CS 220 Exam 2 Study Questions

1. Work on the homework questions due before Spring break.
2. I may ask some questions from Exam 1.
3. What is the cycle time of a processor with a 1.33GHz clock rate (frequency). Express your answer in nanoseconds (ns).

4. A processor that has a 0.67ns clock rate has a frequency of _____. Express answer in MHz.

3. Express **-120** as an 8-bit two's complement binary number.

4. Express **-120** as a 32-bit two's complement integer. Write your answer in hex.

5. The formula for converting Celsius temperatures to Fahrenheit is ***F = 32 + C 9/5***

    a. Create a directory named **`c2f`** in your **CS220** repo.

    b. In the **`c2f`** directory write a C file named **`c2f.c`** that implements a function named **`c2f`**. The function **`c2f`** takes an integer and returns an integer (not a double). Don't worry about these being integers and not doubles.

    c. In the **`c2f`** directory write a C header file named **`c2f.h`** that contains a declaration for the **`c2f`** function.

    d. Create a file named **`main.c`** that contains a **`main`** function that uses your **`c2f`** function. Your program should take the temperature being converted as a command line argument, call the **`c2f`** function, and print the result.

    e. Write a file named **`c2f.s`** that implements the **`c2f`** function as an ARM assembly language function.

    f. Compile and test your program. Here are some sample runs from my implementation.

```
pi@raspberrypi:~/CS220Spring20/quiz2 $ ./c2f -40
-40 Celsius is -40 Fahrenheit

pi@raspberrypi:~/CS220Spring20/quiz2 $ ./c2f 100
100 Celsius is 212 Fahrenheit

pi@raspberrypi:~/CS220Spring20/quiz2 $ ./c2f 0
0 Celsius is 32 Fahrenheit
```

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6. The following C function computes x^y.

```
int xtoy(int x, int y) {
    int currsqr = x, rv = 1;

    while (y > 0) {
        if (y & 1)
            rv *= currsqr;
        currsqr *= currsqr;
        y >>= 1;
    }
    return rv;
}
```

   a. Make a table that traces the values of **currsqr**, **rv**, and **y** for each iteration of the loop when computing **xtoy(3,9)**

   b. Convert **xtoy** to an ARM assembly function.

7. What do each of the Linux commands do?

   a. **ls**
   b. **pwd**
   c. **mkdir**
   d. **ls -r**
   e. **cp**
   f. **mv**
   g. **ls ..**
   h. **ls ../..**
   i. **ls ./././**
   j. **ls dir/..**

8. Assume the following three function definitions of **f**, **g**, and **h** are in a file named **funcs.c**. Write an ARM assembly language version of the file that implements **f**, **g**, and **h**. Calling **f(1,2,3)** should return 48.

```
int h(int z) { return z * 2; }

int g(int x, int y) { return h(x + y); }

int f(int a, int b, int c) { return h(2) * g(a, b+c); }
```

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9. Consider the following variable declarations

```
int x = 77;
int *p = &x;
```

   a. Which of the following are aliases for **x**

```
*x    &x    p     *p    **p   &p    *&p   *&x   &*x
```

   b. Which of the following are valid assignment statements. Here valid means that the compiler will not issue an error or warning. The compiler would give a warning if there was a type issue.

```
p = x;
x = p;
&x = 88;
*p = 33;
x = 23;
p = NULL;
```