G5BADS informal coursework 1

1. Consider the following method:

```
int divisions(int n){
   int k = 1;
   while(n > 1){
      n = n/2;
      k++;
   }
   return k;
}
```

   (a) Write its time usage function $t(n)$.

   (b) Prove that $t(n)$ is in $O(log_2 n)$.

   (c) Write its space usage function $s(n)$.

   (d) Prove that $s(n)$ is in $O(1)$.

2. Which statements below are true:

   (a) If an algorithm has time complexity $O(N^2)$, then it always makes N^2 steps, where N is the size of the input.

   (b) An algorithm with time complexity $O(N)$ is always slower than an algorithm with time complexity $O(log_2 N)$, for any input.

   (c) An algorithm which makes $c_1 log_2 N$ steps and an algorithm which makes $c_2 log_4 N$ steps are in the same complexity class ($c1, c2$ are constants).