HOMEWORK PROBLEMS 3

1) What values are assigned to `b1`, `b2`, `b3`, and `b4` by the following code? Run the code to check your answers.

```
byte b1, b2, b3, b4;
int i = 3, j = 258;
double x = 4.999, y = 4.0E2;
b1 = (byte)i;
b2 = (byte)j;
b3 = (byte)x;
b4 = (byte)y;
```

2) Incorporate the code below in a program and compile. Why is there a compile-time error?

```
int x;
x = 999999999999;
```

3) Incorporate the code below in a program and compile. Why is there a compile-time error?

```
float x;
x = 2.0;
```

4) Why do the first and third `println` statements below display different values? Why do the second and fourth `println` statements display different values.

```
int x = 1;
System.out.println(x == 2);
System.out.println(x);
System.out.println(x = 2);
System.out.println(x);
```

5) What is displayed by the following statement:

```
System.out.println(100.0 + 50/4);
```

6) Run a program with the code below to determine if it is legal to concatenate two `char` constants, or to concatenate a `char` constant to a string.

```
System.out.println('a' + 'b');        // is this legal?
System.out.println('\'a' + "bcd");    // is this legal?
```

7) Write a program that initializes the `int` variables `x`, `y`, and `z` to `1`, `2`, and `3`, respectively, and then executes

```
x = y = z;
```

From the values assigned to `x, y`, and `z`, determine the order in which the assignments occur. Left to right or right to left? Is the assignment operator left or right associative?

8) Is it legal to assign a `char` value to an `int` variable with a cast? For example, is the following code legal?

```
int i;
i = (int)'A';      // is this legal?
```

What value is assigned to `i`? Is the cast required? Is it legal to assign an `int` value to `char` variable with a cast? Is a cast required? Run a test program to check your answers.

9) What is the effect of the following code:

```
char c = 'N';
c = (int)'a' – (int)'A' + (int)c;
System.out.println(c);
```

Run a test program to check your answer. The code for every lowercase letter is 32 more than the code for the corresponding uppercase letter. Thus, `(int)'a' – (int)'A'` is equal to 32. If you add 32 to the character `'N'`, what character do you get?

10) Is it legal to cast a `boolean` constant to `int`. For example, is the following statement legal:

```
int i;
i = (int)true;
```

Run a test program to check your answer. If the code is legal, display the value assigned to `i`, and then repeat using the `boolean` constant `false` in place of `true`.

11) Write a program that determines if the value of `x` is less than 1 or greater than 10. If it is, your program should display `true`; otherwise, it should display `false`. Test your program for `x` equal to `-3, 1, 5, 10, and 20.`

12) Write a program that assigns `1.2345` to `x`, and then extracts from `x` and separately displays its integer part and its fractional part. `x` should have type `double`.

13) Write a program that computes and displays (with an appropriate label) the exact average of `1`, `2`, `3`, and `4` (the correct answer is `2.5`).

14) Write a program that outputs the truth table for the `&&` operator. Use the `&&` operator in your program to determine the values of `p && q` that appear in your table. For example, to display the value of `&&` when both operands are `false`, use

```
System.out.println("false    false    " + false && false);
```

Do *not* use

```
System.out.println("false    false    false");
```

Your output should look like this:

```
   p      q    p && q

false  false  false
false  true   false
true   false  false
true   true   true
```

15) Write a program that computes and displays the truth table for `!(p && q)`. Use the technique described in homework problem 14. .

16) Write a program that computes and displays the truth table for `!p || !q` . Use the technique described in homework problem 14. Compare with your results from homework problem 15. The equivalence of `!(p && q)` and `!p || !q` is one of **DeMorgan's Laws** (see homework problem 18 for the other DeMorgan's Law).

17) Write a program that computes and displays the truth table for `!(p || q)`. Use the technique described in homework problem 14.

18) Write a program that computes and displays the truth table for `!p && !q`. Use the technique described in homework problem 14. Compare with your results from homework problem 17. The equivalence of `!(p || q)` and `!p && !q` is one of **DeMorgan's Laws**.

19) Same as homework problem 14, but for the ^ (exclusive OR) operator. How does it differ from `||`?

20) `charAt` is a method in a `String` object that returns the character at the specified position. For example, if `c` is type `char` and `s` is a reference variable to a `String` object, then the following assignment statement assigns `c` the first character in the `String` object to which `s` points:

```
c = s.charAt(0);
```

Write a program in which you assign `"AB3cd$"` to `s`. Display each character in this string on a separate line. Display all the letters in uppercase. Thus, your program should display `AB3CD$`, one character per line. Your program should work for any five-character string. Do not use the `toUpperCase` method. *Hint*: See homework problem 9.

21) `compareTo` is a method in a `String` object that compares two strings for equality. If the first string precedes alphabetically the second string, `compareTo` returns a negative integer. If the two strings are equal, it returns 0. If the first string follows alphabetically the second string, it returns a positive integer. What does `compareTo` return for

```
s1.compareTo(s2)
```

for the following pairs of `s1` and `s2`:

```
"AAA", "AAA"
"AAA", "aAA"
"aAA", "AAA"
"AAA", "aAA"
"AAA", "AAAA"
"AAA", "AAA "
"CAA", "AAA"
"AAA", "CAA"
"000", "333"
"000", "AAA"
"???", "AAA"
```