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| **Objective** | **Students will be able to implement Bubble Sort algorithm using Python Programming** |
| **Prior Knowledge** | Understanding of various constructs in Python Programming Language like variables, operators, list, for loop etc.  Understanding of Bubble Sort Algorithm  Bubble Sort Algorithm is ready from the theory class |

**Session 1: Session time:** 40 minutes

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| **Goal:** | To get the children to understand about logical operators and comments in a program. |
| **Description:** | Children will be able to understand how to use logical operators in conditions. |
| **Material required:** | **Physical:** Notebook to take notes  **Electronic:**  A computer with a Python compiler (version 3.x) for each student and the teacher (with a projector).  If there is an internet connection, <https://www.codechef.com/ide> or <https://repl.it> can be used.  A projector with the computer screen of the teacher projected for the students to see. |
| **Download and Install Python:** | Python 3.4 - <https://www.python.org/downloads/release/python-344/>  Python 3.6 - <https://www.python.org/downloads/release/python-362/> |
| **Essential Understanding** | **1. In programming world, index of a list starts with *0***  **2. Length of the list is [length\_of\_list – 1]**  **3. To sort the elements, we need to have access to each element in the given collection** |
| **Procedure Summary:** | Follow the lesson plan and ask the students to type in the python program on their computer when required.  You can also type the programs on a computer projecting it to the students on a screen so that they can see the output.  Ensure that students are sitting in the group of three on each computer. |
| **Opening Discussion**  **(10 minutes)** | Open , <https://www.codechef.com/ide> or <https://repl.it> or Python IDLE Editor  Slides 2 – 5:   1. These 4 slides will revise basic concepts of Python Programming 2. Slide 2 explains about how to use output formatting to print the output in a specific format 3. On slides 3-4, using for loop how to iterate through list is explained 4. On slide 5, swapping of values between two variable using temporary variable is demonstrated 5. Students will type the code on Python IDLE and verify the output 6. These concepts will be used in implementing bubble sort algorithm 7. Students individually must type the code and verify the output |
| **Beginning** | 1. Slide 6:    1. Recall the example of sorting water containers based on their storage capacity from Sorting Theory class.    2. Ask one of the students to describe the process that was followed    3. Recall the sorting condition and how it affects the final representation 2. Slides 7-23:    1. On slide 7, Bubble Sort algorithm is given    2. Use the algorithm and co-relate it with       1. **Value, position, compare, swap, iteration, iteration number and comparison condition**    3. **Check for Understanding**   *If we need the sorted list in a descending order, should we swap when bottom most element is smaller or larger than the adjacent element.*   * 1. Using value and position of the elements in a list, trace the list for sorted or not  1. Slides 24-25:    1. Do not show the slide no 24, let students write down the code on computer    2. Steps       1. Define the list with appropriate elements       2. Use nested for loops          1. Outer for loop to trace the list elements          2. Inner for loop will give us two adjacent elements          3. Using if block, compare both the elements          4. Swap the numbers if condition is true using temp variable OR without temp variable          5. Print the formatted result    3. On slide 24 python implementation of the bubble sort algorithm is given    4. On slide 25, the swapping of two variables is performed without using temp variable |
| **Group Work** | **THINK Lists**  Slide 26:  Question – **Write a python program to print all the alphabets in your letter in an ascending order.**  1. Teacher should ask questions about how to represent the name  2. What will happen if we represent our name as a word?  3. What will happen if we represent our name as a series of alphabets?  4. To sort the elements, we need to have access to each element in the given collection.  5. Involve groups in to 3-5 minutes of group discussion.  6. Once everyone agrees to the point no 4,  🡪 Ask individual groups to write the code on their notebook  7. Execute python code on Python IDLE and verify the results.  8. On slide 27, Python Implementation of the question is given.  9. Verify with your code. |
| **Independent Practice** | List1: **31, 68, 42, 1, 23, 78**  List2: **10, 50, 100, 200, 300, 400**  List3: **40, 50, 60, 100, 20, 200**  **Write a python program to sort above given three lists.**  **Sort all the three lists in an ascending as well as descending order.** |
| **HOTS Question** | **Given a 3-digit or 4-digit number, write a python program to print all the digits in ascending or descending order** |