Chapter 1: Data Representation

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Section 1.7.1

2a: What is the Decimal representation of the following unsigned binary integer?: 00110101

$$00110101 = 2^0 + 2^2 + 2^4 + 2^5 = 1 + 4 + 16 + 32 = 53$$

Answer: 53

3a: What is the sum of the pair of binary integers?: 10101111 + 11011011

Answer:

$$\begin{array}{rr} & 10101111 \\ + & 11011011 \\ \hline & 110001010 \end{array}$$

4: Calculate binary 00001101 minus 00000111

Answer:

$$\begin{array}{rr} & 00001101 \\ - & 00000111 \\ \hline & 00000110 \end{array}$$

5: How many bits are used by each of the following data types?

a. word

Answer: 16 bits, 2 bytes

b. doubleword

Answer: 32 bits, 4 bytes

c. quadword

Answer: 64 bits, 8 bytes

d. double quadword

Answer: 128 bits, 16 bytes

7a: What is the hexadecimal representation of the following binary number: 0011 0101 1101 1010?

$0011 = 2^0 + 2^1 = 1 + 2 = 3$
$0101 = 2^0 + 2^2 = 1 + 4 = 5$
$1101 = 2^0 + 2^2 + 2^3 = 1 + 4 + 8 = 13$ OR D in hexadecimal
$1010 = 2^1 + 2^3 = 2 + 8 = 10$ OR A in hexadecimal
When Placed in order you get 35DA

Answer: 35DA

15a: What is the decimal representation of the following signed binary number: 10110101?

A one is the leftmost number of this byte, which indicates that this is a negatively signed number. In order to find the answer we have to use two's complement. First we start by inverting the number.

01001010

After this we add 1 to the new number.

$$01001011$$

Finally, we convert the number to decimal and add a negative symbol in front of it.

$$01001011 = 2^0 + 2^1 + 2^3 + 2^6 = 1 + 2 + 8 + 64 = 75$$

Answer: -75

Section 1.7.2

8: Write a Java program that contains the calculation shown below. Then, use the *javap -c* command to disassemble your code. Add comments to each line that provide your best guess as to its purpose.

```
int Y;
int X = (Y + 4) * 3;
```

```
1 public class homework1 {
2    public static void main(String[] args){
3       int Y = 5;
4       int X = (Y + 4) * 3;
5    }
6 }
```

Listing 1: Java Code Written

```
1 public class homework1 {
2 public homework1();
3 Code:
4 0: aload_0
5 1: invokespecial #1
6 4: return
7
```

```
public static void main(java.lang.String[]);
Code:
0: iconst_5  //I think this is where I have constant 5
1: istore_1  //This is where it was stored, in value Y
2: iload_1  //This loads Y, starting in int X equation
3: iconst_4  //This gets the constant 4 in the equation
4: iadd  //This adds Y and 4
5: iconst_3 //This gets the constant 3 in the equation
6: imul //This multiplies 3 and result of line 4:
7: istore_2 //This stores value in X
8: return //returns out of function
}
```

Listing 2: Return of *javap -c homework1.java* with notes