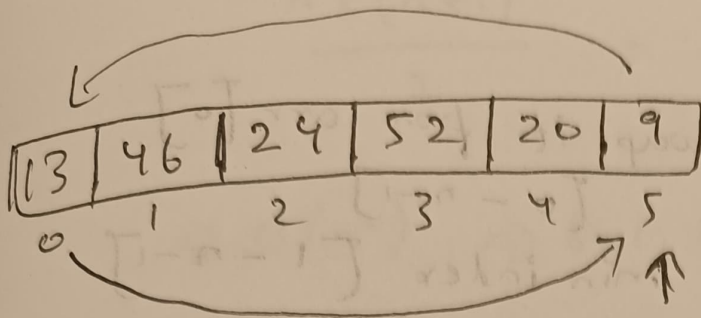


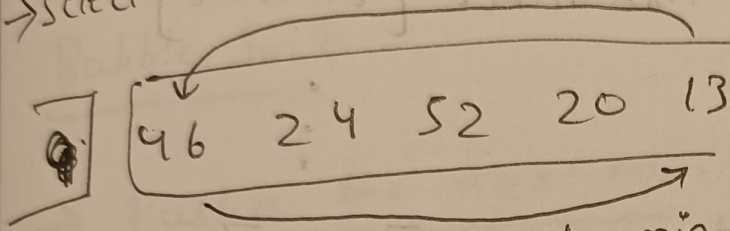
Selection Sort



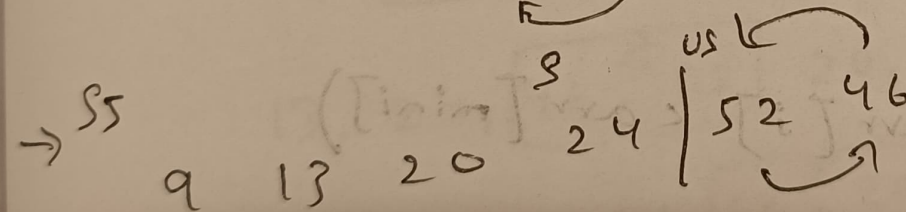
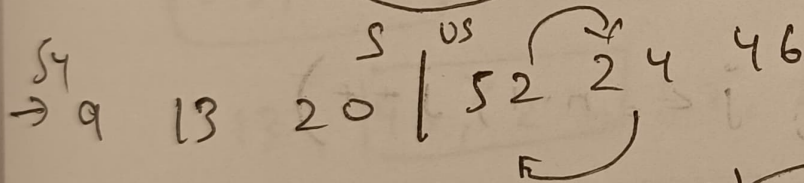
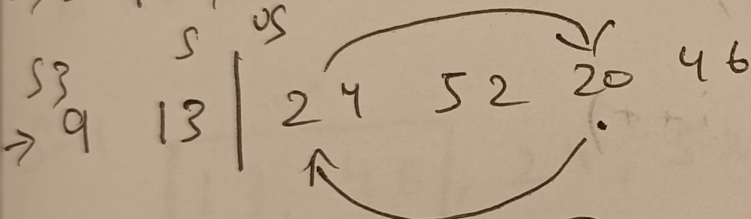
ascending
order

9, 13, 20, 24, 46, 52

→ select minimum and swap (step 1)



→ Step 2, select next min and swap



→ 9 13 20 24 46 52 ⇒ Sorted

Get the min and swap it

Pseudo Code

Observation:

Observation:
 → Figure out mini , swap it from $\text{arr}[0]$
 $[0 - n-1]$
 $[1 - n-1]$

→ Swap at index 1, min index [1-2-1]

→ swap at $2, \text{ min index } [2-n-1]$

$$n-2, \quad [n-1]$$

for ($i=0$; $i \leq n-2$; $i++$)

$$\{ \min_i = 0.1 \}$$
$$\text{for } (int\ j = i; \ j \leq n-1; \ j++)$$

if ($\text{arr}[i] < \text{arr}[\text{mini}]$)

$$m_i = j$$

3

swap(arr[mini], arr[i]);

3

11 to swap

$$temp = arr[mini]$$
$$arr[mini] = arr[i]$$

```
arr[i] = temp;
```

$$n + n-1 + n-2 \dots 2 + 1$$

T.C \Rightarrow

$$\frac{n \times (n+1)}{2} = \frac{n^2}{2} + \frac{n}{2}$$

$\Rightarrow O(n^2) \Rightarrow$ Best, Average, Worst.

Bubble Sort

\rightarrow Pushes the maximum to the left and opposite to the selection sort \rightarrow to the last by adjacent steps.

S-1 \checkmark 13, 46, 24, 52, 20, 9

13, 46 > 24, 52, 20, 9

13, 24, 46 < 52, 20, 9

13, 24, 46, 52 > 20, 9

13, 24, 46, 20, 52 > 9

13, 24, 46, 20, 9, 52

So on...

now if you observe the maximum is at the right.

S-2

13, 24, 20, 46, 9, 52 \Rightarrow 13, 24, 20, 9, 46, 52

S-3 j, j+1

13, 24, 20, 9, 46, 52

13, 20, 24, 9, 46, 52

13, 20, 9, 24, 46, 52

S-4 13, 9, 20, 24, 46, 52

S-5 9, 13, 20, 24, 46, 52

Observation

$S-1 \Rightarrow 0 - n - 1$
 $S-2 \Rightarrow 0 - n - 2$
 $S-3 \Rightarrow 0 - n - 3$
 \vdots
 $\Rightarrow 0 - 1$

i

for (i = n-1; i >= 1; i--)

{ for (j = 0; j <= i-1; j++)

if (a[j] > a[j+1])

swap

}

}

Not to sort last element.

TC \Rightarrow n $n-1$ $n-2$ $n-3$ $n-4$ $n-5$ $n-6$ $n-7$ $n-8$ $n-9$ $n-10$ $n-11$ $n-12$ $n-13$ $n-14$ $n-15$ $n-16$ $n-17$ $n-18$ $n-19$ $n-20$ $n-21$ $n-22$ $n-23$ $n-24$ $n-25$ $n-26$ $n-27$ $n-28$ $n-29$ $n-30$ $n-31$ $n-32$ $n-33$ $n-34$ $n-35$ $n-36$ $n-37$ $n-38$ $n-39$ $n-40$ $n-41$ $n-42$ $n-43$ $n-44$ $n-45$ $n-46$ $n-47$ $n-48$ $n-49$ $n-50$ $n-51$ $n-52$ $n-53$ $n-54$ $n-55$ $n-56$ $n-57$ $n-58$ $n-59$ $n-60$ $n-61$ $n-62$ $n-63$ $n-64$ $n-65$ $n-66$ $n-67$ $n-68$ $n-69$ $n-70$ $n-71$ $n-72$ $n-73$ $n-74$ $n-75$ $n-76$ $n-77$ $n-78$ $n-79$ $n-80$ $n-81$ $n-82$ $n-83$ $n-84$ $n-85$ $n-86$ $n-87$ $n-88$ $n-89$ $n-90$ $n-91$ $n-92$ $n-93$ $n-94$ $n-95$ $n-96$ $n-97$ $n-98$ $n-99$ $n-100$ $n-101$ $n-102$ $n-103$ $n-104$ $n-105$ $n-106$ $n-107$ $n-108$ $n-109$ $n-110$ $n-111$ $n-112$ $n-113$ $n-114$ $n-115$ $n-116$ $n-117$ $n-118$ $n-119$ $n-120$ $n-121$ $n-122$ $n-123$ $n-124$ $n-125$ $n-126$ $n-127$ $n-128$ $n-129$ $n-130$ $n-131$ $n-132$ $n-133$ $n-134$ $n-135$ $n-136$ $n-137$ $n-138$ $n-139$ $n-140$ $n-141$ $n-142$ $n-143$ $n-144$ $n-145$ $n-146$ $n-147$ $n-148$ $n-149$ $n-150$ $n-151$ $n-152$ $n-153$ $n-154$ $n-155$ $n-156$ $n-157$ $n-158$ $n-159$ $n-160$ $n-161$ $n-162$ $n-163$ $n-164$ $n-165$ $n-166$ $n-167$ $n-168$ $n-169$ $n-170$ $n-171$ $n-172$ $n-173$ $n-174$ $n-175$ $n-176$ $n-177$ $n-178$ $n-179$ $n-180$ $n-181$ $n-182$ $n-183$ $n-184$ $n-185$ $n-186$ $n-187$ $n-188$ $n-189$ $n-190$ $n-191$ $n-192$ $n-193$ $n-194$ $n-195$ $n-196$ $n-197$ $n-198$ $n-199$ $n-200$ $n-201$ $n-202$ $n-203$ $n-204$ $n-205$ $n-206$ $n-207$ $n-208$ $n-209$ $n-210$ $n-211$ $n-212$ $n-213$ $n-214$ $n-215$ $n-216$ $n-217$ $n-218$ $n-219$ $n-220$ $n-221$ $n-222$ $n-223$ $n-224$ $n-225$ $n-226$ $n-227$ $n-228$ $n-229$ $n-230$ $n-231$ $n-232$ $n-233$ $n-234$ $n-235$ $n-236$ $n-237$ $n-238$ $n-239$ $n-240$ $n-241$ $n-242$ $n-243$ $n-244$ $n-245$ $n-246$ $n-247$ $n-248$ $n-249$ $n-250$ $n-251$ $n-252$ $n-253$ $n-254$ $n-255$ $n-256$ $n-257$ $n-258$ $n-259$ $n-260$ $n-261$ $n-262$ $n-263$ $n-264$ $n-265$ $n-266$ $n-267$ $n-268$ $n-269$ $n-270$ $n-271$ $n-272$ $n-273$ $n-274$ $n-275$ $n-276$ $n-277$ $n-278$ $n-279$ $n-280$ $n-281$ $n-282$ $n-283$ $n-284$ $n-285$ $n-286$ $n-287$ $n-288$ $n-289$ $n-290$ $n-291$ $n-292$ $n-293$ $n-294$ $n-295$ $n-296$ $n-297$ $n-298$ $n-299$ $n-300$ $n-301$ $n-302$ $n-303$ $n-304$ $n-305$ $n-306$ $n-307$ $n-308$ $n-309$ $n-310$ $n-311$ $n-312$ $n-313$ $n-314$ $n-315$ $n-316$ $n-317$ $n-318$ $n-319$ $n-320$ $n-321$ $n-322$ $n-323$ $n-324$ $n-325$ $n-326$ $n-327$ $n-328$ $n-329$ $n-330$ $n-331$ $n-332$ $n-333$ $n-334$ $n-335$ $n-336$ $n-337$ $n-338$ $n-339$ $n-340$ $n-341$ $n-342$ $n-343$ $n-344$ $n-345$ $n-346$ $n-347$ $n-348$ $n-349$ $n-350$ $n-351$ $n-352$ $n-353$ $n-354$ $n-355$ $n-356$ $n-357$ $n-358$ $n-359$ $n-360$ $n-361$ $n-362$ $n-363$ $n-364$ $n-365$ $n-366$ $n-367$ $n-368$ $n-369$ $n-370$ $n-371$ $n-372$ $n-373$ $n-374$ $n-375$ $n-376$ $n-377$ $n-378$ $n-379$ $n-380$ $n-381$ $n-382$ $n-383$ $n-384$ $n-385$ $n-386$ $n-387$ $n-388$ $n-389$ $n-390$ $n-391$ $n-392$ $n-393$ $n-394$ $n-395$ $n-396$ $n-397$ $n-398$ $n-399$ $n-400$ $n-401$ $n-402$ $n-403$ $n-404$ $n-405$ $n-406$ $n-407$ $n-408$ $n-409$ $n-410$ $n-411$ $n-412$ $n-413$ $n-414$ $n-415$ $n-416$ $n-417$ $n-418$ n

$O(n^2) \Rightarrow$ worst case

If the arr is 2 3 5 15 20 \Rightarrow Best Case

$T.C \Rightarrow O(n) \Rightarrow$ Best case

Insertion Sort

Take an element and place it in the correct position.

14 9 15 12 6 8 13

* Everyone right shifts by one.

→ 9 14 15 12 6 8 13

+ Swap happen.

→ 9 12 14 15 6 8 13

Worst $\Rightarrow O(n^2)$

→ 6 9 12 14 15 8 13

Best Case $\Rightarrow O(n)$

... So on.

6 8 9 12 13 14 15

for ($i = 0$; $i \leq n-1$; $i++$)

2 j n i

```

j = 1
while (j > 0 && a[j-1] > a[j])

```

$$2 \text{ swap}(a[i-1], a[j])$$

9 3 1-1