

Hayden Shelton

## Problem Set 1 – CS4400

1. What is the email address that you used to subscribe? [hayden.shelton@utah.edu](mailto:hayden.shelton@utah.edu)

2. C Code for string length

```
//Hayden Shelton CS4400 Fall 2014
#include <stdio.h>

int main ()
{
    printf("%d \n", stringLength("1"));
    printf("%d \n", stringLength("to"));
    printf("%d \n", stringLength("tri"));
    printf("%d \n", stringLength("four"));
    printf("%d \n", stringLength("fives"));
    printf("%d \n", stringLength("0123456789"));

    return 0;
}

//return number of characters in a string
int stringLength (char* input)
{
    int i = 0;
    while(input[i] != '\0')
    {
        i++;
    }
    return i;
}
```

3. 2.61

```
//A. Any bit of x equals 1
int atLeastOneOne (int x)
{
    return x&&1;
}

//B. Any bit of x equals 0
int atLeastOneZero(int x)
{
    //if there are any zeros the logical value of res will be true
    int res = x ^ (~0);

    return res &&1 ;
}

//C. Any bit in the LSB equals 1
int LSBContainsOne (int x)
{
    //ignore all bits but those from the least significant byte
    int shifted = (x) <<24;

    return shifted &&1;
}

//D. Any bit in the MSB equals 0
int MSBContainsZero (int x)
{
    //get most significant byte (code from pg 121 Computer Systems Textbook)
    int shift_val = (sizeof(int)-1)<<3;
    int xright = x >>shift_val;
    int xBit = xright & 0xFF;

    int notXBit = ~xBit;
    int max = ~0;

    //XOR maximum value with not xBit, if the result of this has a logical value of 1,
    // then there must have been a zero in the xBit
    int res = notXBit ^ max;

    return !res &&1;
}
```

#### 4.2.62

```
int int_shifts_are_arithmetic()
{
    //max is largest possible integer (111111...)
    int max = ~0;
    int shifted = (max)>>1;
    //bitwise XOR shifted with max

    int res = shifted ^ max;
    //if the machine uses arithmetic right shifts, then all the bits in res will be zero
    return !res && 1;
}
```