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Linear/Binary Search

- Outline:
    - What is a search algorithm?
    - Linear and Binary searching
        - Basic concepts
        - Examples
        - Visualization
        - Code
        - Pros and Cons
- Search Algorithms:
    - Definition: “A search algorithm is the step-by-step procedure used to locate specific data among a collection of data.”
    - They are everywhere
    - Fundamental to computer science
    - Very important
- Linear Search
    - Concept
        - Starting from element one, sequentially go through each element of the array checking if it is our answer.
    - Example: Searching through cards
    - Code
        - 3 lines!
        - Very simple!
    - Pros and cons
        - Pros
            - Easy to implement
            - No order required for data
            - Effective in small data sets
            - Only requires an equality comparison
        - Cons

            - Very inefficient in large data sets
            - O(n) search speed
- Binary Search
    - Concept
        - Check the midpoint of your ordered data set, see if its higher or lower than the target, cut the data set in half, try the midpoint of the appropriate half, repeat until you find your answer.
    - Example: Searching through a dictionary
    - Code
        - 9 lines of code
        - Still pretty simple
    - Binary Search Trees
        - A popular field of research
        - Not the topic of today's presentation, but worth mentioning
    - Pros and Cons
        - Pros
            - Simple to implement
            - O(log n) search time
        - Cons
            - Requires ordered data
            - Requires an ordering comparison
- Summary
    - We should really know what search algorithms are at this point
    - Linear search may be easy
    - But binary search is fast