Task 1

1. The time complexity of inserting a new element in an un-balanced Binary Search Tree that contains "N" nodes in the worst case is:

- ○ A: O(Log(N))
- ○ B: O(N * Log(N))
- ○ C: O(N)
- ◉ D: O(1)

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2. If a class B inherits from a class A, that means that objects from class B:

- ○ A: Contain all members defined using any access modifier in both classes A and B
- ○ B: Contain all members defined using "protected" access modifier or higher in both classes A and B
- ○ C: Must implement all "virtual" functions defined in class A
- ◉ D: Both (b) and (c)

3. Given an array "A" of length "N" that contains integer numbers, what is the time complexity of the following code snippet?

```
// "A" is an array of integer numbers
// "N" is the length of array "A"
int sum = 0;
int i, j;
for (i = 0, j = 0; i < N; i++)
{
    sum += A[i];
    while (sum > 15 && j < N)
    {
        sum -= A[j++];
    }
}
```

- A: O(N)
- B: O(N * Log(N))
- C: O(N^2)
- D: O(2^N)

4. What is the value returned from the function below if called with n = 3?

```
int fun(int n)
{
        if (n == 0)
        {
                return 0;
        }

        return n + fun(n - 1) + fun((int)(n / 2));
}
```

- A: 9
- B: 6
- C: 10
- D: 8

5. Which of the following techniques/algorithms can be used to solve the Curse of Dimensionality problem?

- A: Negative Sampling
- B: Principal Component Analysis
- C: Regularization
- D: Backpropagation

Task 2

Programming Language
Python

In my first day in my new flat, I found that the doors of all flats are forming a straight line and all doors are equidistant from each another. A some doors there is a bomb with a timer. This timer indicates how many time units are remaining till the bomb explode.

I called a fire-cracking company which and they told me that they have world class fire-cracking experts. Their experts can crack any bomb in 5 time units and move from door **i** to **(i + 1)** in a single time unit. One expert can crack multiple bombs in sequence, not in parallel.

We want to determine the minimum number of experts that we need to crack all the bombs.

Write a function:

```
def solution(A)
```

that, given a zero-indexed array *A* consisting of *N* integers each integer indicates the time remaining till the bomb explode or -1 means there is no bomb on this door, returns an integer that represents the minimum number of experts needed to crack all bombs assuming that all the experts start at door in index 0. If it's impossible to crack all bombs (no solution), return -1.

Assume that:

The length of array A is between [1, 1000]

Example 1:

Input: doors = [5,-1,10]

Output: 2

Explanation: Here we need 2 experts. The first will crack bomb at door 0 and will finish at time 5. The second needs 2 time unit to move to door 2 and then he will start cracking the bomb at time 2 and will finish at time 7

Assume that:

- The length of array A is between [1, 1000]

Example 1:

Input: doors = [5,-1,10]

Output: 2

Explanation: Here we need 2 experts. The first will crack bomb at door 0 and will finish at time 5. The second needs 2 time unit to move to door 2 and then he will start cracking the bomb at time 2 and will finish at time 7.

Example 2:

Input: doors = [5,11]

Output: 1

Explanation: Here we need only 1 expert. He will finish cracking the bomb at door 0 at time 5, and then move from door 0 to door 1 in 1 time unit. He will start cracking the bomb at door 1 at time 6 and will finish at time 11.

Task 3

Programming Language
Python

An array **A** consisting of **N** distinct positive integers is called "Twisty" if: for each index "**i**" in the array where 0 <= **i** < **N**, **at least one** of the following conditions holds:

- A[i] is divisible by A[i + 1]
- A[i + 1] is divisible by A[i]

Write a function:

```
def solution(A)
```

that, given a zero-indexed array **A** consisting of **N** distinct positive integers, returns an integer that indicates how many "Twisty" arrays can be generated by **only** re-ordering the numbers in array **A**?

For exmaple, if **A = [2, 6, 3]**, the function should return **2** (the twisty arrays are: **[2, 6, 3]** and **[3, 6, 2]**).

Notes:

- 1 < N <= 14
- 0 < A[i] <= INT_MAX
- As the result may be too large, you should return the answer module 1000000009 (that is 10^9 + 9)