15

Graphics and Java 2D™: Solutions

One picture is worth ten thousand words.
—Chinese proverb

Treat nature in terms of the cylinder, the sphere, the cone, all in perspective.
—Paul Cézanne

Colors, like features, follow the changes of the emotions.
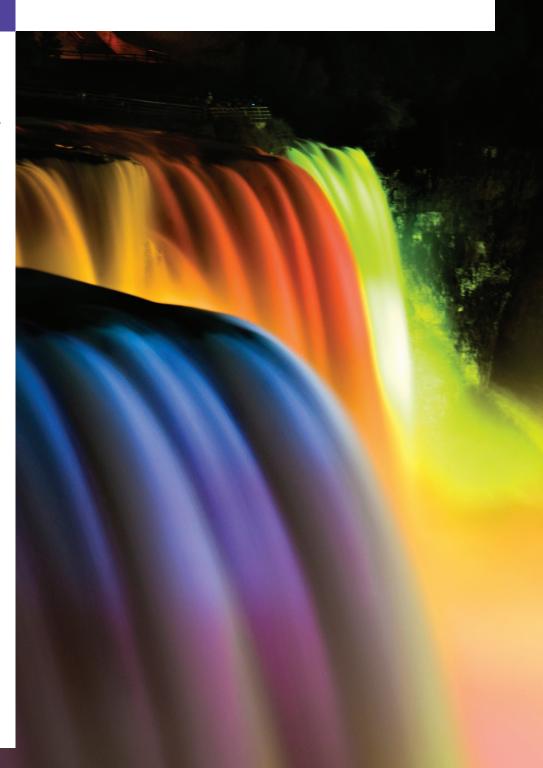—Pablo Picasso

Nothing ever becomes real till it is experienced—even a proverb is no proverb to you till your life has illustrated it.
—John Keats

Objectives

In this chapter you'll learn:

- To understand graphics contexts and graphics objects.
- To manipulate colors and fonts.
- To use methods of class `Graphics` to draw various shapes.
- To use methods of class `Graphics2D` from the `Java 2D` API to draw various shapes.
- To specify `Paint` and `Stroke` characteristics of shapes displayed with `Graphics2D`.

Self-Review Exercises

15.1 Fill in the blanks in each of the following statements:

a) In Java 2D, method _____ of class _____ sets the characteristics of a line used to draw a shape.

ANS: `setStroke, Graphics2D`.

b) Class _____ helps specify the fill for a shape such that the fill gradually changes from one color to another.

ANS: `GradientPaint`.

c) The _____ method of class `Graphics` draws a line between two points.

ANS: `drawLine`.

d) RGB is short for _____, _____ and _____.

ANS: red, green, blue.

e) Font sizes are measured in units called _____.

ANS: points.

f) Class _____ helps specify the fill for a shape using a pattern drawn in a `BufferedImage`.

ANS: `TexturePaint`.

15.2 State whether each of the following is *true* or *false*. If *false*, explain why.

a) The first two arguments of `Graphics` method `drawOval` specify the center coordinate of the oval.

ANS: False. The first two arguments specify the upper-left corner of the bounding rectangle.

b) In the Java coordinate system, *x*-coordinates increase from left to right and *y*-coordinates from top to bottom.

ANS: True.

c) `Graphics` method `fillPolygon` draws a filled polygon in the current color.

ANS: True.

d) `Graphics` method `drawArc` allows negative angles.

ANS: True.

e) `Graphics` method `getSize` returns the size of the current font in centimeters.

ANS: False. Font sizes are measured in points.

f) Pixel coordinate (0, 0) is located at the exact center of the monitor.

ANS: False. The coordinate (0,0) corresponds to the upper-left corner of a GUI component on which drawing occurs.

15.3 Find the error(s) in each of the following and explain how to correct them. Assume that `g` is a `Graphics` object.

a) `g.setFont( "SansSerif" );`

ANS: The `setFont` method takes a `Font` object as an argument—not a `String`.

b) `g.erase( x, y, w, h );     // clear rectangle at (x, y)`

ANS: The `Graphics` class does not have an `erase` method. The `clearRect` method should be used.

c) `Font f = new Font( "Serif", Font.BOLDITALIC, 12 );`

ANS: `Font.BOLDITALIC` is not a valid font style. To get a bold italic font, use `Font.BOLD + Font.ITALIC`.

d) `g.setColor( 255, 255, 0 );  // change color to yellow`

ANS: Method `setColor` takes a `Color` object as an argument, not three integers.

Exercises

NOTE: Solutions to the programming exercises are located in the **ch15solutions** *folder. Each exercise has its own folder named* **ex15_##** *where* **##** *is a two-digit number representing the exercise number. For example, exercise 15.17's solution is located in the folder* **ex15_17.**

15.4   Fill in the blanks in each of the following statements:

a)   Class _____ of the Java 2D API is used to draw ovals.

ANS: Ellipse2D.

b)   Methods draw and fill of class Graphics2D require an object of type _____ as their argument.

ANS: Shape.

c)   The three constants that specify font style are _____, _____ and _____.

ANS: Font.PLAIN, Font.BOLD and Font.ITALIC.

d)   Graphics2D method _____ sets the painting color for Java 2D shapes.

ANS: setColor.

15.5   State whether each of the following is *true* or *false*. If *false*, explain why.

a)   Graphics method drawPolygon automatically connects the endpoints of the polygon.

ANS: True.

b)   Graphics method drawLine draws a line between two points.

ANS: True.

c)   Graphics method fillArc uses degrees to specify the angle.

ANS: True.

d)   In the Java coordinate system, values on the *y*-axis increase from left to right.

ANS: False. In the Java coordinate system, values on the *y*-axis increase from top to bottom.

e)   Graphics inherits directly from class Object.

ANS: True.

f)   Graphics is an abstract class.

ANS: True.

g)   The Font class inherits directly from class Graphics.

ANS: False. Class Font inherits directly from class Object.