



Flowchart For Selection Sort

Lesson Plan: Class 06 / ALG / 07



Overall goal of the lesson	Students learn how to build in logical stepwise manner a flow chart for selection sort.
Prior Knowledge Required	<ol style="list-style-type: none"> 1. Flowcharts 2. Selection Sort

Goal:	To develop the logical flow of Selection Sort, by running an unsorted list through the Selection Sort algorithm. To understand how the developed step wise logic can be then used to build the flowchart for Selection Sort.
Description:	<p>Two main sets of activities:</p> <ol style="list-style-type: none"> 1. Build the flowchart by stepwise sorting an unsorted list of numbers using Selection sort Algorithm. 2. Verify the flowchart by simulating or running any unsorted list through the flowchart. The verification will be complete if the end-result is a fully sorted list of numbers.
Material Required:	<ol style="list-style-type: none"> 1. Lesson Presentation 06-ALG-07 to help teach Flowcharting Selection Sort 2. Worksheets to distribute (paper copies) to students to gauge understanding
Procedure Summary :	<p>Useful materials to read prior to this class:</p> <ol style="list-style-type: none"> a) 06-ALG-06 b) 06-DA-02 <ol style="list-style-type: none"> 1. Go through the presentation. 2. Recap of concepts they have learnt earlier (first few slides) – the basics of flowcharts and the basics of Selection Sort. 3. Using the presentation, apply Selection Sort on an unsorted list, to help understand the underlying logic of Selection Sort. Note: Key to building flowcharts is understanding the underlying logic. 4. Complete both the activities in the presentation. 5. Provide the worksheets, consisting of similar sorting exercises along with some algorithm writing exercises. 6. Let the students solve them and help them with answers.
Procedure Details:	<p>Slide 1: Title Slide</p> <p>Slide 2 & 3: These are recap slides, helps walkthrough Selection Sort again (a lesson from an earlier class 06-Alg-06) Define – what is Selection Sort – help them remember that Selection Sort is the algorithm to sort an unsorted list of items, by finding the minimum and placing it at the top (beginning), and continuing the same process on the remaining unsorted items. Each re-iteration successively places the minimum and places it at the top of the list being sorted in that re-iteration. Point out the diagram's on the side to help understand the concept.</p> <p>Slide 4: This is also a recap slide to revise the basic concepts of Flowcharts. Ensure students remember the different symbols of Flowcharts, and the function of each.</p>

Help them understand the meaning of basic symbols of Start, Stop and Decision box.

Explain decision box and looping – how the logic keeps on looping till the decision box criteria is met (condition for No is met), and the logic flow exits the loop. Explain how this is used to depict repetitive activity. Point out how a counter is used increase the value of the variable, to incrementally continue to loop in a controlled manner.

Slide 5:

Using an example unsorted list, help students start to understand the logic of the Selection Sort. Explain using the slide, the concept of 1st row, next rows, comparisons (“<” less than condition) and exchange.

Slide 6:

Introduce and explain some basic terminology: value of the ith space in a list denoted by : row(i) and the size of the list “n”

Slide 7:

Step by step, show how the decision box is built, comparison is made, and loop is executed to go back and start again with the next jth value, by incrementally increasing the value of j.

Explain how this is the exact depiction of these steps that we had visually executed in slide 5

Slide 8:

Show and explain after the first list is sorted, how the remaining subset (row 2 to n) becomes the new list to sort, and so forth. Show by the diagram on the side the concept of sorting 2nd list, 3rd list and so on.

Explain how the logic of counters is used to run through each successive list.

Slide 9:

If using computer, ensure the presentation is running in slideshow mode, with transitions clearly outlining the i-loop and the j –loop. Show how the inner loop executes completely (till the “No” condition is met), and then the outer loop is incremented. Explain how nested loops (a loop within a loop) is depicted by an outer counter i for the outer loop, and within it, an inner counter j, for the inner loop. Point out how the inner loop is in one color (yellow) and the outer loop is in another color (peach)

Slide 10:

Introduce how the loop needs to tie up neatly at the ends. Explain how and when to end and exit the loop and how to depict it in the flowchart.

Slide 11:

Explain how running through this flowchart with an example list, will help validate the correctness of the flowchart. Stress on points that must be validated – conditions of the Condition Boxes, as well as exit criteria.

Slide 12:

Explain the input variables needed for an example to be run through Selection Sort i.e. the unsorted list, and how n (size of list) is important entry criteria.

Slide 13:

Introduce verification of flowchart, and how it traverses the loops, once at a time (first for “i” and then for “j”)

Starting with $n=5$ and the unsorted list, start the run through of the flowchart. Setting $i=1$ and setting $j=i+1$ i.e. $j=2$. Explain how this fares in the decision box and how it proceeds to looping back from top again.

Slide 14:

Execute the loop for $j=3$, with i remaining $=1$. Explain how this fares in the decision box and how it proceeds to looping back from top again.

Slide 15:

Execute the loop for $j=4$, with i remaining $=1$. Explain how this fares in the decision box and how it proceeds to looping back from top again.

Slide 16:

Execute the loop for $j=5$, with i remaining $=1$. Explain how this fares in the decision box and what happens when j is incremented – explain how the j loop (inner loop) has now completed one whole iteration, and exits.

Slide 17:

Explain what happens next – i.e. i is again incremented, i.e. $i=2$, and with $i=2$, the whole j loop is iterated again. Point to the visual of the list on left side of slide, to help understanding. Go through orally some more iterations of the loop, as j increments.

Slide 18:

Consider carefully the case of when $n=5$ and $i=4$ and $j=5$ – discuss how this is the last loop based on the criteria for looping. Explain how the j loop is exited when the value of j is further incremented.

Slide 19:

As per the execution of the case where $i=4$ and $j=5$, show by way of this example how this is really the very last sub-list to be considered for sorting. Show how the j loop is exited.

Slide 20:

As per the execution of the case where $i=4$ and $j=5$, show by way of this example executing through the flow chart the i loop is finally exited at the end. Consider the end result, the list of numbers: has the list been sorted?

Slide 21:

Ask the students these questions, have a discussion with them on these points. Gauge their understanding or their problems using these and more follow up questions of your own, based on the discussions.

Slide 22:

Thank you – move on to the worksheets.