EX 3.11 Write code statements to create a `DecimalFormat` object that will round a formatted value to four decimal places. Then write a statement that uses that object to print the value of `result`, properly formatted.

EX 3.12 Write code statements that prompt for and read a `double` value from the user, and then print the result of raising that value to the fourth power. Output the results to three decimal places.

EX 3.13 Write a declaration for an enumerated type that represents the months of the year.

**Programming Projects**

PP 3.1 Write a program that prompts for and reads the user’s city and country (separately). Then print a string composed of the first two letters of the user’s country, followed by a comma and then followed by user’s city, followed by a random number in the range 1 to 100 which represents the pin code of the city. Similar patterns of representation are sometimes used to store user’s address when a new account is registered.

PP 3.2 Write a program that prints the square of the product. Prompt for and read three integer values and print the square of the product of all the three integers.

PP 3.3 Write a program that creates and prints a random phone number of the form XXX–XXX–XXXX. Include the dashes in the output. Do not let the first three digits contain an 8 or 9 (but don’t be more restrictive than that), and make sure that the second set of three digits is not greater than 655. *Hint:* Think through the easiest way to construct the phone number. Each digit does not have to be determined separately.

PP 3.4 Write a program that reads an integer value and prints the value of e raised to the power of that number. For example, if the number is 2, the program would print 7.389056 (where, e = 2.71828).

PP 3.5 Write a program that reads the (x, y) coordinates for two points which form a straight line. Compute the slope of the line using the following formula:

\[
Slope \ (m) = \frac{y_2 - y_1}{x_2 - x_1}
\]
PP 3.6 Write a program that reads the radius of a sphere and prints its volume and surface area. Use the following formulas. Print the output to four decimal places. \( r \) represents the radius.

Volume \( = \frac{4}{3} \pi r^3 \)
Surface Area \( = 4\pi r^2 \)

PP 3.7 Write a program that reads the two sides and the height of a trapezoid from the user. Compute the area of the trapezoid using the formula given below, in which \( b \) represents the vertical height of the trapezoid and \( a \) and \( b \) represent the two sides of a trapezoid. Print the area to two decimal places.

\[
Area = \frac{(a + b)}{2} \times b
\]

PP 3.8 Write a program that generates two random integers in the range 1 to 20, inclusive, and displays the sine and cosine of the sum of those two integers.

PP 3.9 Write a program that generates a random integer base (b), height (h) and a side (a) for a parallelogram in the range 10 to 30, inclusive, and then computes the area and perimeter of the parallelogram.

\[
Area = \text{base} \times \text{height}
\]
\[
Perimeter = 2(a + b)
\]

PP 3.10 Write a program that displays a frame containing three labels that displays the name of the city, country and its pin code. Ensure that the labels change their orientation when the size of the window is increased or decreased.

PP 3.11 Write a program that displays a frame containing six panels. Each panel should contain exactly one image (use six unique images of your choice). Allow all the panels to change the size as needed and set different background colors for each of the six panels. Experiment with the size of the window to see the images change orientation. Make sure you understand why the application behaves as it does.

PP 3.12 Modify the NestedPanels program so that it displays four panels within a fifth, each with a different color and a different label.
Chapter 4 Writing Classes

Programming Projects

PP 4.1 Write a class called NumberOfGoals that represents the total number of goals scored by a football team. The NumberOfGoals class should contain a single integer as instance data, representing the number of goals scored. Write a constructor to initialize the number of goals to zero. Write a method called setGoal that increments the value by one whenever a goal is scored, and another method called getGoal that returns the total number of goals scored so far. Finally, create a driver class called GoalTracker that creates a few NumberOfGoals objects and tests their methods.

PP 4.2 Write a class called BitValue that represents binary digits that can be set to true or false. Create a driver class called Bits whose main method instantiates and sets a few bits to true.

PP 4.3 Write a class called Circle that contains instance data that represents the circle’s radius. Define the Circle constructor to accept and initialize the radius, and include getter and setter methods for the radius. Include methods that calculate and return the circumference and area of the sphere. Include a toString method that returns a one-line description of the circle. Create a driver class called MultiCircle, whose main method instantiates and updates several Circle objects. [Circumference = $2\pi r$ and Area = $\pi r^2$].

PP 4.4 Write a class called Dog that contains instance data that represents the dog’s name and age. Define the Dog constructor to accept and initialize instance data. Include getter and setter methods for the name and age. Include a method to compute and return the age of the dog in “person years” (seven times the dog’s age). Include a toString method that returns a one-line description of the dog. Create a driver class called Kennel, whose main method instantiates and updates several Dog objects.

PP 4.5 Write a class called Phone that contains instance data that represents the make, model, and year of the phone. Define the Phone constructor to initialize these values. Include getter and setter methods for all instance data, and a toString method that returns a one-line description of the phone. Add a method called isObsolete that returns a boolean indicating if the phone is obsolete (if it is more than 10 years old). Create a driver class called PhoneCheck, whose main method instantiates and updates several Phone objects.
PP 4.6 Write a class called Shelf that contains instance data that represents the length, breadth, and capacity of the shelf. Also include a boolean variable called occupied as instance data that represents whether the shelf is occupied or not. Define the Shelf constructor to accept and initialize the height, width, and capacity of the shelf. Each newly created Shelf is vacant (the constructor should initialize occupied to false). Include getter and setter methods for all instance data. Include a toString method that returns a one-line description of the shelf. Create a driver class called ShelfCheck, whose main method instantiates and updates several Shelf objects.

PP 4.7 Write a class called Laptop that contains instance data for the laptop model, make, purchaser, and purchase year. Define the Laptop constructor to accept and initialize this data. Include setter and getter methods for all instance data. Include a toString method that returns a nicely formatted, multi-line description of the laptop purchase. Create a driver class called LaptopRecords whose main method instantiates and updates several Laptop objects.

PP 4.8 Write a class called Course that represents a course offered to students. It should contain instance data that represents the course title, course code, credits and course Instructor’s name. Define the Course constructor to accept and initialize all instance data. Include getter and setter methods for all instance data. Include a toString method that returns a one-line description of the course. Create a driver class called CourseDetails whose main method instantiates and updates several Course objects.

PP 4.9 Using the Die class defined in this chapter, write a class called PairOfDice, composed of two Die objects. Include methods to set and get the individual die values, a method to roll the dice, and a method that returns the current sum of the two die values. Create a driver class called RollingDice2 to instantiate and use a PairOfDice object.

PP 4.10 Write a class called BarChart that compares the data using a bar graph representation. Allow the parameters to the constructor to specify the bar’s width and height. Every bar in the graph must have the same color for clear representation of the data. Create a program that draws bars of random size.

PP 4.11 Write a program that displays a graphical, seating chart for a berth reservation. Create a class called Passenger (as in one who travels)