RAMA UNIVERSITY

www.ramauniversity.ac.in

FACULTY OF ENGINEERING & TECHNOLOGY

Lecture : 07

Mr. Nilesh
Assistant Professor
Computer Science & Engineering

❑ Outline

- Bubble Sort

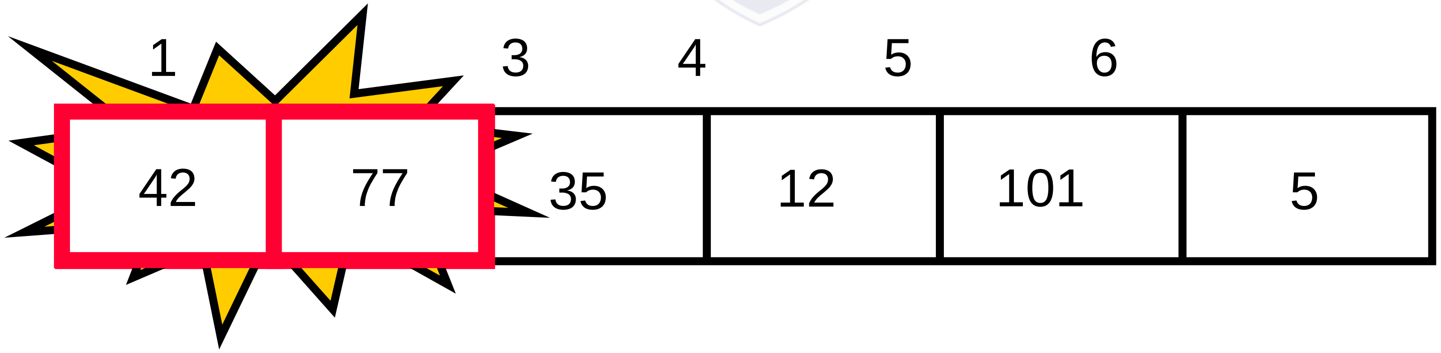
"Bubbling Up" the Largest Element

- **Traverse a collection of elements**
  - **Move from the front to the end**
  - **“Bubble” the largest value to the end using pair-wise comparisons and swapping**

1	2	3	4	5	6
77	42	35	12	101	5

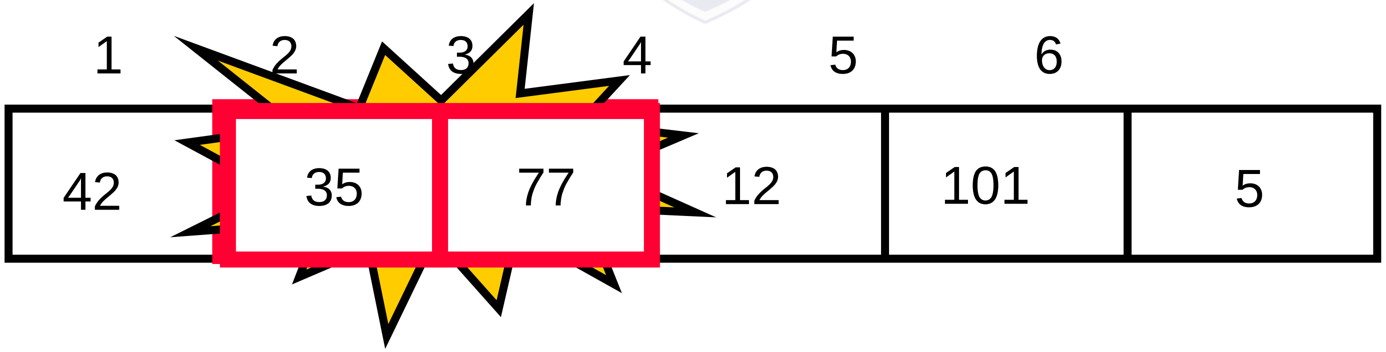
"Bubbling Up" the Largest Element

- Traverse a collection of elements
  - Move from the front to the end
  - “Bubble” the largest value to the end using pair-wise comparisons and swapping



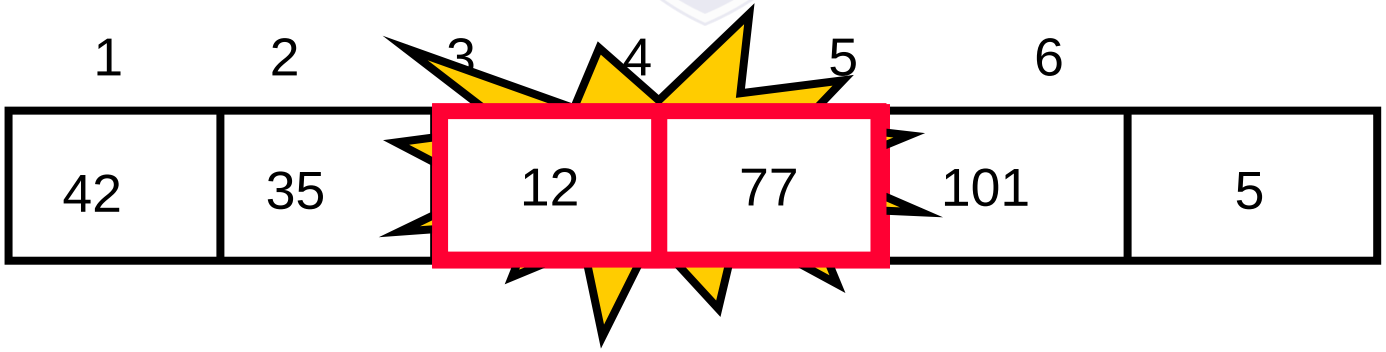
"Bubbling Up" the Largest Element

- Traverse a collection of elements
  - Move from the front to the end
  - "Bubble" the largest value to the end using pair-wise comparisons and swapping



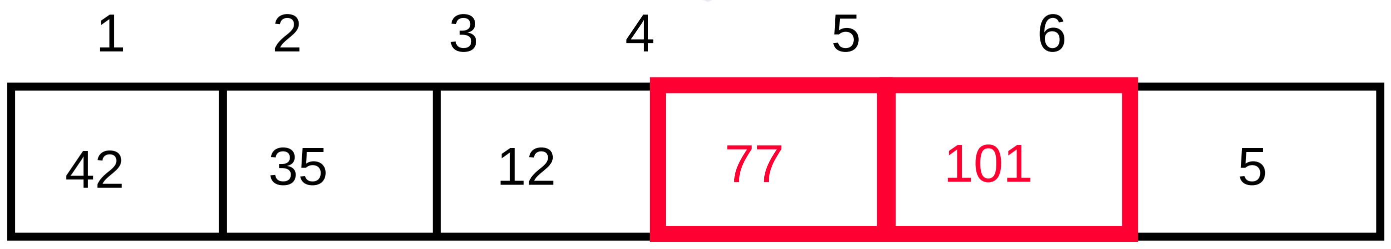
"Bubbling Up" the Largest Element

- Traverse a collection of elements
  - Move from the front to the end
  - "Bubble" the largest value to the end using pair-wise comparisons and swapping



"Bubbling Up" the Largest Element

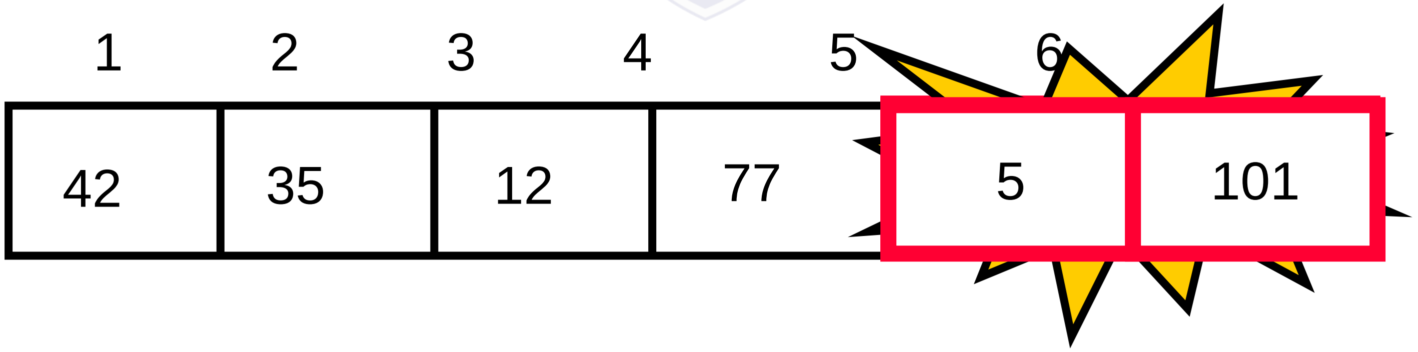
- Traverse a collection of elements
  - Move from the front to the end
  - "Bubble" the largest value to the end using pair-wise comparisons and swapping



No need to swap

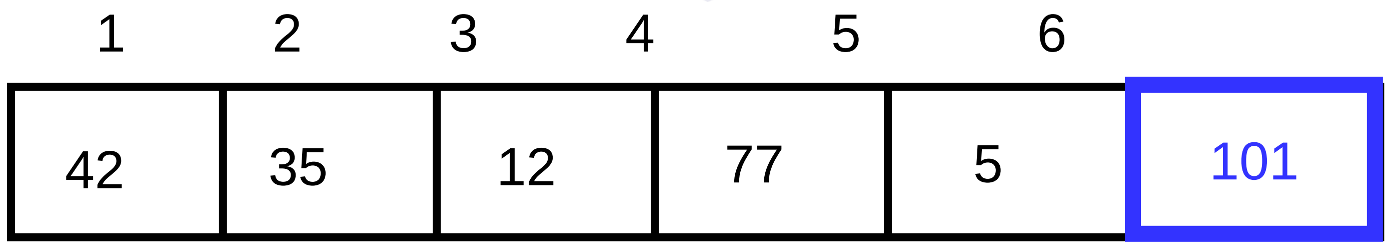
"Bubbling Up" the Largest Element

- Traverse a collection of elements
  - Move from the front to the end
  - “Bubble” the largest value to the end using pair-wise comparisons and swapping



"Bubbling Up" the Largest Element

- Traverse a collection of elements
  - Move from the front to the end
  - “Bubble” the largest value to the end using pair-wise comparisons and swapping



Largest value correctly placed

The “Bubble Up” Algorithm

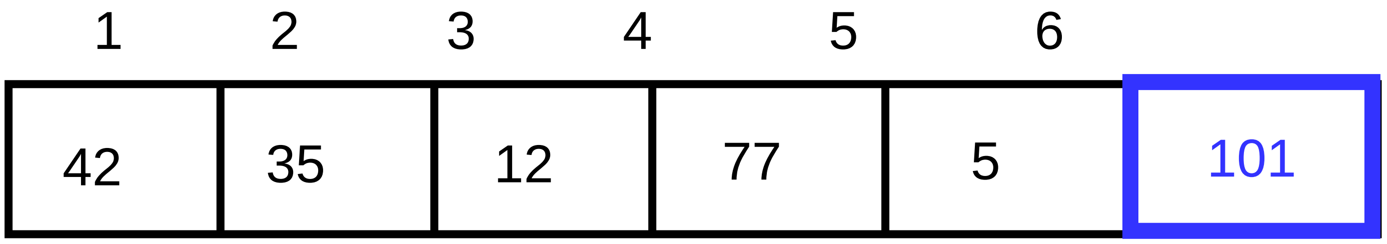
```
index <- 1
last_compare_at <- n – 1

loop
  exitif(index > last_compare_at)
  if(A[index] > A[index + 1]) then
    Swap(A[index], A[index + 1])
  endif
  index <- index + 1
endloop
```

No, Swap isn’t built in.

```
Procedure Swap(a, b isoftype in/out Num)
  t isoftype Num
  t <- a
  a <- b
  b <- t
endprocedure // Swap
```

Items of Interest

- Notice that only the largest value is correctly placed
- All other values are still out of order
- So we need to repeat this process

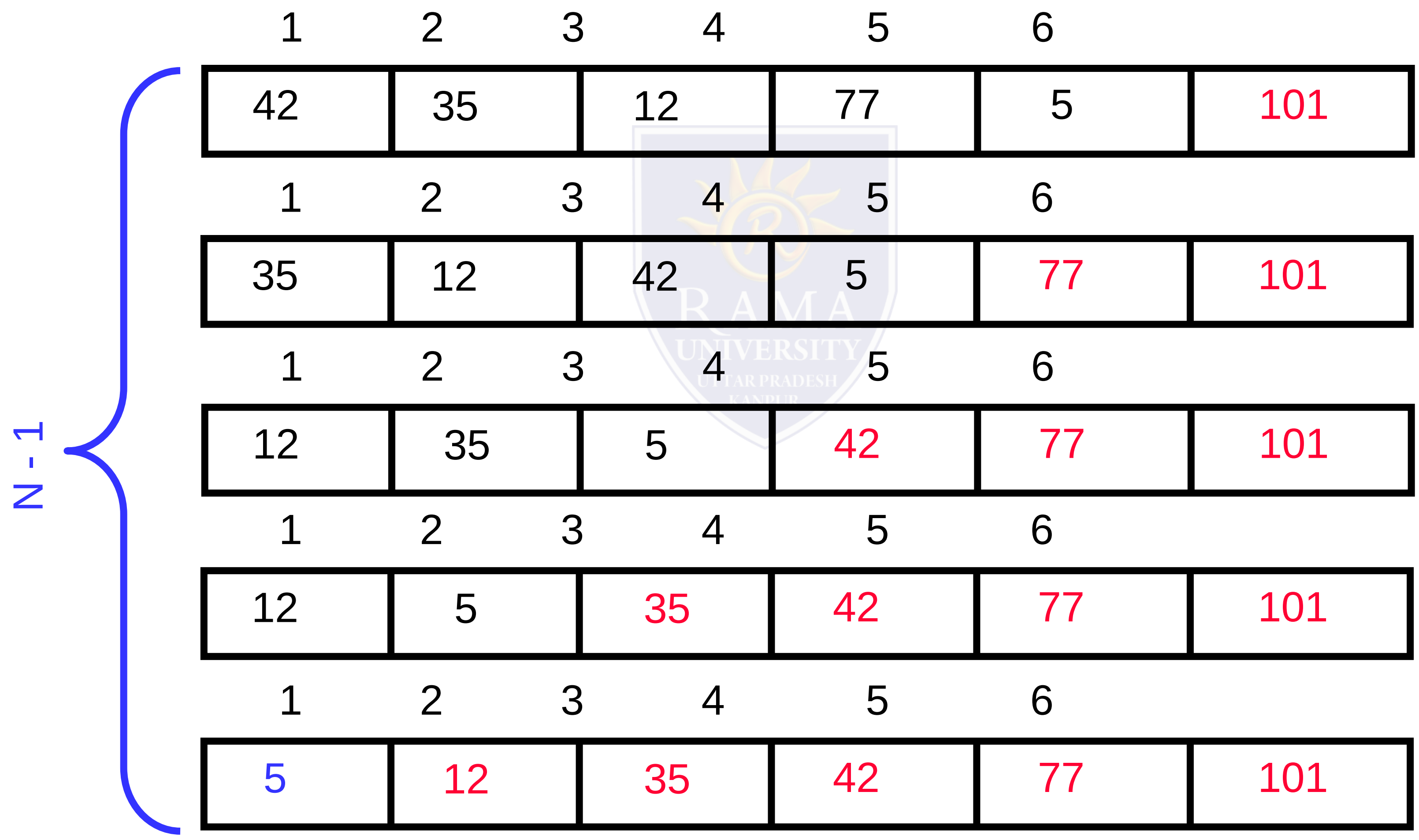


Largest value correctly placed

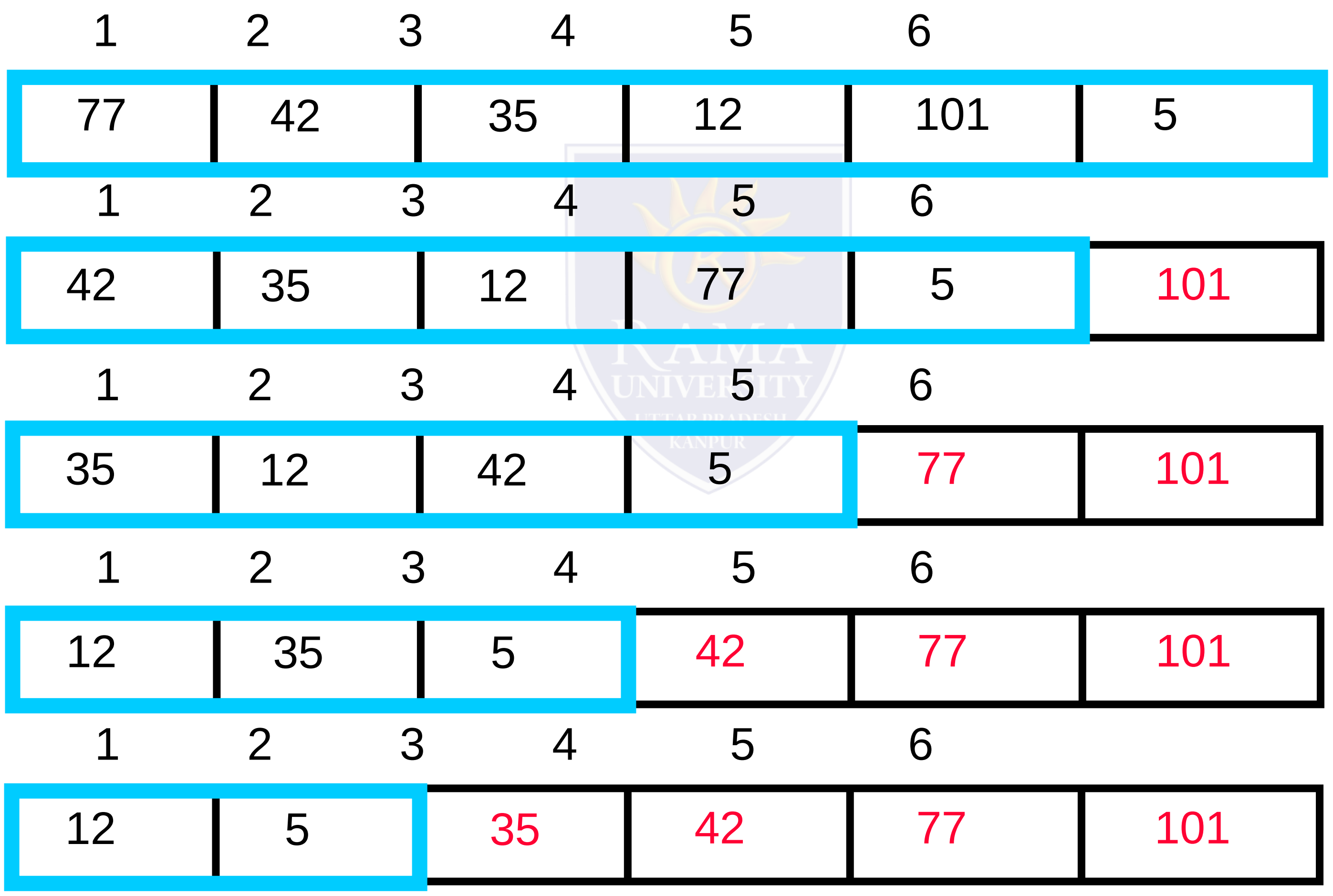
Repeat “Bubble Up” How Many Times?

- If we have N elements…
- And if each time we bubble an element, we place it in its correct location…
- Then we repeat the “bubble up” process N – 1 times.
- This guarantees we’ll correctly place all N elements.

“Bubbling” All the Elements



Reducing the Number of Comparisons



1	2	3	4	5	6
77	42	35	12	101	5

1	2	3	4	5	6
42	35	12	77	5	101

1	2	3	4	5	6
35	12	42	5	77	101

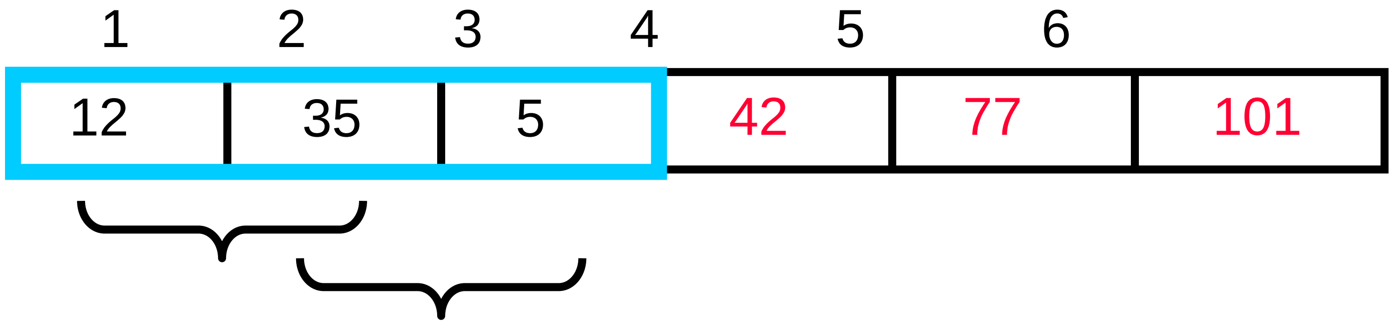
1	2	3	4	5	6
12	35	5	42	77	101

1	2	3	4	5	6
12	5	35	42	77	101

Reducing the Number of Comparisons

- On the Nth “bubble up”, we only need to do MAX-N comparisons.

- For example:
  - This is the 4th “bubble up”
  - MAX is 6
  - Thus we have 2 comparisons to do



Summary

- "Bubble Up" algorithm will move largest value to its correct location (to the right)
- Repeat "Bubble Up" until all elements are correctly placed:
  - Maximum of N-1 times
  - Can finish early if no swapping occurs
- We reduce the number of elements we compare each time one is correctly placed
- Notes:
  - ✓ NOBODY EVER USES BUBBLE SORT
  - ✓ NOBODY
  - ✓ NOT EVER
  - ✓ BECAUSE IT IS EXTREMELY INEFFICIENT