1. Write an application that inputs from the user the radius of a circle as an integer and prints the circle's diameter, circumference and area using the floating-point value 3.14159 for π. Use the techniques shown in Fig. 2.7. [*Note:* You may also use the predefined constant Math.PI for the value of π. This constant is more precise than the value 3.14159. Class Math is defined in package java.lang. Classes in that package are imported automatically, so you do not need to import class Math to use it.] Use the following formulas (*r* is the radius):

   diameter = 2r
   circumference = 2πr
   area = πr2

   Do not store the results of each calculation in a variable. Rather, specify each calculation as the value that will be output in a System.out.printf statement. Note that the values produced by the circumference and area calculations are floating-point numbers. Such values can be output with the format specifier %f in a System.out.printf statement.

   Your output should appear as follows:

```
Enter radius: 3
Diameter is 6
Area is 28.274334
Circumference is 18.849556
```

2. Write an application that reads an integer and determines and prints whether it is odd or even. [*Hint:* Use the remainder operator. An even number is a multiple of 2. Any multiple of 2 leaves a remainder of 0 when divided by 2.]

   Your output should appear as follows:

```
Enter integer: 17
Number is odd
```

```
Enter integer: 14
Number is even
```

3. Create a class called Invoice that a hardware store might use to represent an invoice for an item sold at the store. An Invoice should include four pieces of information as instance variables—a part number (type String), a part description (type String), a quantity of the item being purchased (type int) and a price per item (double). Your class should have a constructor that initializes the four instance variables. Provide a *set* and a *get* method for each instance variable. In addition, provide a method named getInvoiceAmount that calculates the invoice amount (i.e., multiplies the quantity by the price per item), then returns the amount as a double value. If the quantity is not positive, it should be set to 0. If the price per item is not positive, it should be set to 0.0. Write a test application named InvoiceTest that demonstrates class Invoice's capabilities.

   Your output should appear as follows:

```
Original invoice information
Part number: 1234
Description: Hammer
Quantity: 2
Price: 14.95
Invoice amount: 29.90

Updated invoice information
Part number: 001234
Description: Yellow Hammer
Quantity: 3
Price: 19.49
Invoice amount: 58.47

Original invoice information
Part number: 5678
Description: Paint Brush
Quantity: 0
Price: 0.00
Invoice amount: 0.00

Updated invoice information
Part number: 5678
Description: Paint Brush
Quantity: 3
Price: 9.49
Invoice amount: 28.47
```

4. Create a class called Date that includes three pieces of information as instance variables—a month (type int), a day (type int) and a year (type int). Your class should have a constructor that initializes the three instance variables and assumes that the values provided are correct. Provide a *set* and a *get* method for each instance variable. Provide a method displayDate that displays the month, day and year separated by forward slashes (/). Write a test application named DateTest that demonstrates class Date's capabilities.

Your output should appear as follows:

```
The initial date is: 7/4/2004
Date with new values is: 11/1/2003
```

5. Write a Java application that uses looping to print the following table of values:

```
N         10*N       100*N      1000*N

1         10         100        1000
2         20         200        2000
3         30         300        3000
4         40         400        4000
5         50         500        5000
```

6. Write an application that uses only the output statements

   System.out.print("* ");
   System.out.print(" ");
   System.out.println();

to display in the command window the checkerboard pattern that follows:

```
* * * * * * * *
 * * * * * * * *
* * * * * * * *
 * * * * * * * *
* * * * * * * *
 * * * * * * * *
* * * * * * * *
 * * * * * * * *
```

7. Calculate the value of π from the infinite series

$$\pi = 4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} + \cdots$$

Print a table that shows the value of π approximated by computing one term of this series, by two terms, by three terms, and so on. How many terms of this series do you have to use before you first get 3.14? 3.141? 3.1415? 3.14159?

```
Accuracy: 400

Term            Pi
1               4.0000000000000000
2               2.6666666666666670
3               3.4666666666666670
4               2.8952380952380956
5               3.3396825396825403

.
.
.

395             3.1441242951029738
396             3.1390674050903313
397             3.1441115412820086
398             3.1390800947411280
399             3.1440989153182923
400             3.1390926574960143
```

8. *("The Twelve Days of Christmas" Song)* Write an application that uses repetition and switch statements to print the song "The Twelve Days of Christmas." One switch statement should be used to print the day (i.e., "First," "Second," etc.). A separate switch statement should be used to print the remainder of each verse. Visit the Web site www.12days.com/library/carols/12daysofxmas.htm for the complete lyrics of the song.

Your output should appear as follows:

```
On the first day of Christmas, my true love gave to me:
a Partridge in a pear tree.

On the second day of Christmas, my true love gave to me:
Two turtle doves, and
a Partridge in a pear tree.

On the third day of Christmas, my true love gave to me:
Three French hens,
Two turtle doves, and
a Partridge in a pear tree.

On the fourth day of Christmas, my true love gave to me:
Four calling birds,
Three French hens,
Two turtle doves, and
a Partridge in a pear tree.

On the fifth day of Christmas, my true love gave to me:
Five golden rings.
Four calling birds,
Three French hens,
Two turtle doves, and
a Partridge in a pear tree.

On the sixth day of Christmas, my true love gave to me:
Six geese-a-laying,
Five golden rings.
Four calling birds,
Three French hens,
Two turtle doves, and
a Partridge in a pear tree.

On the seventh day of Christmas, my true love gave to me:
Seven swans-a-swimming,
Six geese-a-laying,
Five golden rings.
Four calling birds,
Three French hens,
Two turtle doves, and
a Partridge in a pear tree.
```

```
On the eighth day of Christmas, my true love gave to me:
Eight maids-a-milking,
Seven swans-a-swimming,
Six geese-a-laying,
Five golden rings.
Four calling birds,
Three French hens,
Two turtle doves, and
a Partridge in a pear tree.

On the ninth day of Christmas, my true love gave to me:
Nine ladies dancing,
Eight maids-a-milking,
Seven swans-a-swimming,
Six geese-a-laying,
Five golden rings.
Four calling birds,
Three French hens,
Two turtle doves, and
a Partridge in a pear tree.

On the tenth day of Christmas, my true love gave to me:
Ten drummers drumming,
Nine ladies dancing,
Eight maids-a-milking,
Seven swans-a-swimming,
Six geese-a-laying,
Five golden rings.
Four calling birds,
Three French hens,
Two turtle doves, and
a Partridge in a pear tree.

On the eleventh day of Christmas, my true love gave to me:
Eleven pipers piping,
Ten drummers drumming,
Nine ladies dancing,
Eight maids-a-milking,
Seven swans-a-swimming,
Six geese-a-laying,
Five golden rings.
Four calling birds,
Three French hens,
Two turtle doves, and
a Partridge in a pear tree.

On the twelfth day of Christmas, my true love gave to me:
Twelve lords-a-leaping,
Eleven pipers piping,
Ten drummers drumming,
Nine ladies dancing,
Eight maids-a-milking,
Seven swans-a-swimming,
Six geese-a-laying,
Five golden rings.
Four calling birds,
Three French hens,
Two turtle doves, and
a Partridge in a pear tree.
```

9. Write method distance to calculate the distance between two points (*x1*, *y1*) and (*x2*, *y2*). All numbers and return values should be of type double. Incorporate this method into an application that enables the user to enter the coordinates of the points.

Your output should appear as follows:

```
Type the end-of-file indicator to terminate
   On UNIX/Linux/Mac OS X type <ctrl> d then press Enter
   On Windows type <ctrl> z then press Enter
Or Enter X1: 1
Enter Y1: 1
Enter X2: 4
Enter Y2: 5
Distance is 5.000000

Type the end-of-file indicator to terminate
   On UNIX/Linux/Mac OS X type <ctrl> d then press Enter
   On Windows type <ctrl> z then press Enter
Or Enter X1: ^Z
```

10. Write an application that prompts the user for the radius of a circle and uses a method called circleArea to calculate the area of the circle.

Your output should appear as follows:

```
Enter the radius (negative to quit): 10
Area is 314.159265
Enter the radius (negative to quit): -1
```