CS220 Spring 22 Exam 1 Practice Problems

1. Express **-77** as a 16-bit two's complement binary number.

2. What decimal number does the 8-bit two's complement number **0b11111111** represent?
3. What is the output of the following C code fragment.

`double pi = 3.14159;` `printf("%.2f\n", pi);`	

4. What is the output of the program below? Answer:

```
printf("%d\n", 0x80000000 - 1);
```

5. What is the output of the statement below? **Answer:**

```
printf("%d", sizeof(int));
```

6. What is the output of the statement below? **Answer:**

```
printf("%d", sizeof(char));
```

7. What is the output of the statement below? **Answer:**

```
printf("%d", sizeof(unsigned char));
```

8. What will the following C code fragment print?

```
int x = 0xFFFFFFFE;
printf("%d\n", x + 1);  Answer:
```

9. What is the smallest 32 bit two's complement integer?

    a. as a base ten integer:

    b. in binary:

    c. in hexadecimal:

    d. as a power of two:

10. The output of the code below is ____. For credit show values of **s** and **n** for each iteration of the while loop.

`int s = 0;`
`int n = 57;`
 	
`while (n > 0) {`
`  s = s + (n & 1);`
`  n = n >> 1;`
`}`
`printf("%d\n", s);`
	We have seen this code before. It just counts the numbers of ones in the binary representation of an integer. 57 = 32 + 16 + 8 + 1. So there are four powers of two (or ones in the binary number).

11. Fill in the body of the program below that prompts the user to enter an integer from the keyboard and the program should print the hexadecimal equivalent (recall the **x** format specifier for **printf**) as a C hexadecimal constant. See example output on right.

`#include <stdio.h>`
`int main() {`
 	
`}`
	`Enter an int: 44`
	`0x2C`

12. Write a very short C code fragment that declares a variable **p** to be a pointer to an integer and have it point at the integer **x**. You can assume **x** is already declared.

13. The code fragment below prints _____

```
if (~0 != -1)
    printf("Foo");
else
    printf("Bar");
```

14. The **&** operator applied to a variable (as in) **&x** is called the _____ operator.

15. Assume we label the bits in a 32-bit integer left to right as $\mathbf{b_{31}b_{30}b_{29}...b_1b_0}$. Write a C program that reads a positive integer from the keyboard and prints the position of the leftmost one in the binary representation of the number. For example, if the user entered 33, the program would print 5, because 33_{ten} is **`000...100001`** and the 5th bit is a one.

16. For the following programming question you may use your notes and code we have written in class, but you may not search the internet. Write a C function **reverse** that takes a string **s** as a parameter (an array of characters or a char *) and returns a new string that is the reverse of **s**. Use your function in a complete C program that reads words from the user (keyboard) and prints each word in reverse as in the sample output below. Put your program in files named **reverse.c**, **reverse.h**, and **main.c**. Part of this question is also to successfully push your files to your course repo ***username*_CS220**. Make sure not to touch the file after you are done.The **scanf** function returns **EOF** when the user types control-D and the **fgets** function returns **NULL** when the user types control-D. You can use either function to read a string from the user.

```
pi@raspberrypi-ehar:~/CS220 $ exam1
Word: hello
The reverse of hello is olleh
Word: python
The reverse of python is nohtyp
Word: applesauce
The reverse of applesauce is ecuaselppa
Word: <user typed control-D here>
```