Contents

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:

   (a) logarithmic
   (b) linear
   (c) linearithmic
   (d) cubic
   (e) exponential

3. Complete the following sentences:

   - A quadratic order of magnitude is denoted_____.
   - A_____ order of magnitude is denoted $O(c)$.
   - A factorial order of magnitude is denoted_____.

   Solution

   - A quadratic order of magnitude is denoted $O(n^2)$.
   - A constant order of magnitude is denoted $O(c)$.
   - A factorial order of magnitude is denoted $O(n!)$.

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 n 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.