordered pair, x-coordinate, y-coordinate, x-axis, y-axis, origin, quadrants, graph of an ordered pair, and scatter plot.*

The first goal of Lesson 4.1 is to plot points in a coordinate plane. The second goal of Lesson 4.1 is to use what you learned about plotting points to make a scatter plot of data.

Each point in the plane corresponds to an ordered pair of real numbers. To plot the point (4, -2), start at the origin (the intersection of the *x*- and *y*- axes). Move 4 units to the **right** and 2 units **down**. To plot the point (-3, 1), move 3 units to the **left** and 1 unit **up**.

Now try Exercises 1 through 5. If you need help, go to the worked-out Examples on pages 203 through 205.

Lesson 4.2 Graphing Linear Equations

Important words to know are: *solution of an equation and graph of an equation.*

The first goal of Lesson 4.2 is to graph a linear equation. The second goal of Lesson 4.2 is to graph two special types of linear equations — equations of horizontal and vertical lines. The process is explained on page 213.

To graph the equation $3y = x - 6$, first rewrite the equation in function form by solving the equation for *y*. Divide each side of the equation by 3. You get $y = (x - 6)/3$. Next, choose a few values of *x* and make a table of values. Choose values that make the computation easy. Then plot the points and draw a line through them.

Now try Exercises 6 through 9. If you need help, go to the worked-out Examples on pages 210 through 213.

Lesson 4.3 Quick Graphs Using Intercepts

Important words to know are: *x-intercept and y-intercept.*

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The first goal of Lesson 4.3 is to find the intercepts of the graph of a linear equation. The x -intercept is the x -coordinate of a point where a graph crosses the x -axis. The y -intercept is the y -coordinate where a graph crosses the y -axis. Remember, the intercepts are numbers, not points.

To find the x -intercept of the graph of the equation, $y + 2x = 10$, substitute 0 for y and solve for x . You get $x = 5$. To find the y -intercept, substitute 0 for x and solve for y . You get $y = 10$.

The second goal of Lesson 4.3 is to use intercepts to make a quick graph of a linear equation. You can use the intercepts you just found, 5 and 10, to graph the equation $y + 2x = 10$. Since the x -intercept is 5, the graph crosses the x -axis at the point (5, 0). Since the y -intercept is 10, the graph crosses the y -axis at the point (0, 10).

Now you have two points that you can use to draw the graph. Plot the points (5, 0) and (0, 10) and draw a line through them.

Now try Exercises 10 through 13. If you need help, go to the worked-out Examples on pages 218 through 220.

Lesson 4.4 The Slope of a Line

Important terms to know are: *slope* and *rate of change*.

The first goal of Lesson 4.4 is to find the slope of a line using two of its points. The second goal of Lesson 4.4 is to interpret slopes as rates of change in real-life situations.

To find the slope of the line passing through the points $(-2, 5)$ and $(4, -7)$, let $(x_1, y_1) = (-2, 5)$ and $(x_2, y_2) = (4, -7)$. Write the formula for slope: $m = (y_2 - y_1) / (x_2 - x_1)$. Substitute values for x and y to get $m = (-7 - 5) / (4 - (-2))$ or -2 .

Now try Exercises 14 through 17. If you need help, go to the worked-out Examples on pages 226 through 229.

Lesson 4.5 Direct Variation

Important words to know are: *constant of variation* and *direct variation*.

The first goal of Lesson 4.5 is to write linear equations that represent direct variation. The second goal of Lesson 4.5 is to use a ratio to write an equation for direct variation, such as the ratio of tail length to body length in alligators.

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Two variables x and y *vary directly* if there is a nonzero number k such that $y = kx$. The number k is the constant of variation.

If x and y vary directly, and if $x = 3$ when $y = 18$, you can write an equation that relates x and y . First write the model for direct variation: $y = kx$. Substitute 3 for x and 18 for y to get $18 = k(3)$. To isolate k on one side, divide each side by 3 to get $6 = k$. Now substitute 6 for k in the equation $y = kx$: $y = 6x$.

Another way to solve for k is to rewrite $y = kx$ as $k = y/x$ and then substitute known values for x and y .

Now try Exercises 18 through 21. If you need help, go to the worked-out Examples on pages 234 through 236.

Lesson 4.6 Quick Graphs Using Slope-Intercept Form

Important words to know are: *slope-intercept form* and *parallel lines*.

The goal of Lesson 4.6 is to graph a linear equation in slope-intercept form.

You can find the slope of a line by using a given equation of the line, but only when the equation is in slope-intercept form.

To graph $4x + y = 0$, first write the equation in $y = mx + b$ form: $y = -4x$. Then find the slope and the y -intercept: the slope, m , is -4 ; the y -intercept, b , is 0. Plot the point $(0,0)$ and draw a slope triangle to locate a second point on the line. Draw a line through the two points.

Now try Exercises 22 through 24. If you need help, go to the worked-out Examples on pages 241 through 243.

Lesson 4.7 Solving Linear Equations Using Graphs

The goals of Lesson 4.7 are to solve a linear equation graphically and to use a graph to solve real-life problems.

To solve the equation $2x - 4 = 2$ graphically, first write the original equation: $2x - 4 = 2$. Then rewrite the equation in $ax + b = 0$ form to get $2x - 6 = 0$. Write the related function $y = 2x - 6$ and graph it. The x -intercept is 3 so the solution is 3. To check the solution, substitute 3 for x in the original equation: $2(3) - 4 = 2$. Simplify: $2 = 2$, so 3 is the solution.

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Now try Exercises 25 through 28. If you need help, go to the worked-out Examples on pages 250 through 252.

Lesson 4.8 Functions and Relations

Important words to know are: *relation*, *function notation*, and *graph of a function*.

The first goal of Lesson 4.8 is to identify when a relation is a function. In Lesson 1.7, you learned that a function is relationship between two quantities, called the *input* and the *output*. A relation is a function if, for every input there is exactly one output. To evaluate the function $f(x) = -(1/5)x + 1$ when $x = 15$, substitute the given value for x . First write the original function: $f(x) = -(1/5)x + 1$. Then substitute 15 for x : $f(15) = -(1/5)(15) + 1$. Simplify to get $f(15) = -2$. Remember to use the order of operations when simplifying.

The second goal of Lesson 4.8 is to use function notation to represent real-life situations, such as modeling butterfly migration.

Now try Exercises 29 through 32. If you need help, go to the worked-out Examples on pages 256 through 258.