

Question 1: How many bits? 1.1. If I wanted to give each of you a unique id number, how many bits are needed?

1.2. If I tell you that I will call upon a student whose last name is "Ryan", how much information did I share?

Question 2: Tracing Consider the following code listing:

```
1 int f(int x) {  
2     int r;  
3     int odd = 1;  
4     for (r = 0; x >= odd; r++) {  
5         x -= odd;  
6         odd += 2;  
7     }  
8     return r;  
9 }
```

What does this code do?

Question 3: Binary Addition and Overflow What is the 4-bit result of the following unsigned operations? Did overflow occur (yes/no)?

3.1. $1010_2 + 0101_2$

3.2. $1010_2 + 0111_2$

3.3. $1001_2 + 0111_2$

3.4. $0110_2 + 0110_2$

Question 4: Two's Complement 4.1. Represent -15 in two's complement with 7 bits

4.2. What is the minimum number of bits needed to represent 20 in two's complement?

4.3. Convert the following two's complement number to decimal: 0b1111_1110 complement?

4.4. Convert the following two's complement number to decimal: 0b0011_1000

4.5. All answers must be 4 bits.

4.1. $0111_2 + 0101_2$

4.2. $1000_2 + 1001_2$

4.3. $1111_2 + 0110_2$

4.4. $1101_2 + 1011_2$