**Assignment1 for IST2060A**

**Question 1 (20 Marks)**

**Assume you got the following data elements stored in an array structure: 12,2,5,30, 60, 20, 50, 40, 10, 5, 34, 23, 45, 78, 25,9**

1. **Show the status of each data in the array after each swap that takes place using the following algorithms**
2. **Selection Sort**

**Black represents sorted part of array**

**Red represents unsorted part of array**

**Green identifies the minmum element in the unsorted part of the array**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **12** | **2** | **5** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **12** | **5** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **5** | **12** | **30** | **60** | **20** | **50** | **40** | **10** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **5** | **9** | **12** | **30** | **60** | **20** | **50** | **40** | **10** | **34** | **23** | **45** | **78** | **25** |
| **2** | **5** | **5** | **9** | **10** | **12** | **30** | **60** | **20** | **50** | **40** | **34** | **23** | **45** | **78** | **25** |
| **2** | **5** | **5** | **9** | **10** | **12** | **30** | **60** | **20** | **50** | **40** | **34** | **23** | **45** | **78** | **25** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **30** | **60** | **50** | **40** | **34** | **23** | **45** | **78** | **25** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **30** | **60** | **50** | **40** | **34** | **45** | **78** | **25** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **60** | **50** | **40** | **34** | **45** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **60** | **50** | **40** | **34** | **45** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **60** | **50** | **40** | **45** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **60** | **50** | **45** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **60** | **50** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |

1. **Insertion Sort**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **12** | **2** | **5** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **12** | **5** | **30** | **60** | **60** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **20** | **30** | **60** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **20** | **30** | **50** | **60** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **20** | **30** | **40** | **50** | **60** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **10** | **12** | **20** | **30** | **40** | **50** | **60** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **5** | **10** | **12** | **20** | **30** | **40** | **50** | **60** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **5** | **10** | **12** | **20** | **30** | **34** | **40** | **50** | **60** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **30** | **34** | **40** | **50** | **60** | **45** | **78** | **25** | **9** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **30** | **34** | **40** | **45** | **50** | **60** | **78** | **25** | **9** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **30** | **34** | **40** | **45** | **50** | **60** | **78** | **25** | **9** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** | **9** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |

1. **Bubble Sort**

**Pass 1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **12** | **2** | **5** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **12** | **5** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **60** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **20** | **60** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **20** | **50** | **60** | **40** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **60** | **10** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **60** | **5** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **5** | **60** | **34** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **5** | **34** | **60** | **23** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **60** | **45** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **60** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **60** | **78** | **25** | **9** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **60** | **25** | **78** | **9** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **60** | **25** | **9** | **78** |

**Pass 2**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **30** | **20** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **20** | **30** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **20** | **30** | **50** | **40** | **10** | **5** | **34** | **23** | **45** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **50** | **10** | **5** | **34** | **23** | **45** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **50** | **5** | **34** | **23** | **45** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **50** | **34** | **23** | **45** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **50** | **23** | **45** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **23** | **50** | **45** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **23** | **45** | **50** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **23** | **45** | **50** | **60** | **25** | **9** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **23** | **45** | **50** | **25** | **60** | **9** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **23** | **45** | **50** | **25** | **9** | **60** | **78** |

**Pass 3**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **23** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **23** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **23** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **23** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **23** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **40** | **10** | **5** | **34** | **23** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **40** | **5** | **34** | **23** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **40** | **34** | **23** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **34** | **40** | **23** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **34** | **23** | **40** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **34** | **23** | **40** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **34** | **23** | **40** | **45** | **50** | **25** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **34** | **23** | **40** | **45** | **25** | **50** | **9** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **34** | **23** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |

**Pass 4**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **34** | **23** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **34** | **23** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **34** | **23** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **34** | **23** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **30** | **10** | **5** | **34** | **23** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **10** | **30** | **5** | **34** | **23** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **10** | **5** | **30** | **34** | **23** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **10** | **5** | **30** | **34** | **23** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **10** | **5** | **30** | **23** | **34** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **10** | **5** | **30** | **23** | **34** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **10** | **5** | **30** | **23** | **34** | **40** | **45** | **25** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **10** | **5** | **30** | **23** | **34** | **40** | **25** | **45** | **9** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **10** | **5** | **30** | **23** | **34** | **40** | **25** | **9** | **45** | **50** | **60** | **78** |

**Pass 5**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **12** | **20** | **10** | **5** | **30** | **23** | **34** | **40** | **25** | **9** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **10** | **5** | **30** | **23** | **34** | **40** | **25** | **9** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **10** | **5** | **30** | **23** | **34** | **40** | **25** | **9** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **20** | **10** | **5** | **30** | **23** | **34** | **40** | **25** | **9** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **10** | **20** | **5** | **30** | **23** | **34** | **40** | **25** | **9** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **10** | **5** | **20** | **30** | **23** | **34** | **40** | **25** | **9** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **10** | **5** | **20** | **30** | **23** | **34** | **40** | **25** | **9** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **10** | **5** | **20** | **23** | **30** | **34** | **40** | **25** | **9** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **10** | **5** | **20** | **23** | **30** | **34** | **40** | **25** | **9** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **10** | **5** | **20** | **23** | **30** | **34** | **40** | **25** | **9** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **10** | **5** | **20** | **23** | **30** | **34** | **25** | **40** | **9** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **10** | **5** | **20** | **23** | **30** | **34** | **25** | **9** | **40** | **45** | **50** | **60** | **78** |

**Pass 6**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **12** | **10** | **5** | **20** | **23** | **30** | **34** | **25** | **9** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **10** | **5** | **20** | **23** | **30** | **34** | **25** | **9** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **12** | **10** | **5** | **20** | **23** | **30** | **34** | **25** | **9** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **10** | **12** | **5** | **20** | **23** | **30** | **34** | **25** | **9** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **10** | **5** | **12** | **20** | **23** | **30** | **34** | **25** | **9** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **10** | **5** | **12** | **20** | **23** | **30** | **34** | **25** | **9** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **10** | **5** | **12** | **20** | **23** | **30** | **34** | **25** | **9** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **10** | **5** | **12** | **20** | **23** | **30** | **34** | **25** | **9** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **10** | **5** | **12** | **20** | **23** | **30** | **34** | **25** | **9** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **10** | **5** | **12** | **20** | **23** | **30** | **25** | **34** | **9** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **10** | **5** | **12** | **20** | **23** | **30** | **25** | **9** | **34** | **40** | **45** | **50** | **60** | **78** |

**Pass 7**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **10** | **5** | **12** | **20** | **23** | **30** | **25** | **9** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **10** | **5** | **12** | **20** | **23** | **30** | **25** | **9** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **10** | **5** | **12** | **20** | **23** | **30** | **25** | **9** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **30** | **25** | **9** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **30** | **25** | **9** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **30** | **25** | **9** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **30** | **25** | **9** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **30** | **25** | **9** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **25** | **30** | **9** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **25** | **9** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |

**Pass 8**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **25** | **9** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **25** | **9** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **25** | **9** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **25** | **9** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **25** | **9** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **25** | **9** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **25** | **9** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **25** | **9** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **9** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |

**Pass 9**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **9** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **9** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **9** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **9** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **9** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **9** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **23** | **9** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **9** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |

**Pass 10**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **5** | **10** | **12** | **20** | **9** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **9** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **9** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **9** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **9** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **20** | **9** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **9** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |

**Pass 11**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **5** | **10** | **12** | **9** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **9** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **9** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **9** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **12** | **9** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **9** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |

**Pass 12**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **5** | **10** | **9** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **9** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **9** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **10** | **9** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |

**Pass 13**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |

**Pass 14**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |

**Pass 15**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |
| **2** | **5** | **5** | **9** | **10** | **12** | **20** | **23** | **25** | **30** | **34** | **40** | **45** | **50** | **60** | **78** |

1. **Write a C++ program that capture values, stores the values in an array structure. Within the same program, include a function for inserting new data. Also include a function for deleting any desired data. The program should provide mechanism of sorting any remaining data in the array using insertion sort technique. The program should display all the final data in the array.**

**#include <iostream>**

**using namespace std;**

**int myarray[20];**

**int i, j, n, a, d;//declaring global variables**

**int x=0;**

**void insertdata()//function to allow user to add data**

**{**

**cout<<”How many values would you like to sort”;**

**cin>>n;**

**for(i=0; i<n; i++)//loops n times**

**{**

**cin>>myarray[]; //captures elements from user**

**}**

**}**

**void deletedata()//function for deleting an element**

**{**

**cout<<”Type element to delete…”;**

**cin>>d;**

**for(i=0;i<n;i++)**

**{**

**if(myarray[i]==d)**

**{**

**for(j=i; j<n-1; j++)**

**{**

**myarray[j]=myarray[j+1];**

**x++;//to cover if the element doesn’t exist**

**i--;// to go back to where we started**

**n--;//because we deleted an element**

**}**

**}**

**}**

**if(x==0)**

**{**

**cout<<”\n Element is not in array!”;**

**}**

**else**

**{**

**cout<<”\nDeletion successful”;**

**cout<<endl;**

**}**

**}**

**void insertionsort()**

**{**

**for(i=1; i<n; i++)//iterates n-1 times**

**{**

**a=myarray[i];//assigns the i+1 element of array to a**

**j=i-1;**

**while(j>=0&&myarray[j]>a)/\*loops through the array comparing 2 elements and swapping if the latter is smaller\*/**

**{**

**myarray[j+1]=myarray[j];/\*swaps element j+1 for j\*/**

**j--;//controls the while loop**

**/\*the loop goes through elements to place the smaller element in the right position of the sorted part of the array\*/**

**}**

**myarray[j+1]=a;**

**}**

**}**

**void display()**

**{**

**cout<<”The sorted array is…”;**

**for(i=0;i<n;i++)**

**{**

**cout<<myarray[i]<<””;//to insert space between no**

**}**

**}**

**int main()**

**{**

**insertdata();**

**deletedata();//after insertion 2 sort our errors b4 sorting**

**insertionsort();**

**display();**

**}**