1. Write declarations for storing the following quantities. Choose between integers and floating-point numbers. Declare named constants when appropriate.
   a) The number of days per week: final int DAYS_PER_WEEK
   b) The number of days until the end of the semester: int daysLeftInSemester;
   c) The number of centimeters in an inch: final double CM_PER_IN
   d) The height of the tallest person in your class, in centimeters: double tallestPerson;
2. What is the value of mystery after this sequence of statements?

   ```
   int mystery = 1;
   mystery = 1 - 2 * mystery;
   mystery = mystery + 1;
   ```

   Mystery is 0
3. What is wrong with the following sequence of statements?

   ```
   int mystery = 1;
   mystery = mystery + 1;
   int mystery = 1 - 2 * mystery;
   ```

   Mystery was declared twice
4. Write the following mathematical expressions in Java.

   $$s = s_o + v_o t + \frac{1}{2} g t^2$$

   finalPosition = initialPosition + initialVelocity * time + (0.5) * accelerationGravity * time * time;

   $$FV = PV * \left(1 + \frac{INT}{100}\right)^{YRS}$$

   futureValue = presentValue * Math.pow(1 + (interest / 100), years);

   $$G = 4\pi^2 \frac{a^3}{p^2(m_1 + m_2)}$$

   g = 4 * Math.PI * Math.PI * (Math.pow(a, 3) / (p * p * (m1 +m2)));

   $$c = \sqrt{a^2 + b^2 - 2ab\cos(\gamma)}$$

   c = Math.sqrt(a * a + b * b – 2 * a * b * Math.cos(gamma));
5. Write the following Java expressions in mathematical notation.
   a) dm = m * (Math.sqrt(1 + v / c) / Math.sqrt(1 - v / c) – 1);

   $$d_m = m \frac{\sqrt{1 + \frac{v}{c}}}{\sqrt{1 - \frac{v}{c}} - 1}$$

   b) volume = Math.PI * r * r * h;

   $$V = \pi r^2 h$$

   c) volume = 4 * Math.PI * Math.pow(r, 3) / 3;

   $$V = \frac{4\pi r^3}{3}$$

   d) z = Math.sqrt(x * x + y * y);

   $$z = \sqrt{x^2 + y^2}$$
6. What are the values of the following expressions? In each line, assume that

   ```
   double x = 2.5;
   double y = -1.5;
   int m = 18;
   int n = 4;
   ```

a) x + n * y - (x+n) * y = 6.25
b) m / n + m % n = 6
c) 5 * x - n / 5 = 12.5
d) 1 - (1 - (1 - (1 - (1 – n)))) = -3
e) Math.sqrt(Math.sqrt(n)) = 1.414

7. What are the values of the following expressions, assuming that n and m have type int, n is 17, and m is 18?
   a) n / 10 + n % 1 = 8
   b) n % 2 + m % 2 = 1
   c) (m + n) / 2 = 17
   d) (m + n) / 2.0 = 17.5
   e) (int) (0.5 * (m + n)) = 17
   f) (int) Math.round(0.5 * (m + n)) = 18
8. Assuming that a and b are variables of type int, fill in the following table:

A	B	Math.pow(a, b)	Math.max(a, b)	a / b	a % b
2	3	8.0	3	0	2
3	2	9.0	3	1	1
2	-3	0.125	2	0	2
3	-2	0.111	3	-1	1
-3	2	9.0	2	-1	-1
-3	-2	0.111	-2	1	-1

9. Find at least five compile-time (syntax) errors in the following program.

```
public class HasErrors
{
  public static void main();
  {
    System.out.print(Please enter two numbers:)
    x = in.readDouble;
    y = in.readDouble;
    System.out.printline("The sum is " + x + y);
  }
}
```

   a) The main method is missing the (String[] args) parameters
   b) The main method has a semicolon after the parenthesis
   c) The string in the print statement doesn't have quotes around it
   d) In lines 6 and 7 they are trying to call some method called readDouble on an object called in that doesn't exist
   e) In the last print statement it should be println and not printline

10. Find three run-time errors in the following program.

```
public class HasErrors
{
  public static void main(String[] args)
  {
    int x = 0;
    int y = 0;
    Scanner in = new Scanner("System.in");
    System.out.print("Please enter an integer:");
    x = in.readInt();
    System.out.print("Please enter another integer: ");
```

```
        x = in.readInt();
        System.out.println("The sum is " + x + y);
    }
}
```

a) System.in is in quotes, but the compiler doesn't catch this, so when you run the code you get an error
b) The method for getting integers from System.in is nextInt() and not readInt()
c) The program should print (x + y) and not x + y, this will print the values of x an y next to each other. Also, y is assigned the value 0 and never changed.

11. Consider the following code segment.

```
double purchase = 19.93;
double payment = 20.00;
double change = payment - purchase;
System.out.println(change);
```

a) The code segment prints the change as 0.07000000000000028. Explain why. Give a recommendation to improve the code so that users will not be confused.
The result can't be precisely represented in binary which results in a rounding error. To improve the code, you could use a format string to only print out the first two decimal places. System.out.printf("%.2f", change);

12. Write a program that prints the values

```
3 * 1000 * 1000 * 1000
3.0 * 1000 * 1000 * 1000
```

Explain the results.
The first statement prints -1,294,967,196. This is because the maximum value an int can be in java is 2,147,483,647, and when it reaches that limit, it wraps around to the negative value which is -2,147,483,647. So, the program essentially prints -2,147,483,647 + 3,000,000,000 which is -1,294,967,196. The next print statement prints 3,000,000,000in scientific notation which is 3.0E9.