Chapter 2 Sample Programs

```
//********************************************************************
//  Countdown.java       Author: Lewis and Loftus
//  Demonstrates the difference between print and println.
//********************************************************************

public class Countdown
{
   //-----------------------------------------------------------------
   //  Prints two lines of output representing a rocket countdown.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      System.out.print ("Three... ");
      System.out.print ("Two... ");
      System.out.print ("One... ");
      System.out.print ("Zero... ");

      System.out.println ("Liftoff!");            // appears on first output line
      System.out.println ("Houston, we have a problem.");
   }
}

//********************************************************************
//  Facts.java       Author: Lewis and Loftus
//  Demonstrates the use of the string concatenation operator and the
//  automatic conversion of an integer to a string.
//********************************************************************

public class Facts
{
   //-----------------------------------------------------------------
   //  Prints various facts.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      // Strings can be concatenated into one long string
      System.out.println ("We present the following facts for your "
                          + "extracurricular edification:");

      System.out.println ();

      // A string can contain numeric digits
      System.out.println ("Letters in the Hawaiian alphabet: 12");

      // A numeric value can be concatenated to a string
      System.out.println ("International dialing code for Anarctica: " + 672);

      System.out.println ("Year in which Leonardo da Vinci invented " + "the parachute: " + 1515);

      System.out.println ("Speed of ketchup: " + 40 + " km per year");
   }
}
```

```
//********************************************************************
//  Addition.java       Author: Lewis and Loftus
//  Demonstrates the difference between the addition and string
//  concatenation operators.
//********************************************************************

public class Addition
{
   //-----------------------------------------------------------------
   //  Concatenates and adds two numbers and prints the results.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      System.out.println ("24 and 45 concatenated: " + 24 + 45);

      System.out.println ("24 and 45 added: " + (24 + 45));
   }
}

//********************************************************************
//  Roses.java       Author: Lewis and Loftus
//  Demonstrates the use of escape sequences.
//********************************************************************

public class Roses
{
   //-----------------------------------------------------------------
   //  Prints a poem (of sorts) on multiple lines.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      System.out.println ("Roses are red,\n\tViolets are blue,\n" +
         "Sugar is sweet,\n\tBut I have \"commitment issues\",\n\t" +
         "So I'd rather just be friends\n\tAt this point in our " +
         "relationship.");
   }
}

//********************************************************************
//  PianoKeys.java       Author: Lewis and Loftus
//  Demonstrates the declaration, initialization, and use of an
//  integer variable.
//********************************************************************

public class PianoKeys
{
   //-----------------------------------------------------------------
   //  Prints the number of keys on a piano.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      int keys = 88;
      System.out.println ("A piano has " + keys + " keys.");
   }
}
```

```
//********************************************************************
//  Geometry.java       Author: Lewis and Loftus
//  Demonstrates the use of an assignment statement to change the
//  value stored in a variable.
//********************************************************************

public class Geometry
{
   //-----------------------------------------------------------------
   //  Prints the number of sides of several geometric shapes.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      int sides = 7;                  // declaration with initialization
      System.out.println ("A heptagon has " + sides + " sides.");

      sides = 10;                     // assignment statement
      System.out.println ("A decagon has " + sides + " sides.");

      sides = 12;
      System.out.println ("A dodecagon has " + sides + " sides.");
   }
}

//********************************************************************
//  StringMutation.java       Author: Lewis and Loftus
//  Demonstrates the use of the String class and its methods.
//********************************************************************

public class StringMutation
{
   //-----------------------------------------------------------------
   //  Prints a string and various mutations of it.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      String phrase = new String ("Change is inevitable");
      String mutation1, mutation2, mutation3, mutation4;

      System.out.println ("Original string: \"" + phrase + "\"");
      System.out.println ("Length of string: " + phrase.length());

      mutation1 = phrase.concat (", except from vending machines.");
      mutation2 = mutation1.toUpperCase();
      mutation3 = mutation2.replace ('E', 'X');
      mutation4 = mutation3.substring (3, 30);

      // Print each mutated string
      System.out.println ("Mutation #1: " + mutation1);
      System.out.println ("Mutation #2: " + mutation2);
      System.out.println ("Mutation #3: " + mutation3);
      System.out.println ("Mutation #4: " + mutation4);
      System.out.println ("Mutated length: " + mutation4.length());
   }
}
```

```
//********************************************************************
//  RandomNumbers.java       Author: Lewis and Loftus
//  Demonstrates the import statement, and the creation of pseudo-
//  random numbers using the Random class.
//********************************************************************
import java.util.Random;
public class RandomNumbers
{
   //-----------------------------------------------------------------
   //  Generates random numbers in various ranges.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      Random generator = new Random();
      int num1;
      float num2;

      num1 = generator.nextInt();
      System.out.println ("A random integer: " + num1);

      num1 = Math.abs (generator.nextInt()) % 10;
      System.out.println ("0 to 9: " + num1);

      num1 = Math.abs (generator.nextInt()) % 10 + 1;
      System.out.println ("1 to 10: " + num1);

      num1 = Math.abs (generator.nextInt()) % 20 + 10;
      System.out.println ("10 to 29: " + num1);

      num2 = generator.nextFloat();
      System.out.println ("A random float [between 0-1]: " + num2);

      num2 = generator.nextFloat() * 6;  // 0 to 5
      num1 = (int) num2 + 1;
      System.out.println ("1 to 6: " + num1);
   }
}

//********************************************************************
//  Echo.java       Author: Lewis and Loftus
//  Demonstrates the use of the readString method of the Keyboard class.
//********************************************************************
import cs1.Keyboard;
public class Echo
{
   //-----------------------------------------------------------------
   //  Reads a character string from the user and prints it.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      String message;
      System.out.println ("Enter a line of text:");
      message = Keyboard.readString();
      System.out.println ("You entered: \"" + message + "\"");
   }
}
```

```
//********************************************************************
//  Quadratic.java       Author: Lewis and Loftus
//  Demonstrates a calculation based on user input.
//********************************************************************

import cs1.Keyboard;
public class Quadratic
{
   //-----------------------------------------------------------------
   //  Determines the roots of a quadratic equation.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      int a, b, c;                                  // ax^2 + bx + c

      System.out.print ("Enter the coefficient of x squared: ");
      a = Keyboard.readInt();

      System.out.print ("Enter the coefficient of x: ");
      b = Keyboard.readInt();

      System.out.print ("Enter the constant: ");
      c = Keyboard.readInt();

      // Use the quadratic formula to compute the roots.
      // Assumes a positive discriminant.
      double discriminant = Math.pow(b, 2) - (4 * a * c);
      double root1 = ((-1 * b) + Math.sqrt(discriminant)) / (2 * a);
      double root2 = ((-1 * b) - Math.sqrt(discriminant)) / (2 * a);

      System.out.println ("Root #1: " + root1);
      System.out.println ("Root #2: " + root2);
   }
}

//********************************************************************
//  Price.java       Author: Lewis and Loftus
//  Demonstrates the use of various Keyboard and NumberFormat
//  methods.
//********************************************************************

import cs1.Keyboard;
import java.text.NumberFormat;

public class Price
{
   //-----------------------------------------------------------------
   //  Calculates the final price of a purchased item using values
   //  entered by the user.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      final double TAX_RATE = 0.06;  // 6% sales tax

      int quantity;
      double subtotal, tax, totalCost, unitPrice;
```

```
      System.out.print ("Enter the quantity: ");
      quantity = Keyboard.readInt();

      System.out.print ("Enter the unit price: ");
      unitPrice = Keyboard.readDouble();

      subtotal = quantity * unitPrice;
      tax = subtotal * TAX_RATE;
      totalCost = subtotal + tax;

      // Print output with appropriate formatting
      NumberFormat money = NumberFormat.getCurrencyInstance();
      NumberFormat percent = NumberFormat.getPercentInstance();

      System.out.println ("Subtotal: " + money.format(subtotal));
      System.out.println ("Tax: " + money.format(tax) + " at "
                          + percent.format(TAX_RATE));
      System.out.println ("Total: " + money.format(totalCost));
    }
}

//********************************************************************
//  CircleStats.java       Author: Lewis and Loftus
//  Demonstrates the formatting of decimal values using the
//  DecimalFormat class.
//********************************************************************
import cs1.Keyboard;
import java.text.DecimalFormat;

public class CircleStats
{
  //-----------------------------------------------------------------
  //  Calculates the area and circumference of a circle given its
  //  radius.
  //-----------------------------------------------------------------
  public static void main (String[] args)
  {
    int radius;
    double area, circumference;

    System.out.print ("Enter the circle's radius: ");
    radius = Keyboard.readInt();

    area = Math.PI * Math.pow(radius, 2);
    circumference = 2 * Math.PI * radius;

    // Round the output to three decimal places
    DecimalFormat fmt = new DecimalFormat ("0.###");
    System.out.println ("The circle's area: " + fmt.format(area));
    System.out.println ("The circle's circumference: "
                                      + fmt.format(circumference));
  }
}
```

```
//********************************************************************
//  Einstein.java       Author: Lewis and Loftus
//  Demonstrates a simple applet.
//********************************************************************

import java.applet.Applet;
import java.awt.*;
public class Einstein extends Applet
{
   //-----------------------------------------------------------------
   //  Draws a quotation by Albert Einstein among some shapes.
   //-----------------------------------------------------------------
   public void paint (Graphics page)
   {
      page.drawRect (50, 50, 40, 40);                 // square
      page.drawRect (60, 80, 225, 30);                // rectangle
      page.drawOval (75, 65, 20, 20);                 // circle
      page.drawLine (35, 60, 100, 120);               // line
      page.drawString ("Out of clutter, find simplicity.", 110, 70);
      page.drawString ("-- Albert Einstein", 130, 100);
   }
}

<HTML>
<HEAD>
<TITLE>The Einstein Applet</TITLE>
</HEAD>
<BODY>
<center>
<H3>The Einstein Applet</H3>
<applet code="Einstein.class" width=350 height=175></applet>
</center>

<p>Above this text you should see a picture of a some shapes and a quote by
Albert Einstein. This picture is generated by a Java applet. If you don't see
the picture, it may be because your browser is not set up to process Java
applets, or because the bytecode version of the applet is not stored in the
same location as this web page.
</BODY>
</HTML>
```

```
//********************************************************************
//  Snowman.java       Author: Lewis and Loftus
//  Demonstrates basic drawing methods and the use of color.
//********************************************************************

import java.applet.Applet;
import java.awt.*;
public class Snowman extends Applet
{
  //-----------------------------------------------------------------
  //  Draws a snowman.
  //-----------------------------------------------------------------
  public void paint (Graphics page)
  {
    final int MID = 150;
    final int TOP = 50;

    setBackground (Color.cyan);

    page.setColor (Color.blue);
    page.fillRect (0, 175, 300, 50);  // ground
    page.setColor (Color.yellow);
    page.fillOval (-40, -40, 80, 80);  // sun
    page.setColor (Color.white);
    page.fillOval (MID-20, TOP, 40, 40);      // head
    page.fillOval (MID-35, TOP+35, 70, 50);   // upper torso
    page.fillOval (MID-50, TOP+80, 100, 60);  // lower torso
    page.setColor (Color.black);
    page.fillOval (MID-10, TOP+10, 5, 5);   // left eye
    page.fillOval (MID+5, TOP+10, 5, 5);    // right eye
    page.drawArc (MID-10, TOP+20, 20, 10, 190, 160);   // smile
    page.drawLine (MID-25, TOP+60, MID-50, TOP+40);  // left arm
    page.drawLine (MID+25, TOP+60, MID+55, TOP+60);  // right arm
    page.drawLine (MID-20, TOP+5, MID+20, TOP+5);  // brim of hat
    page.fillRect (MID-15, TOP-20, 30, 25);        // top of hat
  }
}
```

```
<HTML>
<HEAD>
<TITLE>The Snowman Applet</TITLE>
</HEAD>
<BODY>

<center>
<H3>The Snowman Applet</H3>
<applet code="Snowman.class" width=300 height=225></applet>
</center>

<p>Above this text you should see a picture of a snowman. This picture is
generated by a Java applet. If you don't see the picture, it may be because
your browser is not set up to process Java applets, or because the bytecode
version of the applet is not stored in the same location as this web page.

</BODY>
</HTML>
```

```
//********************************************************************
//  TempConverter.java       Author: Lewis and Loftus
//  Demonstrates the use of primitive data types and arithmetic
//  expressions.
//********************************************************************

public class TempConverter
{
   //-----------------------------------------------------------------
   //  Computes the Fahrenheit equivalent of a specific Celsius
   //  value using the formula F = (9/5)C + 32.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      final int BASE = 32;
      final double CONVERSION_FACTOR = 9.0 / 5.0;

      int celsiusTemp = 24;                        // value to convert
      double fahrenheitTemp;

      fahrenheitTemp = celsiusTemp * CONVERSION_FACTOR + BASE;

      System.out.println ("Celsius Temperature: " + celsiusTemp);
      System.out.println ("Fahrenheit Equivalent: " + fahrenheitTemp);
   }
}
```