2025-08-27

# Complexity (Solutions)

## Questions

1. Put a checkmark in the box corresponding to true statements.
   * Abstract data types have exactly one implementation.
   * Data structures are generally useful to store and retrieve data.
   * A data type generally comes with allowed operations.
   * In data structures classes, ergonomics is the main metrics to compare programs.
   * In data structures classes, hardware is generally ignored.
2. Rank the following from 1 (“best”, fast to execute, slow to grow) to 5 (“worst”, fast to grow, slow to execute):
   * cubic
   * linear
   * linearithmic
   * logarithmic
   * exponential

* Solution
* From fastest to execute to slowest to execute:
  1. logarithmic
  2. linear
  3. linearithmic
  4. cubic
  5. exponential

1. Complete the following sentences:
   * A quadratic order of magnitude is denoted ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟.
   * A ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ order of magnitude is denoted .
   * A factorial order of magnitude is denoted ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟ ͟.

* Solution
  + A quadratic order of magnitude is denoted ͟O͟(͟n͟²͟)͟.
  + A ͟c͟o͟n͟s͟t͟a͟n͟t͟ order of magnitude is denoted .
  + A factorial order of magnitude is denoted ͟O͟(͟n͟!͟)͟.

## Problems

1. Write a code snippet (no need to include using statements or Main header) that displays the sum of all the values in a score int array that you can suppose declared and initialized. What is the worst case time complexity of the algorithm you wrote, relative to the size of the array score?

* Solution
* int sum = 0;  
   for(int i = 0; i < score.Length; i++){sum += score[i];}  
   Console.WriteLine($"The sum is {sum}.");
* This algorithm is linear: it goes through the array once.