Cho dãy số:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |

f

**\*\*\*----------LinearySeach-----------\*\*\***

Y/c: Tìm X=8

i=1 X=8

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |

i=2 X=8

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |

i=3 X=8

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |

i=4 X=8

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |

i=5 X=8

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |

i=6 X=8

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |

Vậy: Tìm thấy X=8 tại vị trí thứ 6.

**\*\*\*----------SELECTION SORT-----------\*\*\***

***Tăng dần***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| i | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |
| 1 | 1 | 6 | 9 | 11 | 12 | 8 | 4 | 5 | 6 |
| 2 |  | 4 | 9 | 11 | 12 | 8 | 6 | 5 | 6 |
| 3 |  |  | 5 | 11 | 12 | 8 | 6 | 9 | 6 |
| 4 |  |  |  | 6 | 12 | 8 | 11 | 9 | 6 |
| 5 |  |  |  |  | 6 | 8 | 11 | 9 | 12 |
| 6 |  |  |  |  |  | 8 | 11 | 9 | 12 |
| 7 |  |  |  |  |  |  | 9 | 11 | 12 |
| 8 |  |  |  |  |  |  |  | 11 | 12 |

***Giảm dần***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| i | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |
| 1 | 12 | 6 | 9 | 11 | 5 | 8 | 4 | 1 | 6 |
| 2 |  | 11 | 9 | 6 | 5 | 8 | 4 | 1 | 6 |
| 3 |  |  | 9 | 6 | 5 | 8 | 4 | 1 | 6 |
| 4 |  |  |  | 8 | 5 | 6 | 4 | 1 | 6 |
| 5 |  |  |  |  | 6 | 5 | 4 | 1 | 6 |
| 6 |  |  |  |  |  | 6 | 4 | 1 | 5 |
| 7 |  |  |  |  |  |  | 5 | 1 | 4 |
| 8 |  |  |  |  |  |  |  | 4 | 1 |

**\*\*\*----------INSERTION SORT-----------\*\*\***

***Tăng dần***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| i | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |
| 2 | 5 | 6 |  |  |  |  |  |  |  |
| 3 | 5 | 6 | 9 |  |  |  |  |  |  |
| 4 | 5 | 6 | 9 | 11 |  |  |  |  |  |
| 5 | 5 | 6 | 9 | 11 | 12 |  |  |  |  |
| 6 | 5 | 6 | 8 | 9 | 11 | 12 |  |  |  |
| 7 | 4 | 5 | 6 | 8 | 9 | 11 | 12 |  |  |
| 8 | 1 | 4 | 5 | 6 | 8 | 9 | 11 | 12 |  |
| 9 | 1 | 4 | 5 | 6 | 6 | 8 | 9 | 11 | 12 |

***Giảm dần***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| i | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |
| 8 |  |  |  |  |  |  |  | 6 | 1 |
| 7 |  |  |  |  |  |  | 6 | 4 | 1 |
| 6 |  |  |  |  |  | 8 | 6 | 4 | 1 |
| 5 |  |  |  |  | 12 | 8 | 6 | 4 | 1 |
| 4 |  |  |  | 12 | 11 | 8 | 6 | 4 | 1 |
| 3 |  |  | 12 | 11 | 9 | 8 | 6 | 4 | 1 |
| 2 |  | 12 | 11 | 9 | 8 | 6 | 6 | 4 | 1 |
| 1 | 12 | 11 | 9 | 8 | 6 | 6 | 5 | 4 | 1 |

**\*\*\*----------INTERCHAGE SORT-----------\*\*\***

***Tăng dần***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| i | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |
| 1 | 1 | 6 | 9 | 11 | 12 | 8 | 5 | 4 | 6 |
| 2 |  | 4 | 9 | 11 | 12 | 8 | 6 | 5 | 6 |
| 3 |  |  | 5 | 11 | 12 | 9 | 8 | 6 | 6 |
| 4 |  |  |  | 6 | 12 | 11 | 9 | 8 | 6 |
| 5 |  |  |  |  | 6 | 12 | 11 | 9 | 8 |
| 6 |  |  |  |  |  | 8 | 12 | 11 | 9 |
| 7 |  |  |  |  |  |  | 9 | 12 | 11 |
| 8 |  |  |  |  |  |  |  | 11 | 12 |

***Giảm dần***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| i | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |
| 1 | 12 | 5 | 6 | 9 | 11 | 8 | 4 | 1 | 6 |
| 2 |  | 11 | 5 | 6 | 9 | 8 | 4 | 1 | 6 |
| 3 |  |  | 9 | 5 | 6 | 8 | 4 | 1 | 6 |
| 4 |  |  |  | 8 | 5 | 6 | 4 | 1 | 6 |
| 5 |  |  |  |  | 6 | 5 | 4 | 1 | 6 |
| 6 |  |  |  |  |  | 6 | 4 | 1 | 5 |
| 7 |  |  |  |  |  |  | 5 | 1 | 4 |
| 8 |  |  |  |  |  |  |  | 4 | 1 |

**\*\*\*----------BUBBLE SORT-----------\*\*\***

***Tăng dần***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| i | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |
| 1 | 1 | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 6 |
| 2 |  | 4 | 5 | 6 | 9 | 11 | 12 | 8 | 6 |
| 3 |  |  | 5 | 6 | 6 | 9 | 11 | 12 | 8 |
| 4 |  |  |  | 6 | 6 | 8 | 9 | 11 | 12 |
| 5 |  |  |  |  | 6 | 8 | 9 | 11 | 12 |
| 6 |  |  |  |  |  | 8 | 9 | 11 | 12 |
| 7 |  |  |  |  |  |  | 9 | 11 | 12 |
| 8 |  |  |  |  |  |  |  | 11 | 12 |

***Giảm dần***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| i | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |
| 1 | 12 | 5 | 6 | 9 | 11 | 8 | 6 | 4 | 1 |
| 2 |  | 11 | 5 | 6 | 9 | 8 | 6 | 4 | 1 |
| 3 |  |  | 9 | 5 | 6 | 8 | 6 | 4 | 1 |
| 4 |  |  |  | 8 | 5 | 6 | 6 | 4 | 1 |
| 5 |  |  |  |  | 6 | 5 | 6 | 4 | 1 |
| 6 |  |  |  |  |  | 6 | 5 | 4 | 1 |
| 7 |  |  |  |  |  |  | 5 | 4 | 1 |
| 8 |  |  |  |  |  |  |  | 4 | 1 |

**\*\*\*----------QUICK SORT-----------\*\*\***

***Tăng dần***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |  |  |
| i | j | x | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 | i’ | j’ |
| 1 | 9 | 12 | 5 | 6 | 9 | 11 | 6 | 8 | 4 | 1 | 12 | 9 | 8 |
| 1 | 8 | 11 | 5 | 6 | 9 | 1 | 6 | 8 | 4 | 11 |  | 8 | 7 |
| 1 | 7 | 1 | 1 | 6 | 9 | 5 | 6 | 8 | 4 |  |  | 2 | 1 |
| 2 | 7 | 5 |  | 4 | 5 | 9 | 6 | 8 | 6 |  |  | 4 | 3 |
| 2 | 3 | 4 |  | 4 | 5 |  |  |  |  |  |  | 3 | 1 |
| 4 | 7 | 6 |  |  |  | 6 | 6 | 8 | 9 |  |  | 6 | 4 |
| 6 | 7 | 8 |  |  |  |  |  | 8 | 9 |  |  | 7 | 5 |

***Giảm dần***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |  |  |
| i | j | x | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 | i’ | j’ |
| 1 | 9 | 12 | 12 | 6 | 9 | 11 | 5 | 8 | 4 | 1 | 6 | 2 | 1 |
| 2 | 9 | 5 |  | 6 | 9 | 11 | 6 | 8 | 4 | 1 | 5 | 7 | 6 |
| 2 | 6 | 11 |  | 11 | 9 | 6 | 6 | 8 |  |  |  | 3 | 2 |
| 3 | 6 | 6 |  |  | 9 | 8 | 6 | 6 |  |  |  | 6 | 4 |
| 3 | 4 | 9 |  |  | 9 | 8 |  |  |  |  |  | 4 | 2 |
| 7 | 9 | 1 |  |  |  |  |  |  | 4 | 5 | 1 | 9 | 8 |
| 7 | 8 | 4 |  |  |  |  |  |  | 5 | 4 |  | 8 | 7 |

Làm Thêm

***Tăng dần***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |  |  |
| i | j | x | 3 | 5 | 0 | 9 | 6 | 5 | 0 | 8 | 9 | i’ | j’ |
| 1 | 9 | 6 | 3 | 5 | 0 | 0 | 5 | 6 | 9 | 8 | 9 | 6 | 5 |
| 1 | 5 | 0 | 0 | 0 | 5 | 3 | 5 |  |  |  |  | 3 | 2 |
| 1 | 2 | 0 | 0 | 0 |  |  |  |  |  |  |  | 2 | 1 |
| 3 | 5 | 3 |  |  | 3 | 5 | 5 |  |  |  |  | 4 | 3 |
| 4 | 5 | 5 |  |  |  | 5 | 5 |  |  |  |  | 5 | 4 |
| 6 | 9 | 9 |  |  |  |  |  | 6 | 9 | 8 | 9 | 9 | 8 |
| 6 | 8 | 9 |  |  |  |  |  | 6 | 8 | 9 |  | 8 | 7 |
| 6 | 7 | 6 |  |  |  |  |  | 6 | 8 |  |  | 7 | 5 |

**\*\*\*----------HEAPSORT-----------\*\*\***

***Tăng dần: ai >= a2i  và ai >= a2i+1***

Giai đoạn 1:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| left | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |
| 4 |  |  |  | 11 | 12 | 8 | 4 | 1 | 6 |
| 3 |  |  | 9 | 11 | 12 | 8 | 4 | 1 | 6 |
| 2 |  | 12 | 9 | 11 | 6 | 8 | 4 | 1 | 6 |
| 1 | 12 | 11 | 9 | 6 | 6 | 8 | 4 | 1 | 5 |

Giai đoạn 2:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| right | 12 | 11 | 9 | 6 | 6 | 8 | 4 | 1 | 5 |
| 9 | 11 | 6 | 9 | 5 | 6 | 8 | 4 | 1 | 12 |
| 8 | 9 | 6 | 8 | 5 | 6 | 1 | 4 | 11 |  |
| 7 | 8 | 6 | 4 | 5 | 6 | 1 | 9 |  |  |
| 6 | 6 | 6 | 4 | 5 | 1 | 8 |  |  |  |
| 5 | 6 | 5 | 4 | 1 | 6 |  |  |  |  |
| 4 | 5 | 1 | 4 | 6 |  |  |  |  |  |
| 3 | 4 | 1 | 5 |  |  |  |  |  |  |
| 2 | 1 | 4 |  |  |  |  |  |  |  |

***Giảm dần : ai <= a2i  và ai <= a2i+1***

Giai đoạn 1:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| left | 5 | 6 | 9 | 11 | 12 | 8 | 4 | 1 | 6 |
| 4 |  |  |  | 1 | 12 | 8 | 4 | 11 | 6 |
| 3 |  |  | 4 | 1 | 12 | 8 | 9 | 11 | 6 |
| 2 |  | 1 | 4 | 6 | 12 | 8 | 9 | 11 | 6 |
| 1 | 1 | 5 | 4 | 6 | 12 | 8 | 9 | 11 | 6 |

Giai đoạn 2:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| right | 1 | 5 | 4 | 6 | 12 | 8 | 9 | 11 | 6 |
| 9 | 4 | 5 | 6 | 6 | 12 | 8 | 9 | 11 | 1 |
| 8 | 5 | 6 | 6 | 11 | 12 | 8 | 9 | 4 |  |
| 7 | 6 | 9 | 6 | 11 | 12 | 8 | 5 |  |  |
| 6 | 6 | 9 | 8 | 11 | 12 | 6 |  |  |  |
| 5 | 8 | 9 | 12 | 11 | 6 |  |  |  |  |
| 4 | 9 | 11 | 12 | 8 |  |  |  |  |  |
| 3 | 11 | 12 | 9 |  |  |  |  |  |  |
| 2 | 12 | 11 |  |  |  |  |  |  |  |