Written Assignment 2
Branches, Logic & Bitwise Ops.

CS152 – Computer Programming Fundamentals
Instructor: M. Wolverton

Q2-1

Define each of the following Java **relational** and **logical** operators then describe what it does.

Operator	Name	Description
==		
!=		
>		
>=		
<		
<=		
&&		
||		
!		
? :		

Q2-2

There is a logic operation called “**exclusive-or**” or “**ex-or**” for short. In the below code, boolean c is the equivalent of “a ex-or b”. First fill out the truth table.

```
boolean c = !(( a || !b ) && ( !a || b ));
```

a	b	(a || !b)	(!a || b)	c
true	true			
false	true			
true	false			
false	false			

How is “ex-or” different from “or”?

Q2-3

The following logic operation is inefficient. First fill out the truth table then explain why below.

```
boolean d = ( a || b || c ) && ( a || (!b && !c) );
```

a	b	c	(a || b || c)	(!b && !c)	a || (!b && !c)	d
true	true	true				
false	true	true				
true	false	true				
false	false	true				
true	true	false				
false	true	false				
true	false	false				
false	false	false				

Why is the expression evaluated to boolean d above inefficient?

Q2-4

Consider the following block of Java code. A int a holds the value “-25” or “10”. This block of code is supposed to toggle a between these two values:

```
if (a == -25){ a = 10;}
if (a == 10){ a = -25;}
```

This code compiles fine, but it doesn’t work correctly. How can it be fixed?

Q2-5

Consider the following block of Java code.

```
int a = -12;
String b = new String();
switch (a) {
       case 0: b = “red”;
              break;
       case 1: b = “blue”;
              break;
       case 2: b = “green”;
              break;
       default: b = “transparent”;
}
```

What is stored in b at the end of the code block?

Suppose the initial value of a was 1, what would be stored in b at the end of the code block?

Q2-6

Consider the following block of Java code containing **ternary operators**.

```
int a = 4;
int b = -7;
String c = a < b ? “this” : “that”;
b = 18;
String d = a < b ? “this” : “that”;
```

What is stored in c and d at the end of this code block?

Q2-7

Define each of the following Java **bitwise** operators then describe what it does.

Operator	Name	Description
<<		
>>		
&		
|		
^		

Q2-8

Consider the following block of Java code.

```
int a = 5;
int b = 9;

int c = a & b;
int d = a | b;
int e = a ^ b;
int f = ~a;
int g = a << 3;
```

Complete the following table describing the data held in int c,d,e,f and g in both binary and decimal.

variable	decimal value	binary value
a	5	0b 0000 0000 0000 0000 0000 0000 0000 0101
b	9	0b 0000 0000 0000 0000 0000 0000 0000 1001
c		0b _____ _____ _____ _____ _____ _____ _____ _____
d		0b _____ _____ _____ _____ _____ _____ _____ _____
e		0b _____ _____ _____ _____ _____ _____ _____ _____
f		0b _____ _____ _____ _____ _____ _____ _____ _____
g		0b _____ _____ _____ _____ _____ _____ _____ _____