Lesson 3: Linear Search vs Binary Search

In this lesson, students will learn about two different searching algorithms: linear search and binary search. They will compare the features and efficiency of these algorithms and understand when to use each one. The lesson will include a presentation on the step-by-step process of linear and binary search, as well as demonstrations and code interpretation. Students will also have the opportunity to practice these algorithms in small groups and independently, tracing the code and analyzing the number of comparisons made. The lesson will conclude with a review of the main points and a discussion on the importance of understanding different searching algorithms in problem-solving.

## **Objectives:**

- Compare the features of linear and binary search and decide which is most suitable in a given context.

- Interpret the code for linear search and binary search.

- Trace code for both searching algorithms with input data.

## **Materials:**

- Slides or presentation software

- Demo versions of linear search and binary search algorithms

- Commented code for linear search and binary search

- Worksheets for tracing the algorithms and exploring the code

## **Bell-Ringer Activity:**

- Ask students to brainstorm different scenarios where they might need to search for an item in a list or array.

- Discuss their answers as a class and write them on the board.

## **Introduction:**

- Explain to students that in this lesson, they will be learning about two different searching algorithms: linear search and binary search.

- Discuss the importance of searching algorithms in computer science and everyday life.

- Introduce the concept of efficiency in searching algorithms and explain that different algorithms have different strengths and weaknesses.

- Explain that linear search is a simple algorithm that checks each element in a list or array until it finds the desired item, while binary search is a more efficient algorithm that works by repeatedly dividing the search space in half.

- Discuss the factors that can affect the performance of linear and binary search, such as whether the data is ordered, the number of comparisons made, and the simplicity of the algorithm.

## **Direct Instruction:**

- Present the slides or use the presentation software to explain the step-by-step process of linear search and binary search.

- Show the demo versions of linear search and binary search algorithms and explain how they work.

- Interpret the code for both algorithms and explain the purpose of each line.

- Discuss the efficiency of linear search and binary search and compare the number of comparisons made in each algorithm.

- Use examples and visual aids to help students understand the concepts.

## **Guided Practice:**

- Divide the class into small groups and provide each group with a sample of data.

- Instruct the groups to perform a linear search and a binary search on the given data.

- Ask the groups to record the number of comparisons made for each algorithm.

- After they have completed the searches, have each group share their results with the class.

- Discuss the differences in the number of comparisons made and the efficiency of the two algorithms.

## **Independent Practice:**

- Distribute the worksheets that accompany the Python activities.

- Instruct the students to explore and understand the demo code by answering the questions and tracing the algorithms with the given set of data.

- Encourage students to work individually or in pairs to complete the worksheets.

- Circulate the classroom to provide assistance and answer any questions.

## **Exit Ticket:**

- Give each student an exit ticket with a few questions related to the lesson objectives.

- Collect the exit tickets before the end of the class.

## **Closure:**

- Review the main points of the lesson, including the features of linear and binary search, the interpretation of the code, and the efficiency of the algorithms.

- Ask students to reflect on the lesson and share one thing they learned or found interesting.

- Emphasize the importance of understanding different searching algorithms and their suitability in different contexts.

- Preview the next lesson or topic related to algorithms and problem-solving.

## **Common Core Standards:**

- CCSS.ELA-LITERACY.RST.9-10.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

- CCSS.ELA-LITERACY.RST.9-10.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.