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Exercise 4

Finger Exercises due Aug 5, 2020 20:30 -03

Exercise 4

4/4 points (graded)

ESTIMATED TIME TO COMPLETE: 12 minutes

Determine the complexity of the following tasks.

1. 6.00.1x staff decide to hold an online chess tournament, and *n* 6.00.1x students respond to participate in it. If the tournament is a single-elimination tournament (this means you are eliminated when you lose once), how many games do we need to decide the winner, in terms of *n*? Assume there will be no draws or byes.

- ○ $O(1)$
- ◉ $O(n)$
- ○ $O(n^2)$
- ○ $O(\log n)$
- ○ $O(n \log n)$
- ○ It depends on how the tournament is organized.

Explanation:
To win, a student will have to play every student on their side and keep winning, eliminating students one at a time, a total of n/2 students.

2. You are asked to write an *n* page research paper. You've written plenty of research papers in your time, and you know it always takes you 30 minutes to write one page of a research paper. In terms of *n*, what is the complexity order that describes the amount of time this research paper will take to write?

- ○ $O(1)$
- ◉ $O(n)$
- ○ $O(n^2)$
- ○ $O(\log n)$
- ○ $O(n \log n)$

✔

Explanation:
Each page takes 30 mins to write and there are n pages. The total time is `30n`, so an order of `n`.

3. You are asked to write an *n* page personal essay. You've written plenty of personal essays in your time, and you know it always takes you two hours to write a personal essay, no matter the length. In terms of *n*, what is the complexity order that describes the amount of time this personal essay will take to write?

- ◉ $O(1)$
- ○ $O(n)$
- ○ $O(n^2)$
- ○ $O(\log n)$
- ○ $O(n \log n)$

✔

Explanation:
The number of pages you write does not influence how long it takes you to write. The time to write is a constant 2 hours, so order of 1.

4. You just dropped a box of glass toys and *n* toys in the box broke in half. You'd like to match the halves of the toys so that you could glue them together, but the only way to tell whether two halves belonged to one toy is to physically pick up the two pieces and try to fit them together. Express how long this matching process will take in terms of *n*.

- ○ $O(1)$
- ○ $O(n)$
- ◉ $O(n^2)$
- ○ $O(\log n)$
- ○ $O(n \log n)$

✔

Explanation:
You have to compare every piece with every other piece. If you have 1 toy and it breaks in half, you have 1 comparison to make. If you have 2 toys and they both break in half there are 4 pieces and you have to do 6 comparisons. If you have 3 toys, there are 6 pieces and you have to do 15 comparisons. If you have `N/2` toys, you have `N` pieces and you have to do `N-1 + N-2 + N-3 + ... + 1 =(N)(N-1)/2` comparisons. This is `O(N^2)`

Enviar

ℹ Answers are displayed within the problem

Exercise 4

Ocultar discussão

Topic: Lecture 11 / Exercise 4

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#1?

question posted about 21 hours ago by anônimo

I'm confused on #1 - why is it linear?

This post is visible to everyone.

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4 responses

Barkevious
about 20 hours ago

I, too, was confused. Maybe its b/c they were asking about games rather than rounds? If the question had asked "how many rounds" would the answer have been log(n) rounds?

I mean, if there were 100 students, then in successive rounds we would have: 100 --> 50 --> 25 --> 13 --> 7 --> 4 --> 2 --> 1 which seems like log(n) time to me.

posted about 20 hours ago by **Barkevious**

Add a comment

regelink
about 20 hours ago

Because you need to play n-1 games to have one winner left.

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tjhintz
about 19 hours ago

I got this one wrong so i sat down with a piece of paper and just put some numbers in.

The counting of the games is trivial (i'm probably wrong but im in the ball park) but if you assume everyone has to play at least once at every round of playing then the total number of games is n-1 if the initial players are an odd number and n if there are an even number of players.

The rounds are O(log(n)) but the games are O(n)

Add a comment

abhinav_vikram
about 8 hours ago

Number of games is n-1. Each game eliminates exactly 1 player from the tournament, since a player is eliminated the moment he loses a game. To decide a winner we need to eliminate n-1 players, hence exactly n-1 games.

To answer for the number of rounds there will need to be more information provided about the structure of the tournament, or more to the point an exact definition of what constitutes a "round". log(n) assumes additional structure on the tournament which is not explicitly provided. For example, some players (say higher ranked) may get byes into later rounds. Or a bizarre structure where each round is the single game between two randomly chosen players who haven't been eliminated it.

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