COMP500 / ENSE501: Week 11 – Exercise:

EXERCISE NAME: *Count 1s and 0s*

The following program source code is incomplete:

```
1  #define _CRT_SECURE_NO_WARNINGS
2  #include <stdio.h>
3
4  int count_1s(unsigned int value);
5  int count_0s(unsigned int value);
6
7  int main(void)
8  {
9      unsigned int input = 0;
10
11     int looping = 1;
12
13     while (looping)
14     {
15         printf("> ");
16         scanf("%d", &input);
17
18         int num_zeroes = count_0s(input);
19         int num_ones = count_1s(input);
20
21         printf("%u contains ", input);
22         printf("%u zeroes and ", num_zeroes);
23         printf("%u ones\n\n", num_ones);
24     }
25
26     return 0;
27 }
28
29 // TODO: Define count_1s function:
30
31 // TODO: Define count_0s function:
```

Using sequence, selection, repetition and bitwise operators, define the **`count_1s`** function such that it will count how many bits are set to **`1`** within the **`value`** parameter. The function must then return the count.

Using sequence, selection, repetition and bitwise operators, define the **`count_0s`** function such that it will count how many bits are set to **`0`** within the **`value`** parameter. The function must then return the count.

Remember, there 32 bits within an **`unsigned int`** (32 bits is equal to 4 bytes, which is the size of an **`unsigned int`**).

Also remember, **`%u`** will cause **`printf`** to output an unsigned integer.

An example of the completed program's output is as follows:

```
> 1
1 contains 31 zeroes and 1 ones

> 5
5 contains 30 zeroes and 2 ones

> 8
8 contains 31 zeroes and 1 ones

> 100
100 contains 29 zeroes and 3 ones

> 4294967295
4294967295 contains 0 zeroes and 32 ones

> 0
0 contains 32 zeroes and 0 ones

> 65535
65535 contains 16 zeroes and 16 ones

> 12345678
12345678 contains 20 zeroes and 12 ones

> 13
13 contains 29 zeroes and 3 ones

> 1677215
1677215 contains 18 zeroes and 14 ones

> 9999
9999 contains 24 zeroes and 8 ones

> 256
256 contains 31 zeroes and 1 ones

> 512
512 contains 31 zeroes and 1 ones

> 1024
1024 contains 31 zeroes and 1 ones

>
```

Ensure the program output is exactly as described, and that the whitespace of your source code is well formatted.