Binary Search: Flowchart And Simulation
Lesson Plan: Class 07 / ALG / 06

Overall goal of the lesson	To help the students to 1) Build the flowchart for the binary search algorithm 2) Understand how the algorithm works inside a computer
Prior knowledge required	Introduction to the binary search algorithm, including the knowledge that: 1) It is used for searching *sorted* data 2) It utilizes the 'cut-in-half' strategy for elimination

MODULE 1: **Module time:** 35 minutes

Goal:	Help the children build a flowchart for binary search and understand how it works
Description:	In the previous lesson, the children learnt that binary search is used for searching sorted data and that it employs the 'cut-in-half' strategy for elimination. In this lesson, we put that knowledge into action by building a flowchart for binary search and understand how it works inside a computer. We build the flowchart bit-by-bit in a "top-down" fashion by first drawing it in an abstract manner and then filling in the details as they become available. This way, not only do the children understand how the flowchart works but also learn how to build it by themselves.
Material required:	**Physical:** 1. One copy of worksheet per student 2. Pen/Pencil, eraser. **Electronic:** 1. Lesson presentation
Procedure Summary:	1. We go through the presentation, ensuring understanding by all the students and answering any questions from them. 2. We distribute the worksheets to the students after the presentation is done. 3. We help the students solve the problems in the worksheet.
Procedure Details:	**Slide 1:** Title Slide We greet the students and help them settle down. We then mention the topic of the lesson. **Slide 2:** Outline We recollect what we learned from the last lesson and outline the items of today's discussion **Slides 3-6:** A rough draft of the flowchart We take a "top-down" approach of drawing the flowchart and first understand the input and output for binary search. Using this understanding, we then draw a rough first sketch of the flowchart with only the input and the output. We actually are starting to use the ANSI standard blocks to denote the various parts of the flowchart by now! **Slides 7-11:** Filling in the first level of details We continue building the flowchart in a top-down fashion by filling in a little more detail. In this part, our goal is to draw a rough sketch of the loop in the algorithm. Asking the children to identify the body of the loop and its exit condition makes it easier for them to understand any iterative algorithm. That is why we follow such a strategy here.

	Slides 12-14: Filling in the remaining details Finally, we expand the details of the loop and draw the complete picture of the flowchart. We revisit the different scenarios of the 'cut-in-half' strategy learnt in the last lesson and use them to fill in the details of the loop. After we are done drawing the loop completely, we then plug it in to the input and output blocks to obtain the full flowchart. At this stage, there is some more explanation required as to how we find the middle element. **Slide 15**: Explaining the middle element We clarify how to identify the middle element when the number of data items is odd vs. when the number of data items is even. **Slide 16**: Simulation of the algorithm We are ready now to illustrate how the algorithm works! In our example, we look for an item that is not in the sorted data and progressively show which steps of the algorithm are active at different stages of the search process. **Slide 17:** Summary The lesson is almost done. We take a moment to recap what we have learned so far and then, it is time for the worksheets! **Slide 18:** Thank you!