# AADS: Assignment 1

Juan José Méndez Torrero (s3542416)

February 11, 2018

## Exercise 1: Part A

To do this part of the assignment, we have to consider the following notations:

1. Let consider that the function to be solved is:

$$f(n) = tin\ microseconds$$

2. Also, we have to know that

$$1second = 10^6 microseconds$$
$$1hour = 3.6 * 10^9 microseconds$$
$$1month = 2.592 * 10^12 microseconds$$
$$1century = 3.1104 * 10^5 microseconds$$

First, to fill the table I have to make some mathematical operations, all of them are equations. The resolution of each equation is in the following enumeration

1. Row 1

$$log_2(n) = 10^6;$$
$$n = (2^{10})^6$$

2. Row 2

$$\sqrt{n} = 10^6;$$
$$n = 10^{12}$$

3. Row 3

$$n = 10^6$$

4. Row 4

$$nlog_2(n) = 10^6$$

To solve this equation I have used the following $C$ program:

```c
#include <stdio.h>
#include <math.h>
#include <stdlib.h>

int main()
{
     int n=1;
     while((n*(log(n)/log(2)))<1000000)
     {
      n+=1;
     }
     printf("Minimum value of n in n*lg(n)->", n-1);
     return 0;
}
```

Listing 1: n*log(n) program

The result of this operation is n=62746.

5. Row 5

$$n^2 = 10^6;$$
$$n = 10^3$$

6. Row 6

$$n^3 = 10^6;$$
$$n = 10^2$$

7. Row 7

$$2^n = 10^6;$$
$$n = 6 * lg_2 10 = 19$$

8. Row 8

$$n! = 10^6;$$

To solve this equation I have used the following $C$ program:

```c
#include <stdio.h>
#include <math.h>
#include <stdlib.h>

int main()
{
    int n=1,i, aux=1;
    for(i=1;i=n;i++)
    {
     aux*=i;
    }
    while(aux<1000000)
    {
     aux+=1;
    }
    printf("Minimum value of n in n!->", n-1);
    return 0;
}
```

Listing 2: n! program

The result of last operation is n=9.

Now, it is time to fill the table with the correspondant values:

| | 1 second | 1 minute | 1 hour | 1 day | 1 month | 1 year | 1 century |
|---|---|---|---|---|---|---|---|
| $\log n$ | $2^{60}$ | $2^{6*10^7}$ | $2^{36*10^8}$ | $2^{864*10^8}$ | $2^{25920*10^8}$ | $2^{315360*10^8}$ | $2^{31556736*10^8}$ |
| $\sqrt{n}$ | $10^{12}$ | 36*$10^{14}$ | 1296*$10^{16}$ | 746496*$10^{16}$ | 6718464*$10^{18}$ | 994519296*$10^{18}$ | 995827586973696*$10^{1}$ |
| $n$ | $10^6$ | 6*$10^7$ | 36*$10^8$ | 864*$10^8$ | 2592*$10^9$ | 31536*$10^9$ | 31556736*$10^8$ |
| $n \log n$ | 62746 | 2801417 | 133378058 | 2755147513 | 71870856404 | 79763389349 | 68654697441062 |
| $n^2$ | 1000 | 7745 | 60000 | 293938 | 1609968 | 5615692 | 56175382 |
| $n^3$ | 100 | 391 | 1532 | 4420 | 13736 | 31593 | 146677 |
| $2^n$ | 19 | 25 | 31 | 36 | 41 | 44 | 51 |
| $n!$ | 9 | 11 | 12 | 13 | 15 | 16 | 17 |

# Exercise 2: Part B