## Quiz 1 Solution

8 February 2013

1. Using 7-bit signed (two's complement) binary numbers, what is the largest positive number? What is the smallest negative number?

In 7-bit two's complement, the column values are:

So the largest positive number is 01111111 = 63 and the most negative number is 1000000 = -64.

2. Convert the following 16-bit binary number into hexadecimal.

3. Add and verify the following unsigned binary numbers.

```
1 1 1 1 1
                                      1
  1 \ 0 \ 1 \ 1 \ 1 \ 1 = 47
                                  1 1 0 1 1 1 = 55
+ 0 1 1 1 0 1 = 29
                                + 1 0 0 1 0 0 = 36
_____
                                _____
                                1 0 1 1 0 1 1 = 91
1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 = 76
         2
                                          2
  32 8
                                  32 8
64 16 4
                                64 16 4
```

- 4. Suppose we need to send a text message uses just 15 distinct characters. How many bits per character are required if we're using a fixed encoding?

  We need 4 bits per character, which allows 16 distinct characters to be represented.
- 5. Draw a binary tree that corresponds to the following variable-width encoding of four characters. The characters should appear in boxes at the leaves. Branch left on a zero, or right on a one.

```
T 00
R 010
N 011
O 1
```

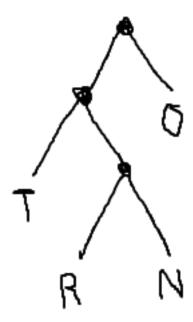


Figure 1:

6. Use the character encoding from the previous question to decode the following word: