Chapter 1

1. a. True; b. False; c. True; d. True; e. False; f; False; g. True; h. True; i. True;

2. Keyboard and mouse.

3. Monitor and printer.

4. Because programs and data must be stored in main memory before processing and because everything in main memory is lost when the computer is turned off, information stored in main memory must be transferred to some other device for permanent storage. Secondary storage permanently stores programs and data.

5. An operating system monitors the overall activity of the computer and provides services. Some of these services include memory management, input/output activities, and storage management.

6. A program written in a high-level language is called a source program.

7. Syntax errors.

8. Every computer directly understands its machine language. Therefore, for the computer to execute a program written in a high level language, the high level language program must be translated into the computer's machine language.

9. Instructions in a high level language are closer to the natural language, such as English, and therefore, are easier to understand and learn than the machine language.

10. A well-analyzed problem leads to a well designed algorithm. Moreover, a program that is well-analyzed is easier to modify and spot and fix errors.

11. To find the weighted average of the four test scores, first you need to know each test score and its weight. Next, you multiply each test score with its weight, and then add these numbers to get the average. Therefore,

    1. Get `testScore1, weightTestScore1`

    2. Get `testScore2, weightTestScore2`

    3. Get `testScore3, weightTestScore3`

    4. Get `testScore4, weightTestScore4`

    5. ```
       weightedAverage = testScore1 * weightTestScore1 +
                         testScore2 * weightTestScore2 +
                         testScore3 * weightTestScore3 +
                         testScore4 * weightTestScore4;
       ```

12. To find the price per square inch, first we need to find the area of the pizza. Then we divide the price of the pizza by the area of the pizza. Let `radius` denote the radius and `area` denote the area of the circle, and `price` denote the price of pizza. Also, let `pricePerSquareInch` denote the price per square inch.

    a. Get `radius`

    b. `area = π * radius * radius`

    c. Get `price`

    d. `pricePerSquareInch = price / area`

13. To calculate the selling price of the item, we need to know the original price (the price the store pays to buy), the item. We can then the use the following formula to find the selling price:

```
sellingPrice = originalPrice + originalPrice * .60
```

The algorithm is as follows:

a. Get `originalPrice`

b. Calculate the `sellingPrice` using the formula:

```
sellingPrice = originalPrice + originalPrice * .60
```

The information needed to calculate the selling price is the original price and the marked up percentage.

14. To calculate the area of the triangle using the given formula, we need to know the lengths of the sides, `a`, `b`, and `c`, of the triangle. Next we calculate `s` using the formula

```
s = (1/2)(a + b + c)
```

next calculate the area using the formula:

```
area = sqrt(s(s-a)(s-b)(s-c))
```

where `sqrt` denote the square root.

The algorithm is therefore:

a. Get `a`, `b`, `c`

b. `s = (1/2)(a + b + c)`

c. `area = sqrt(s(s-a)(s-b)(s-c))`

The information need to calculate the area of the triangle is the lengths of the sides of the triangle.

15. Let r denote the radius of the circle. Given the lengths a, b, and c, such that $a + b + c$ is the circumference of the circle, we have $2\pi r = a + b + c$. This implies that $r = (a + b + c) / (2\pi)$. We can now write the algorithm as follows:

a. Get the values of `a`, `b`, `c`

b. Calculate `r` using the formula:

$$r = (a + b + c) / (2\pi)$$

16. Suppose `averageTestScore` denotes the average test score, `highestScore` denotes the highest test score, `testScore` denotes a test score, `sum` denote the sum of all the test scores, and `count` denotes the number of students in class, and `studentName` denotes the name of a student.

a. First you design an algorithm to find the average test score. To find the average test score, first you need to count the number of students in the class and add the test score of each student. You then divide the sum by count to find the average test score. The algorithm to find the average test score is as follows:

i. Set `sum` and `count` to 0.

ii. Repeat the following for each student in class.

1. Get `testScore`

2. Increment `count` and update the value of `sum` by adding the current test score to `sum`.

iii. Use the following formula to find the average test score.

```
if (count is 0)

    averageTestScore = 0;

otherwise
```

```
                averageTestScore = sum / count;
```

b. The following algorithm determines and prints the names of all the students whose test score is below the average test score.

Repeat the following for each student in class:

i.   Get `studentName` and `testScore`

ii.

```
if (testScore is less than averageTestScore)
    print studentName
```

c. The following algorithm determines and highest test score

i.   Get first student's test score and call it `highestTestScore`.

ii. Repeat the following for each of the remaining student in class

1. Get `testScore`

2.

```
if (testScore is greater than highestTestScore)
    highestTestScore = testScore;
```

d. To print the names of all the students whose test score is the same as the highest test score, compare the test score of each student with the highest test score and if they are equal print the name. The following algorithm accomplishes this

Repeat the following for each student in class:

i.   Get `studentName` and `testScore`

ii.

```
if (testScore is equal to highestTestScore)
    print studentName
```

You can use the solutions of the subproblems obtained in parts a to d to design the main algorithm as follows:

1. Use the algorithm in part a to find the average test score.

2. Use the algorithm in part b to print the names of all the students whose score is below the average test score.

3. Use the algorithm in part c to find the highest test score.

4. Use the algorithm in part d to print the names of all the students whose test score is the same as the highest test score

Chapter 2

1. a. False; b. False; c. False; d. False; e. True; f. True; g. True; h. False; i. True; j. False;
2. a, c, d, e, j
3. a
4. a. 3

    b. 5

c. 1

d. -2

e. 4.25

f. -2.0

g. 12

h. 16.5

5. a. `3`; b. not possible; c. not possible; d. `38.5`; e. `1`; f. `2`; g. `2`; h. `420.0`;
6. a, b, c, e, i, j, and k are valid;
    d, f, and g are invalid because the left side of an assignment must be a variable not an expression;
    h. The expression `num1 % 1.0` evaluates to a decimal number, while `num2` is an `int` variable. A decimal
    value cannot be stored in an `int` variable.

7. 7
8. Only the variable declarations in Lines 3 and 4 are correct
9. a and c are valid
10. a. `int x, y;`
    b. `x = 10; ch = 'B';`
    c. `x = x + 5;`
    d. `double payRate = 25.3;`
    e. `tempNum = firstNum;`
    f. `int temp = x;`
        `x = y;`
        `y = temp;`
    g. `System.out.println(x + "   " + y + " " + (x + 12 / y - 18));`
    h. `char grade = 'A';`
    i. `int num1, num2, num3, num4;`
    j. `x = (int)(z + 0.5);`
11. a. `10 * a`
    b. `'8'`
    c. `(b * b - 4 * a * c) / 2 * a`
    d. `(-b + (b * b - 4 * a * c)) / 2 * a`

12. `x = 5`
    `y = 2`
    `z = 3`
    `w = 9`

13. `x = 20`
    `y = 15`
    `z = 6`
    `w = 11.5`
    `t = 4.5`

14.
    a. 92. (Note that `x + ' ' + y` is evaluate as `(x + ' ') + y = (25 + 32) + 35) = 57 + 35 = 92`.
       Moreover, `char` data type is a subcategory of integral data type and the Unicode value of `' '` is 32.)
    b. `25 35`
15. a. `x = 2, y = 5, z = 6`
    b. `x + y = 7`
    c. `Sum of 2 and 6 is 8`
    d. `z / x = 3`

e. 2 times 2 = 4

16. a. 0.5
    b. 24.5
    c. 37.6
    d. 8.3
    e. 10
    f. 38.75

17. `System.out.println();` or `System.out.print("\n");` or
    `System.out.print('\n');`

18. a and c are correct

19. a. A correct answer is:

```java
public class ProgWithErrorsA
{
    static final int  SECRET_NUM = 11213;
    static final double PAY_RATE = 18.35;

    public void main(String[] arg)
    {
        int one, two, three;
        double first, second;

        double paycheck, hoursWorked;

        one = 18;
        two = 11;
        three = 3;

        first = 25;
        second = first * three;

        second = 2 * SECRET_NUM;

        System.out.println(first + " " + second + " " + SECRET_NUM);

        hoursWorked = 35;

        paycheck = hoursWorked * PAY_RATE;

        System.out.println("Wages = " +  paycheck);
    }
}
```
b. A correct answer is:

```java
public class ProgWithErrorsB
{
    static final char STAR = '*';
    static final int  PRIME = 71;

    public static void main(String[] arg)
    {
        int count = 1;
        int sum = count + PRIME;

        double x = 25.67;
        int newNum = count * PRIME + 2;
```

```
            sum = sum + count;
            x = x + sum * count;
            System.out.println(" count = " + count + ", sum = "
                              + sum + ", PRIME = " + PRIME);
        }
    }
```

20. a. `x *= 2;`
    b. `x += y-2;`
    c. `sum += num;`
    d. `z *= x + 2;`
    e. `y /= x + 5;`

21. a. `x = x + 5 - z;`

    b. `y = y * (2 * x + 5 - z);`
    c. `w = w + 2 * z + 4;`
    d. `x = x - (z + y - t);`
    e. `sum = sum + num;`
    f. `x = x / (y - 2);`

22.

	a	b	c
`a = (b++) + 3;`	9	7	UND
`c = 2 * a + (++b);`	9	8	26
`b = 2 * (++c) - (a++);`	10	45	27

23.

	a	b	c	sum
`sum = a + b + (int)c;`	3	5	14.1	22
`c /= a;`	3	5	4.7	22
`b += (int)c - a;`	3	6	4.7	22
`a *= 2 * b + (int)c;`	48	6	4.7	22

24. (NOTE: The user input us shaded.)

```
a = 25
Enter the first integers: 20

Enter the second integers: 15

The numbers you entered are 20 and 15
z = 45.5
Your grade is A
The value of a = 65
```

25. (NOTE: The user input is shaded.)

```
Enter last name: Miller

Enter a two digit number: 34

Enter a positive integer less than 1000: 340

Name: Miller
Id: 3417
```

```
    Mystery number: 3689
26.

    import java.util.*;

    public class Exercise26
    {
        static Scanner console = new Scanner(System.in);

        static final double X = 13.45;
        static final int Y = 34;
        static final char BLANK = ' ';

        public static void main(String[] arg)
        {
            String firstName;
            String lastName;
            int num;
            double salary;

            System.out.print("Enter first name: ");
            firstName = console.next();
            System.out.println();

            System.out.print("Enter last name: ");
            lastName = console.next();
            System.out.println();

            System.out.print("Enter a positive integer less "
                            + "than 70: ");
            num = console.nextInt();
            System.out.println();

            salary = num * X;

            System.out.println("Name: " + firstName + BLANK
                            + lastName);
            System.out.println("Wages: $" + salary);
            System.out.println("X = " + X);
            System.out.println("X + Y = " + (X + Y));
        }
    }
```

27. The program require three inputs. One possible form of input is:
```
number
string
number
```

Another possible form of input is:
```
number string
number
```