

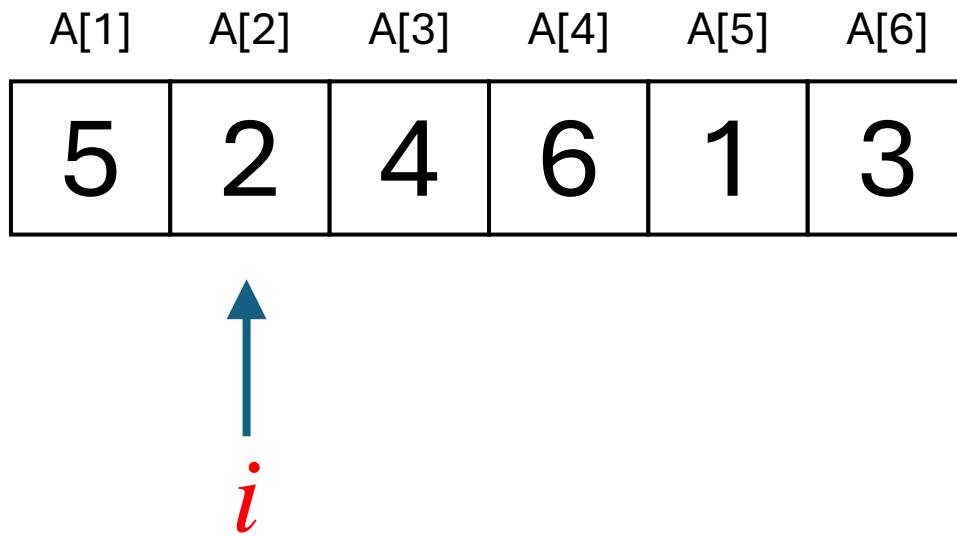
## Insertion Sort (A, n)

```
1  for  $i = 2$  to  $n$ 
2       $key = A[ i ]$ 
3       $j = i - 1$ 
4      while  $j > 0$  and  $A[ j ] > key$ 
5           $A[ j + 1 ] = A[ j ]$ 
6           $j = j - 1$ 
7       $A[ j + 1 ] = key$ 
```

BEGIN

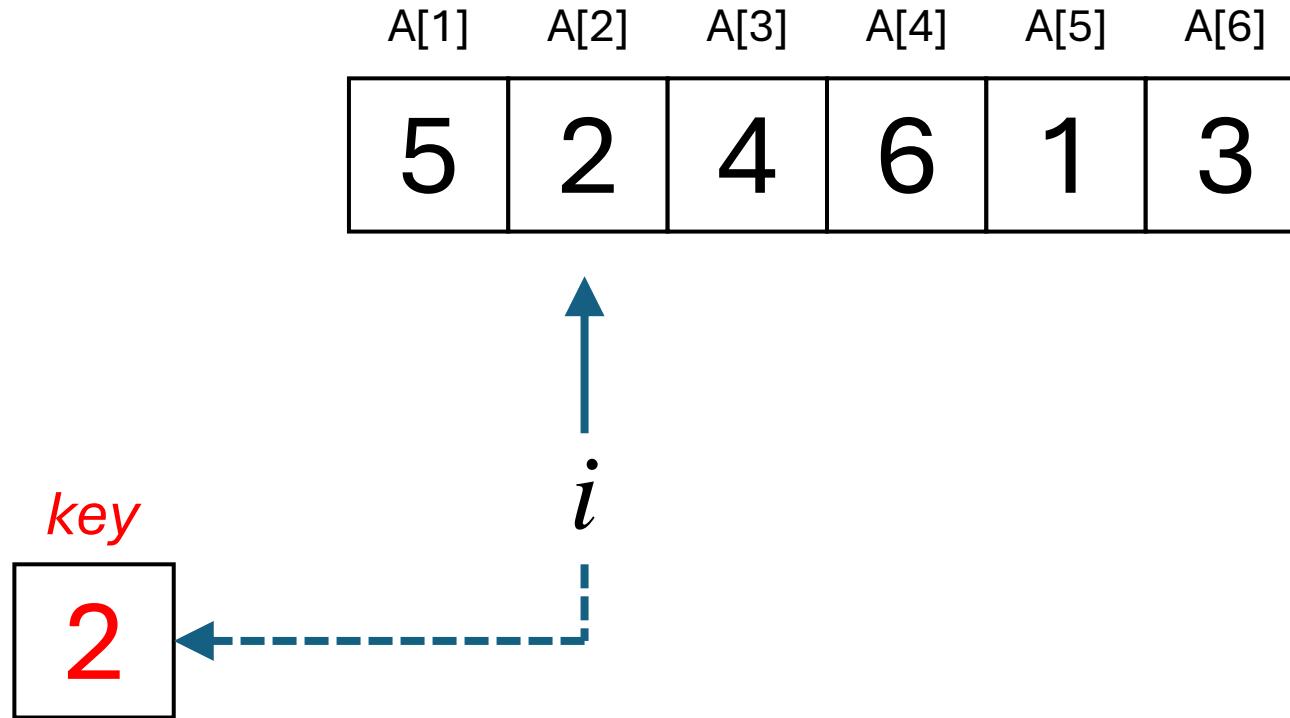
A[1]	A[2]	A[3]	A[4]	A[5]	A[6]
5	2	4	6	1	3

# STEP 1



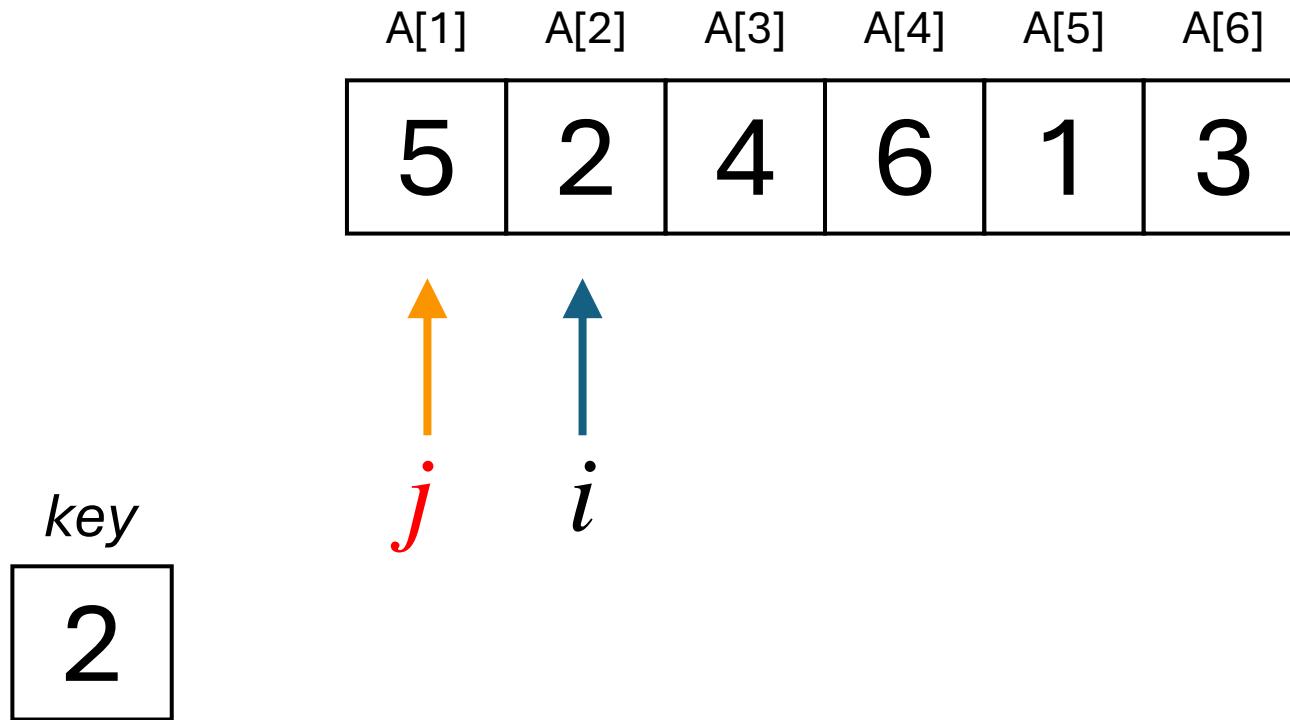
$$i = 2$$

## STEP 2



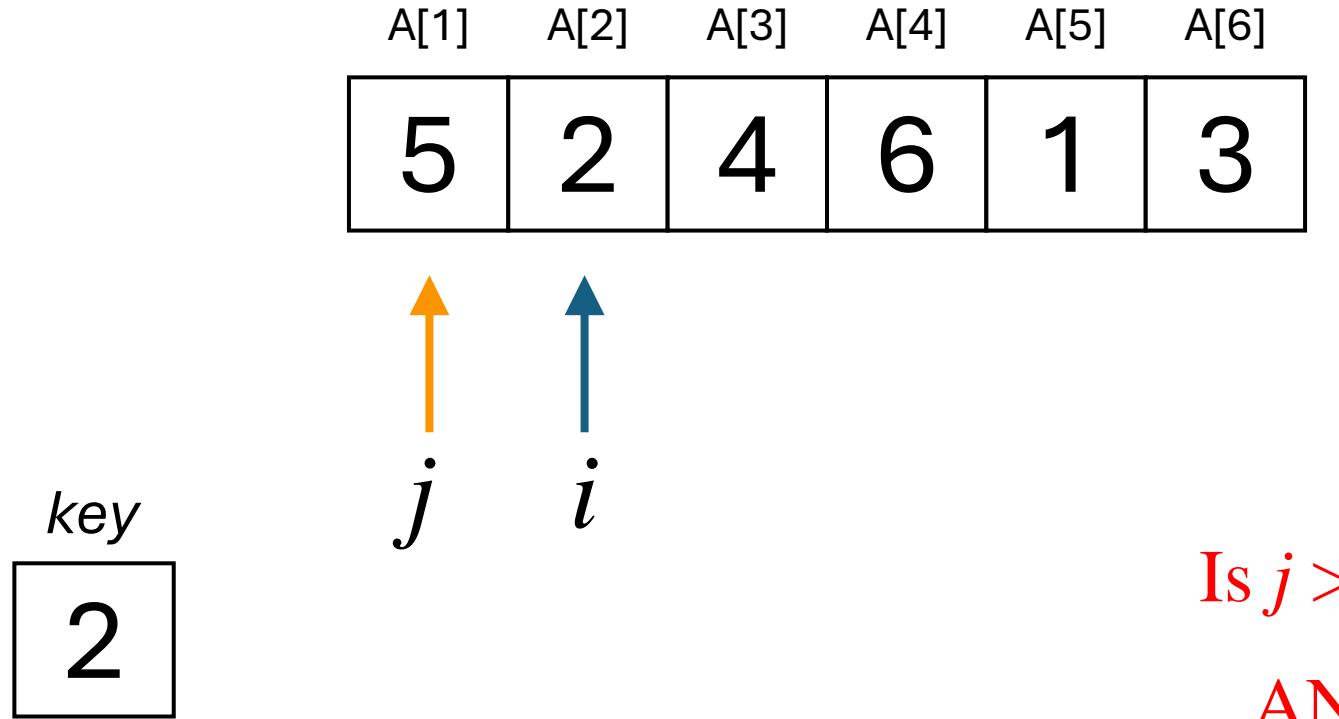
$$i = 2 \quad key = 2$$

## STEP 3



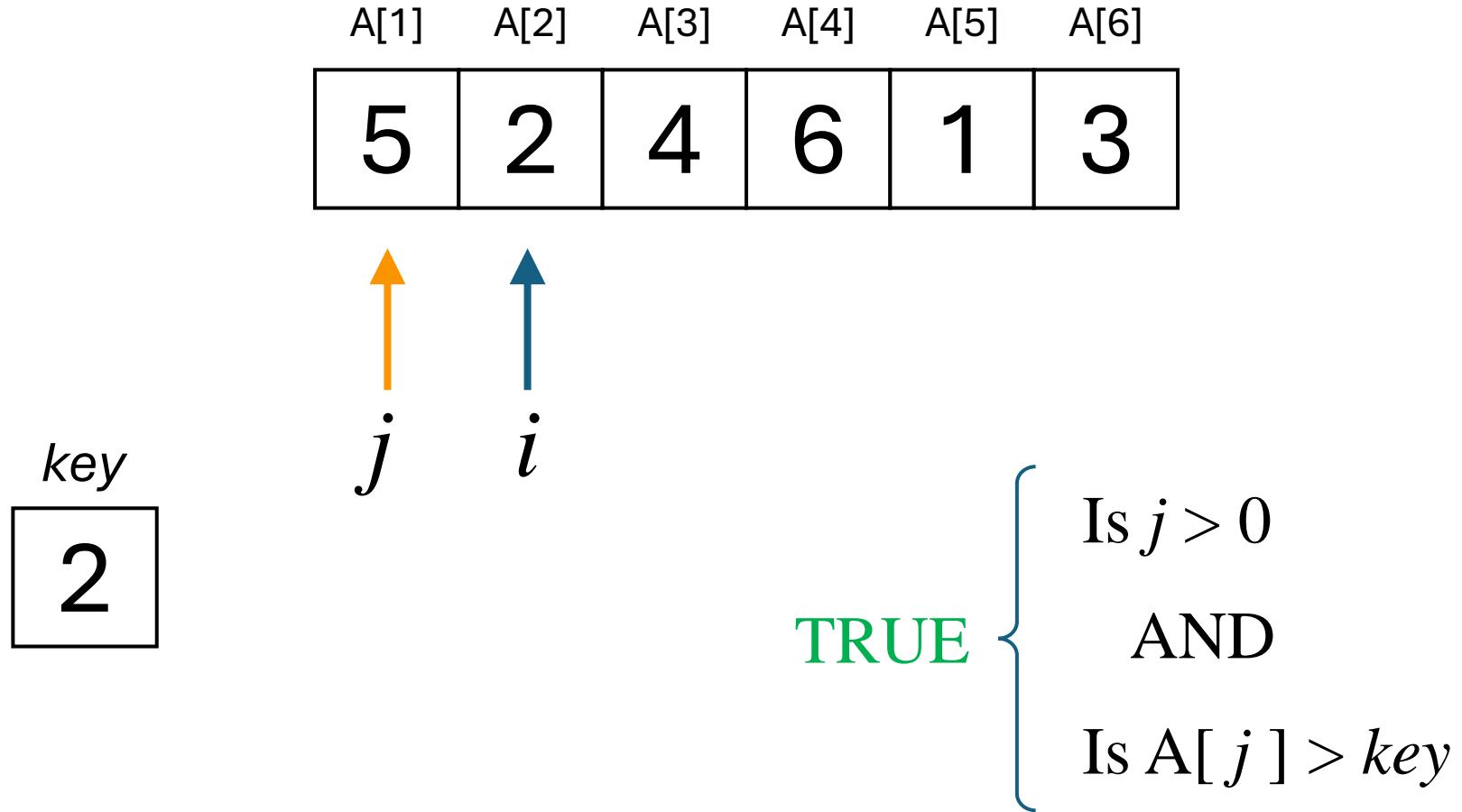
$$i = 2 \quad j = 1 \quad \text{key} = 2$$

## STEP 4



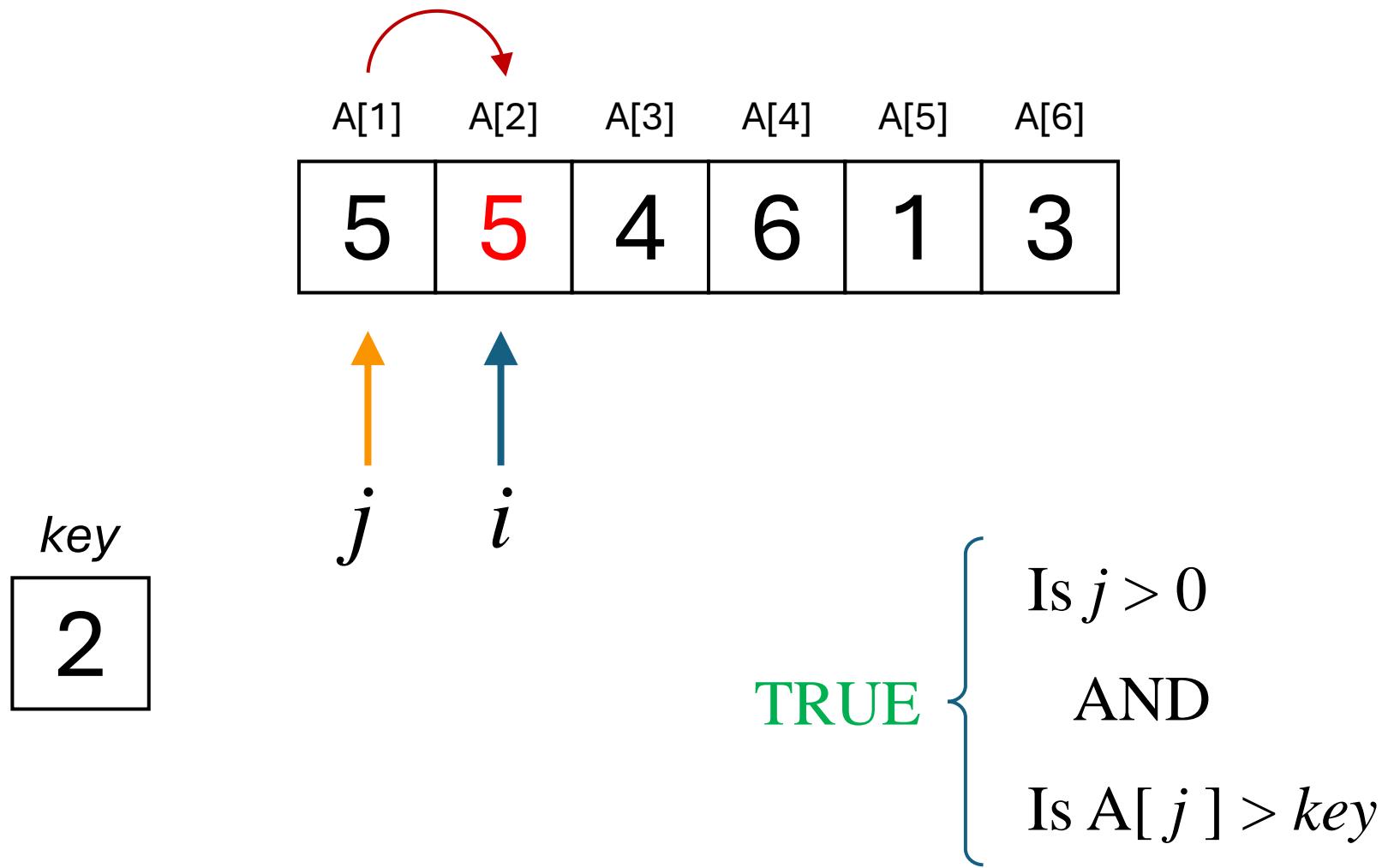
$$i = 2 \quad j = 1 \quad key = 2$$

## STEP 4



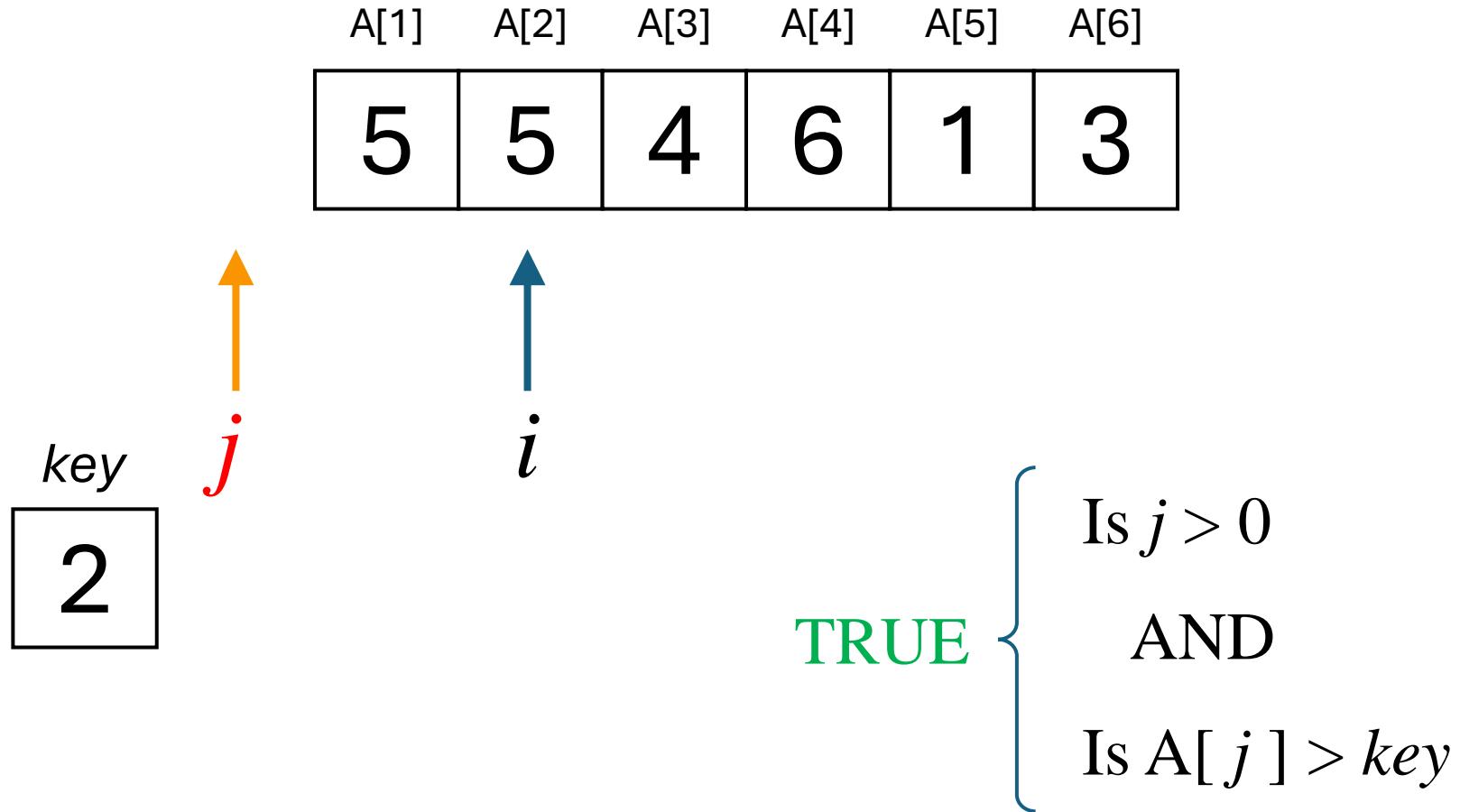
$$i = 2 \quad j = 1 \quad key = 2$$

## STEP 5



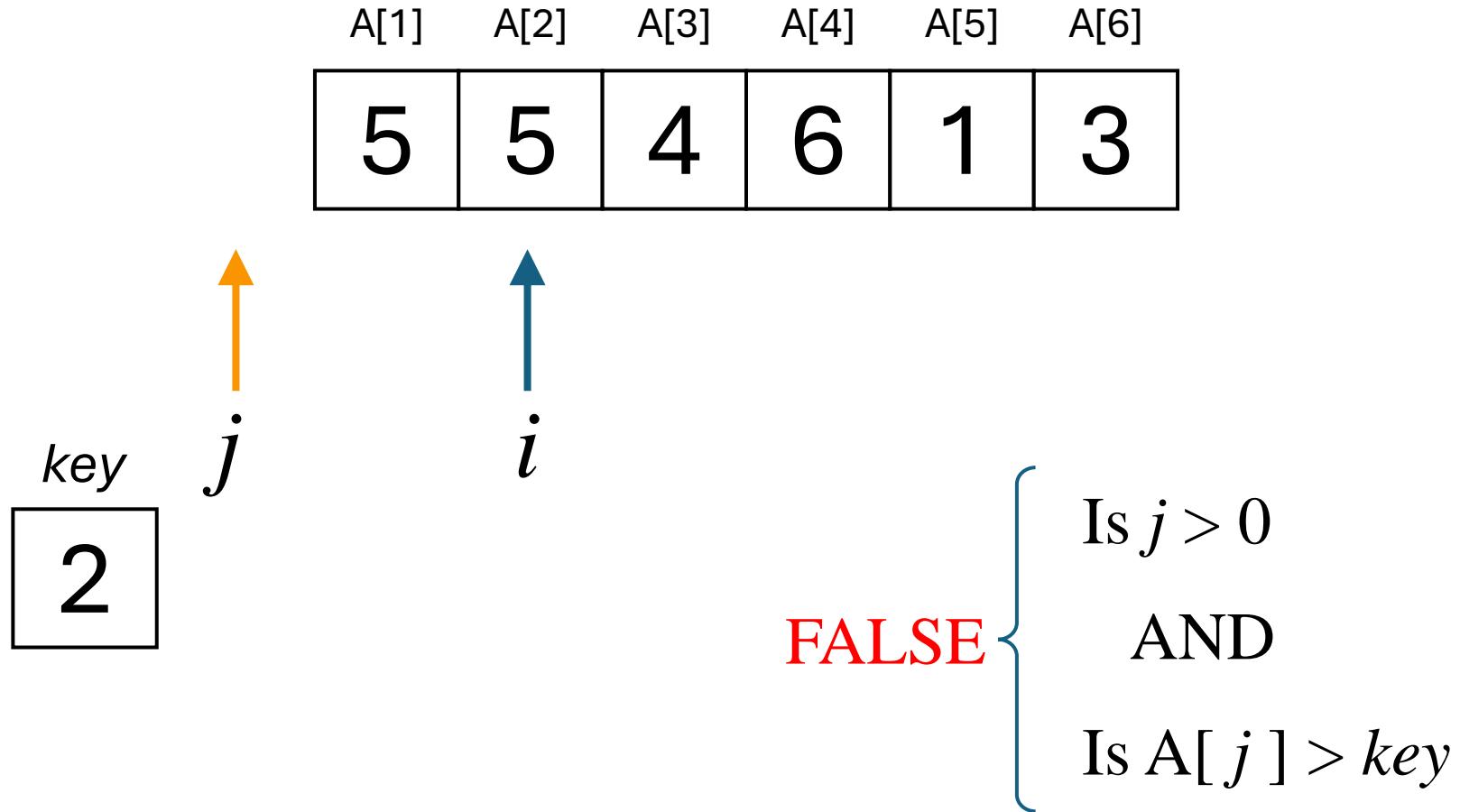
$$i = 2 \quad j = 1 \quad key = 2$$

## STEP 6

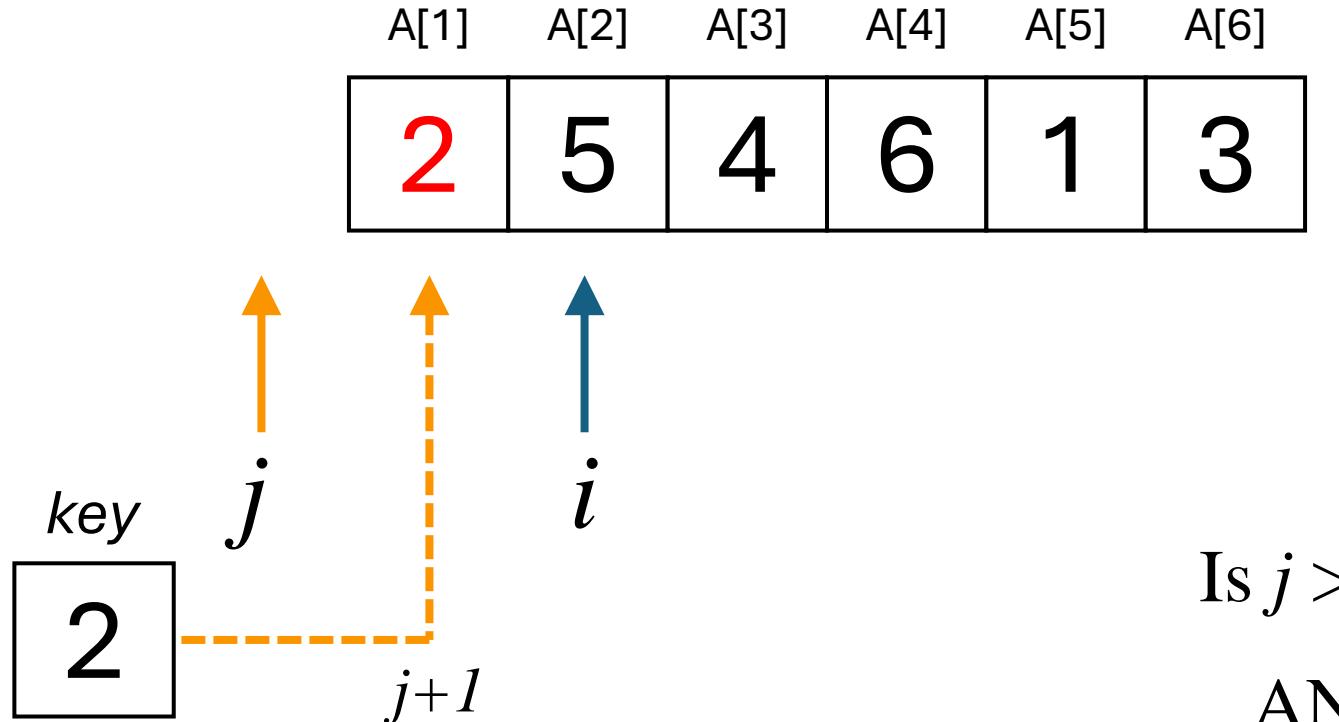


$$i = 2 \quad j = 0 \quad key = 2$$

## STEP 6



## STEP 7



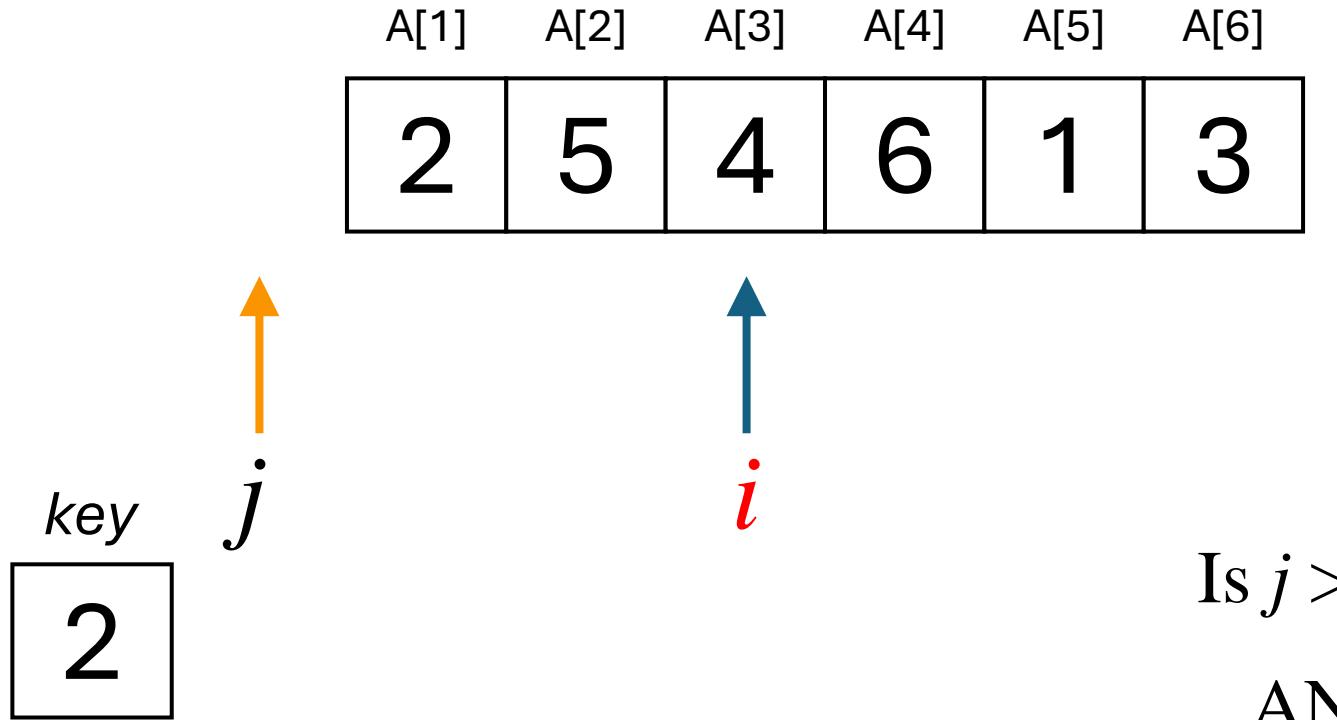
Is  $j > 0$

AND

Is  $A[j] > key$

$$i = 2 \quad j = 0 \quad key = 2$$

## STEP 1



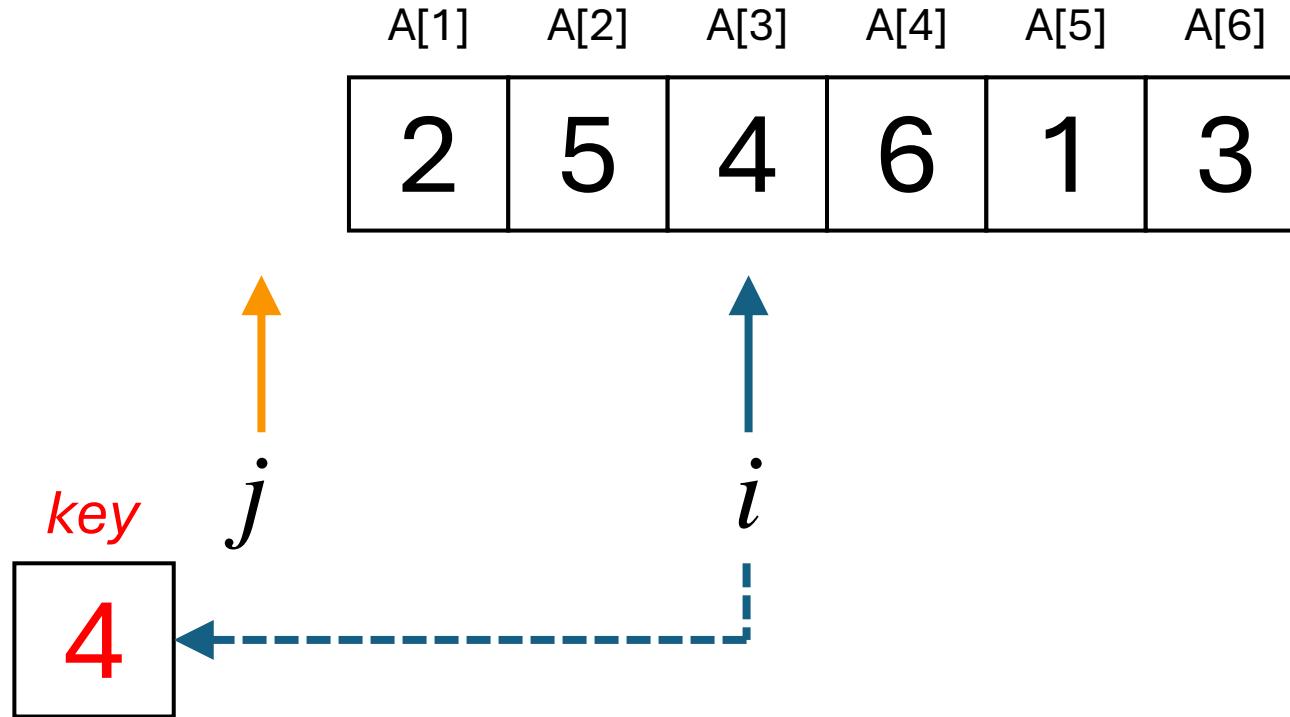
Is  $j > 0$

AND

Is  $A[j] > key$

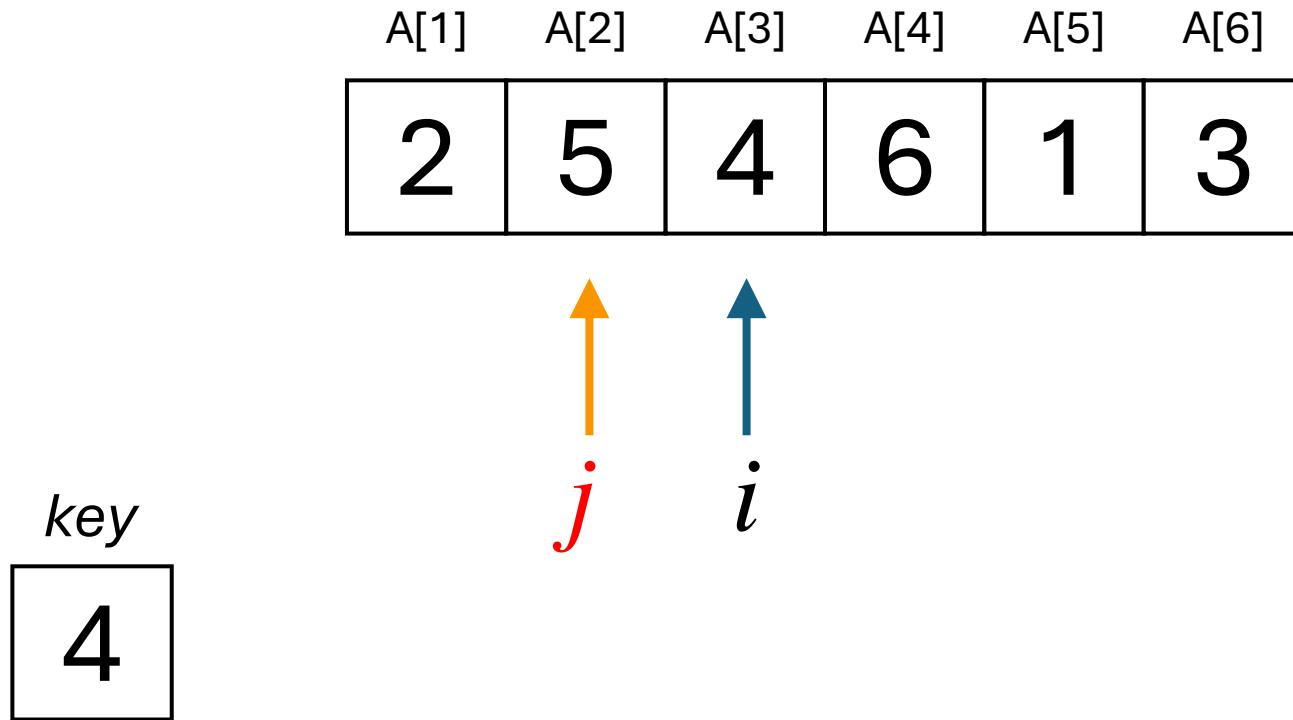
$$i = 3 \quad j = 0 \quad key = 2$$

## STEP 2



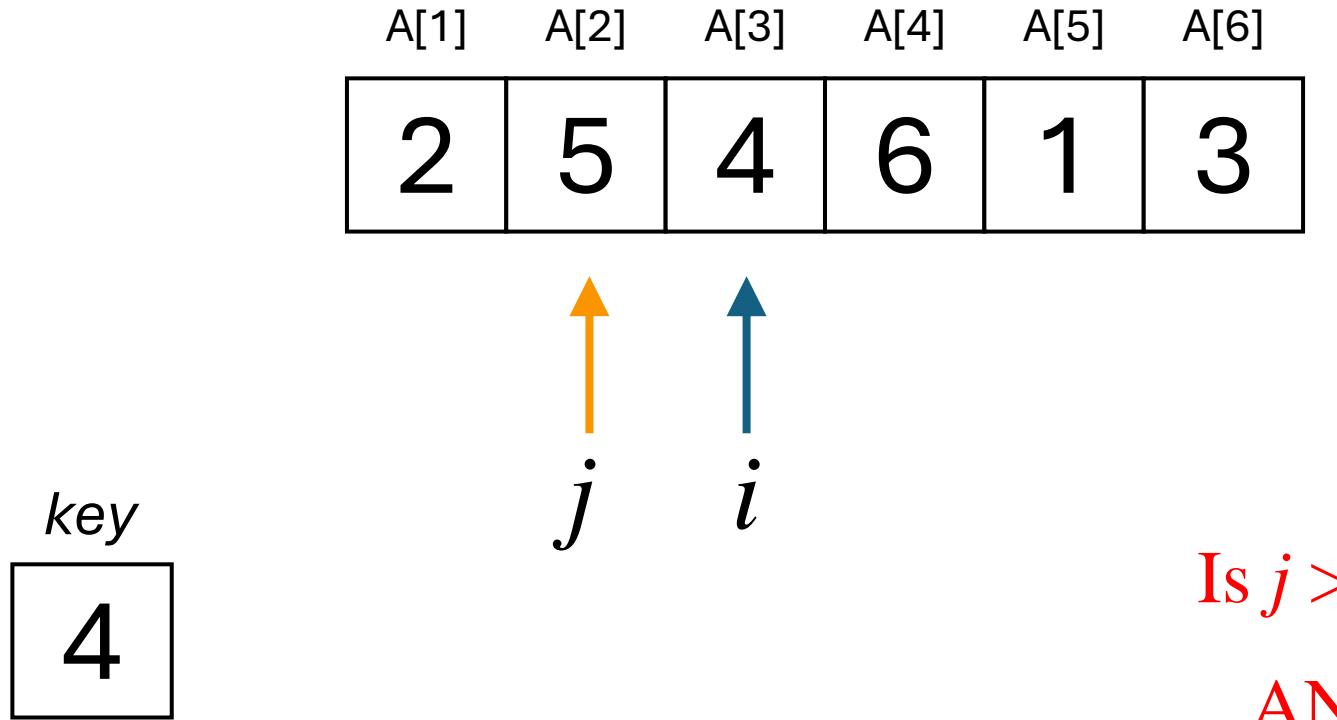
$$i = 3 \quad j = 0 \quad \text{key} = 4$$

## STEP 3



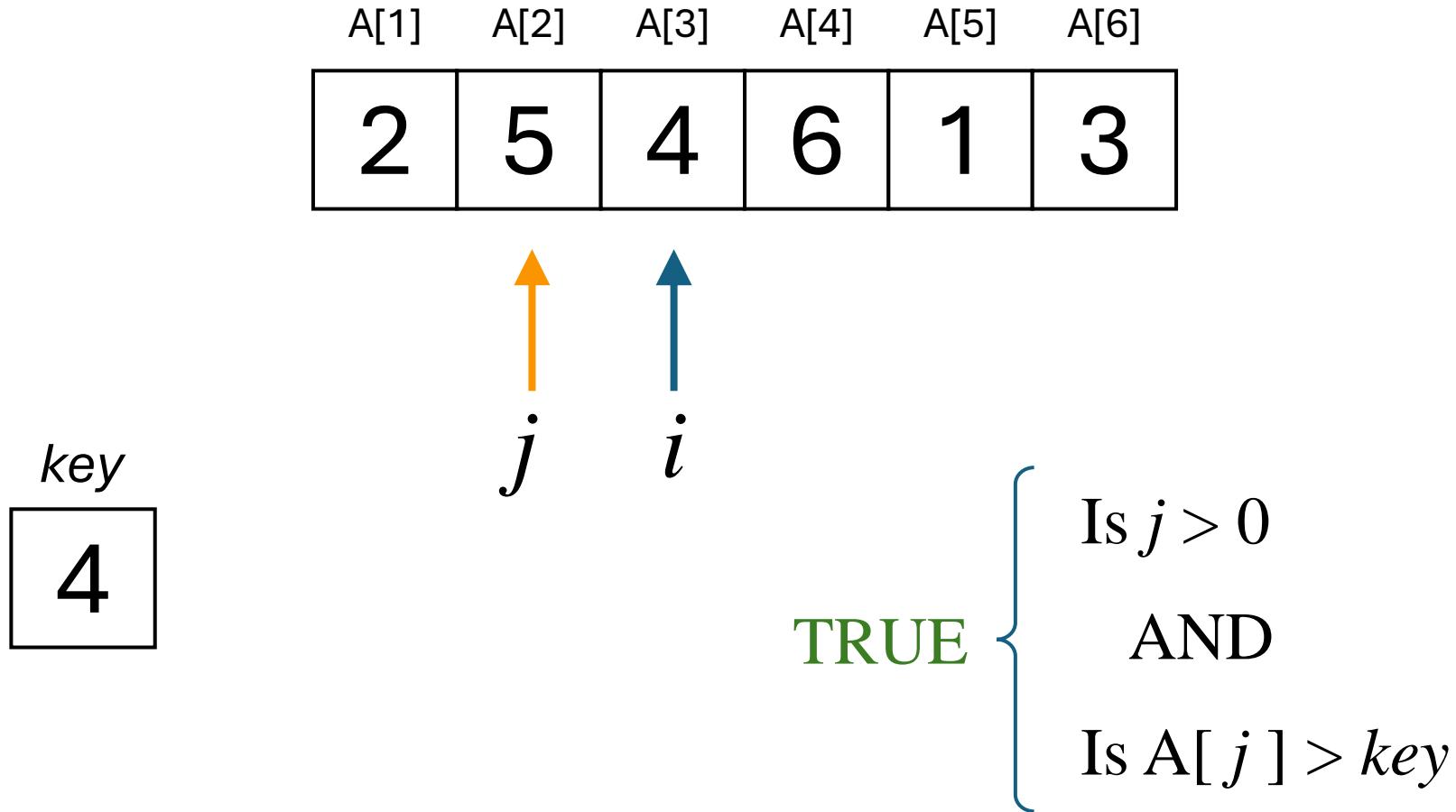
$$i = 3 \quad j = 2 \quad \text{key} = 4$$

## STEP 4



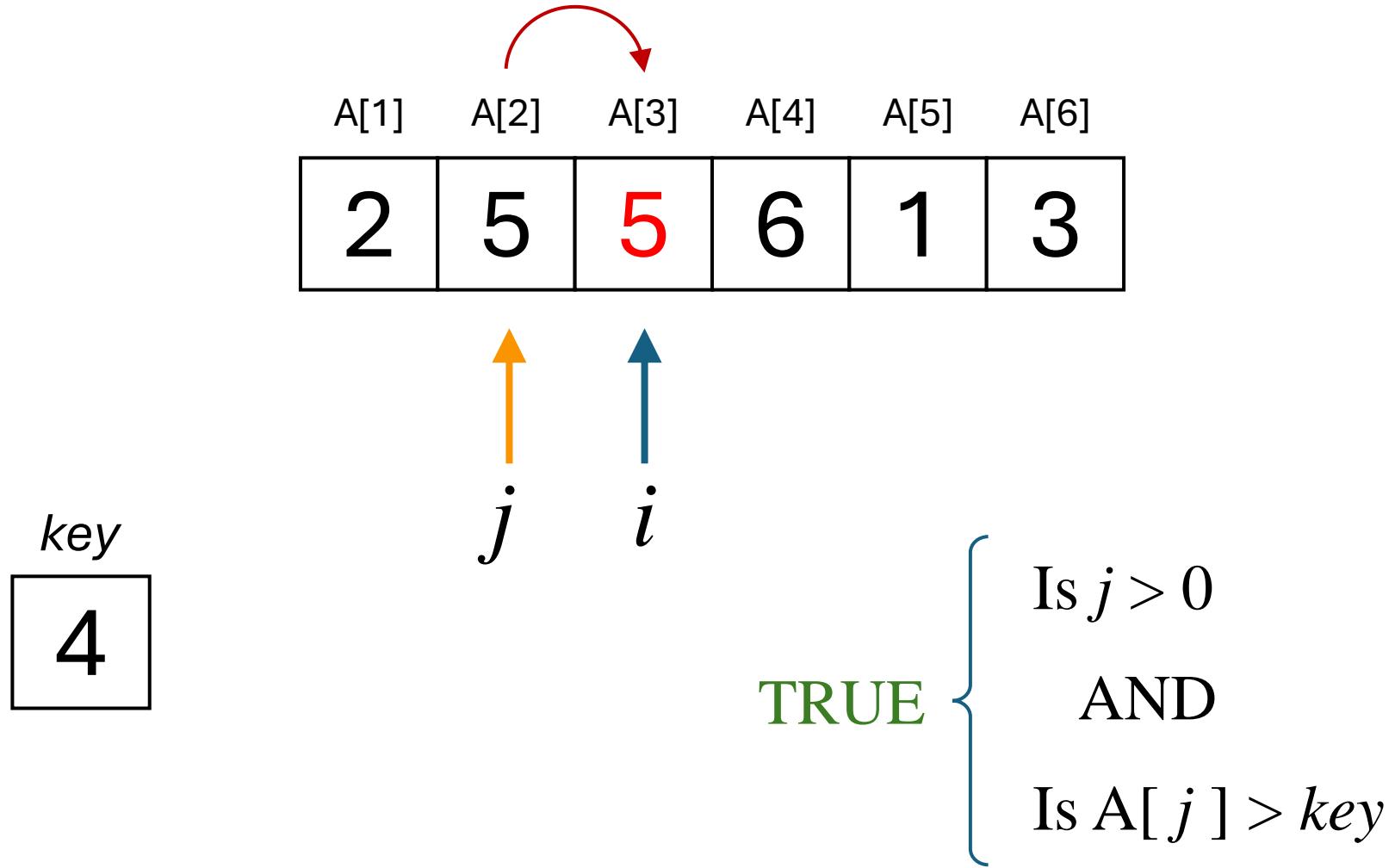
$$i = 3 \quad j = 2 \quad key = 4$$

## STEP 4



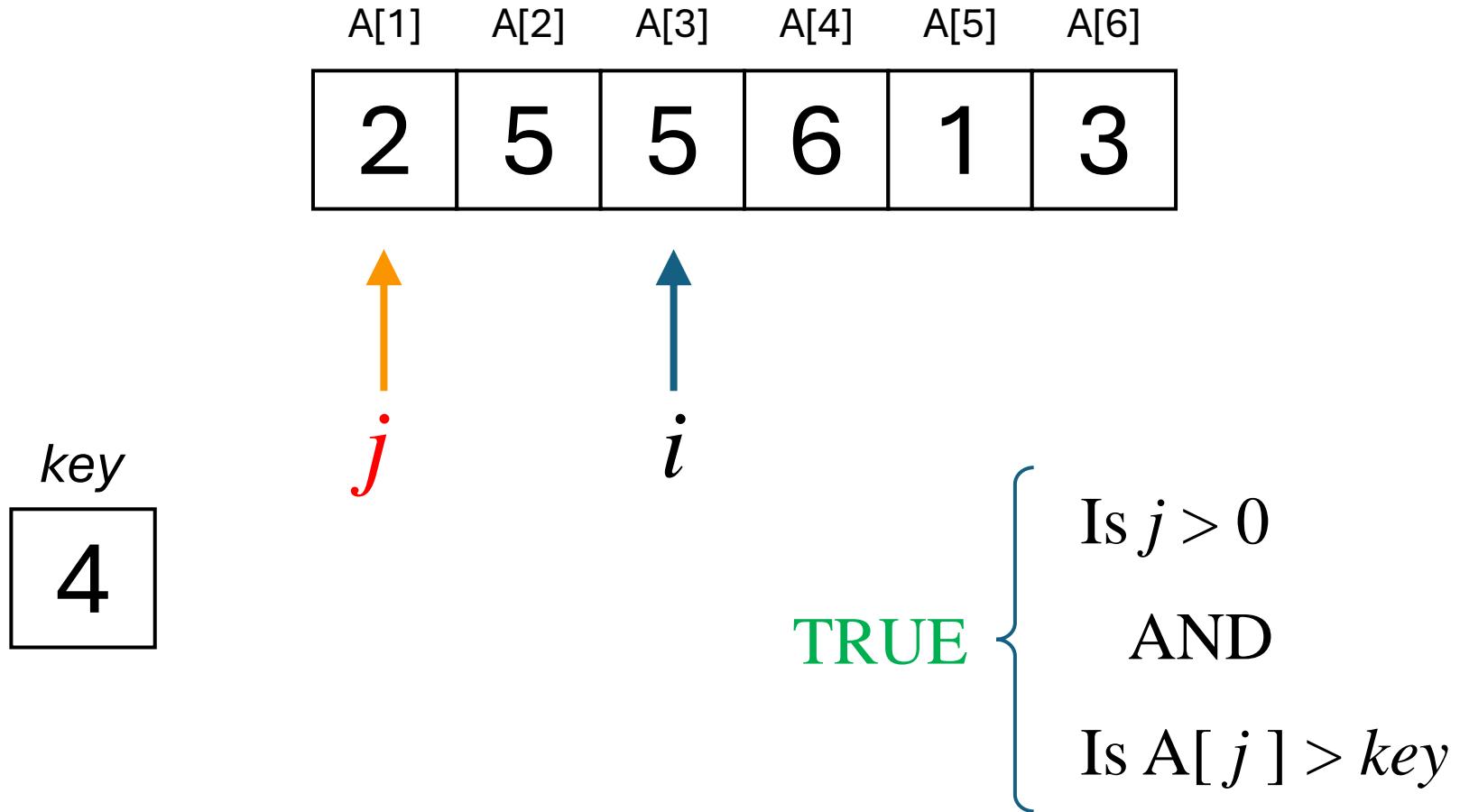
$$i = 3 \quad j = 2 \quad key = 4$$

## STEP 5

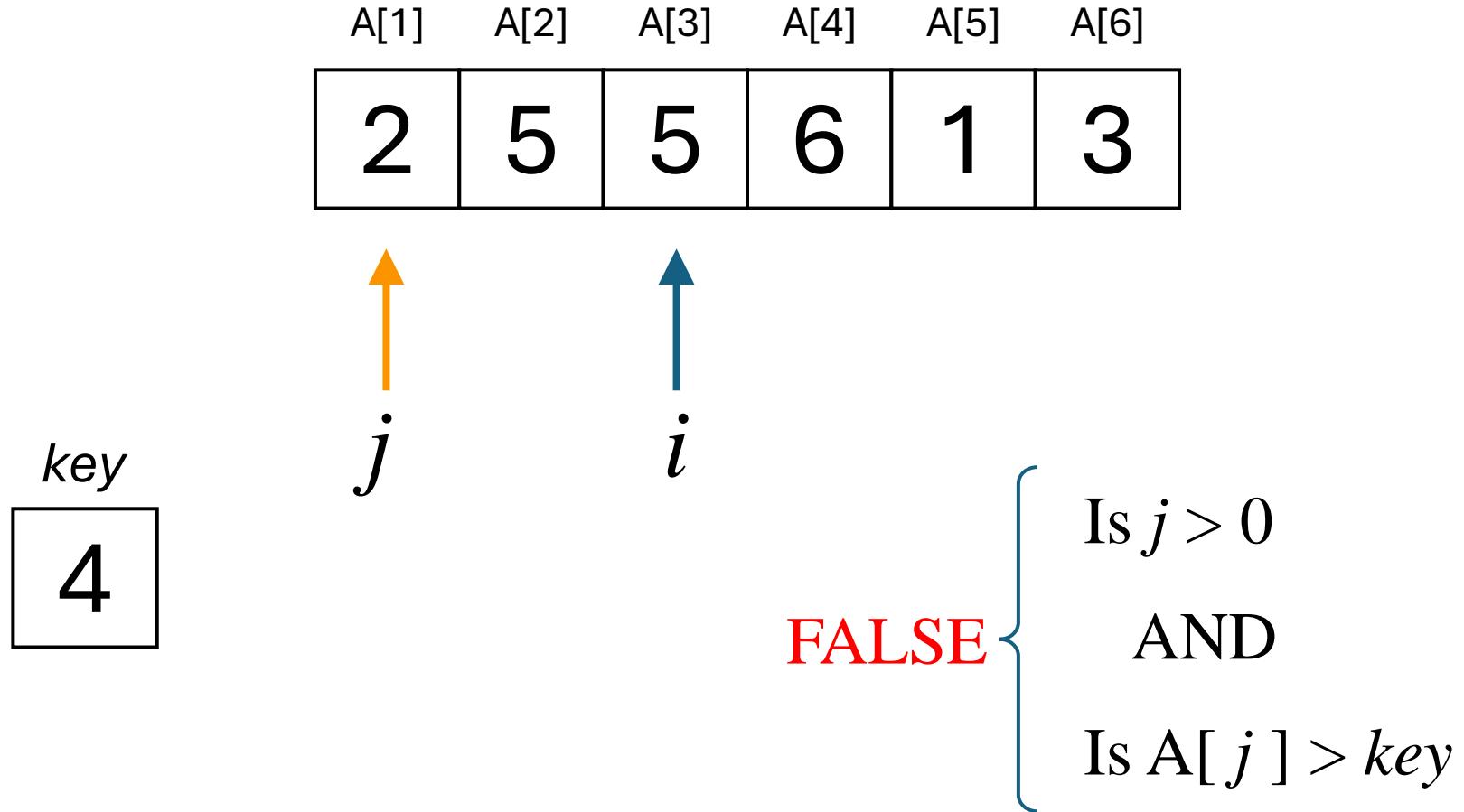


$$i = 3 \quad j = 2 \quad key = 4$$

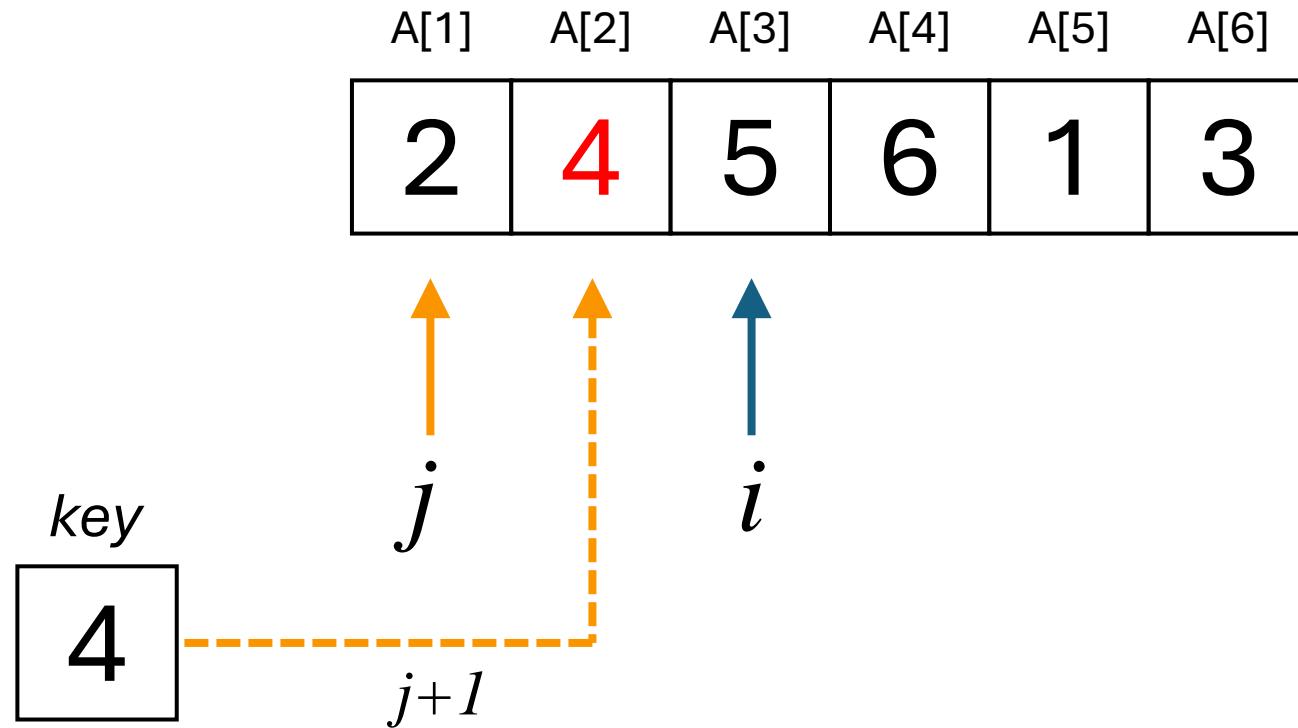
## STEP 6



## STEP 6

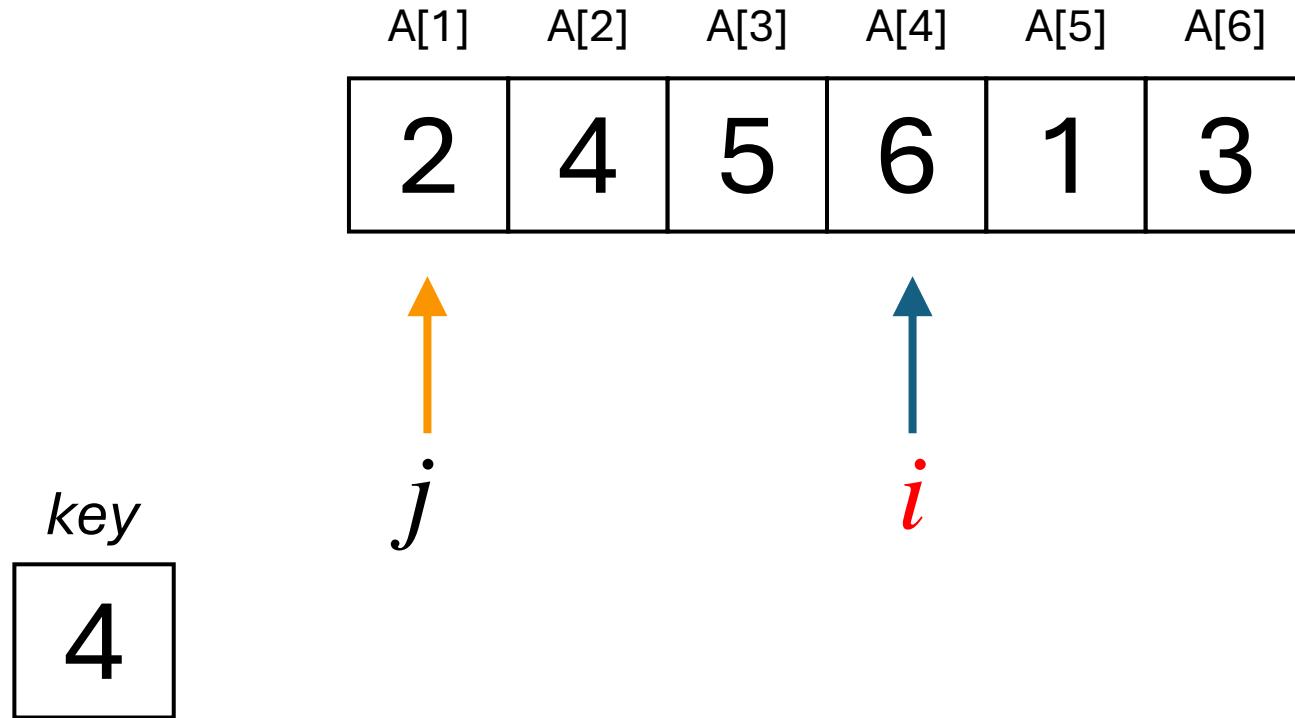


## STEP 7



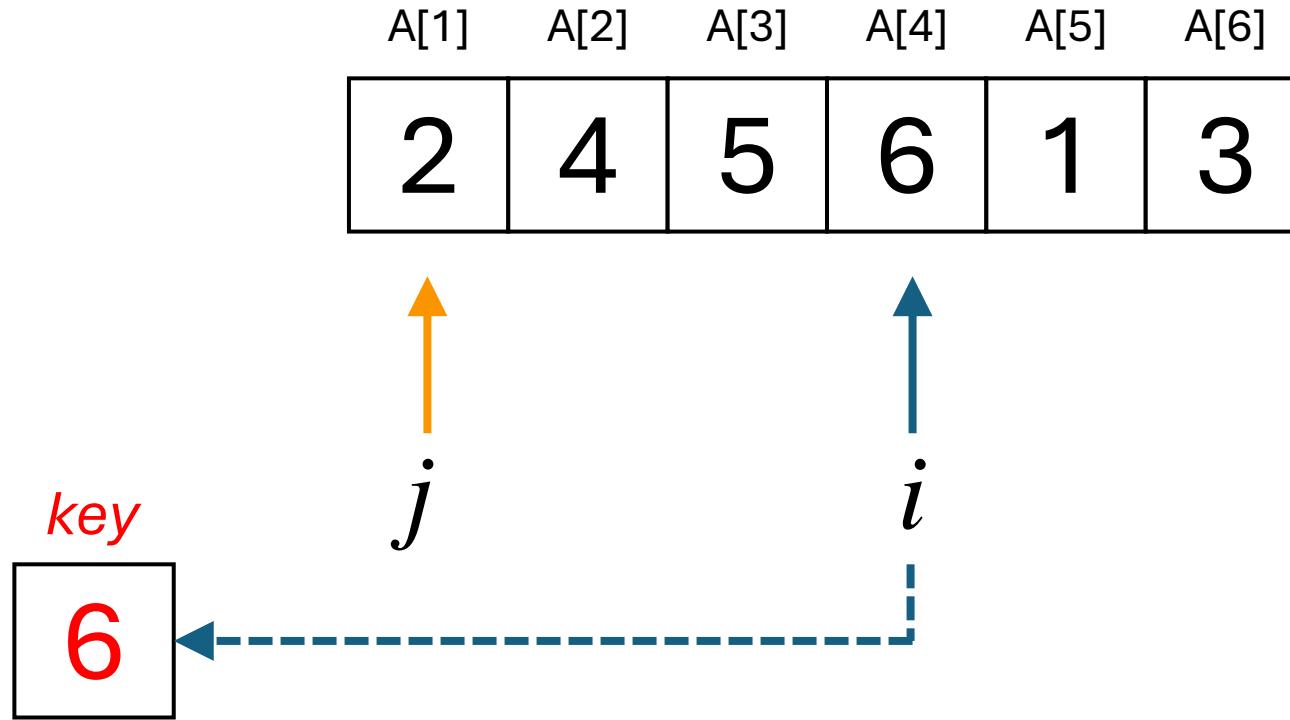
$$i = 3 \quad j = 1 \quad key = 4$$

# STEP 1



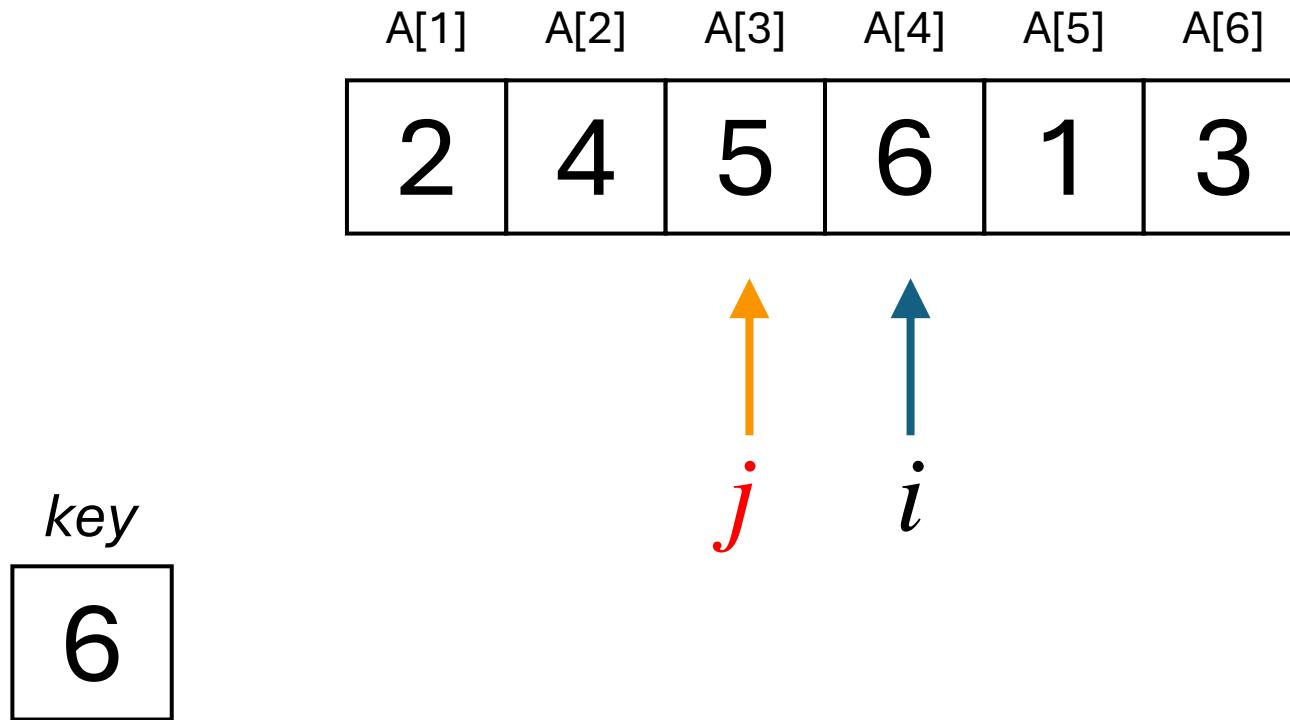
$$i = 4 \quad j = 1 \quad key = 2$$

## STEP 2



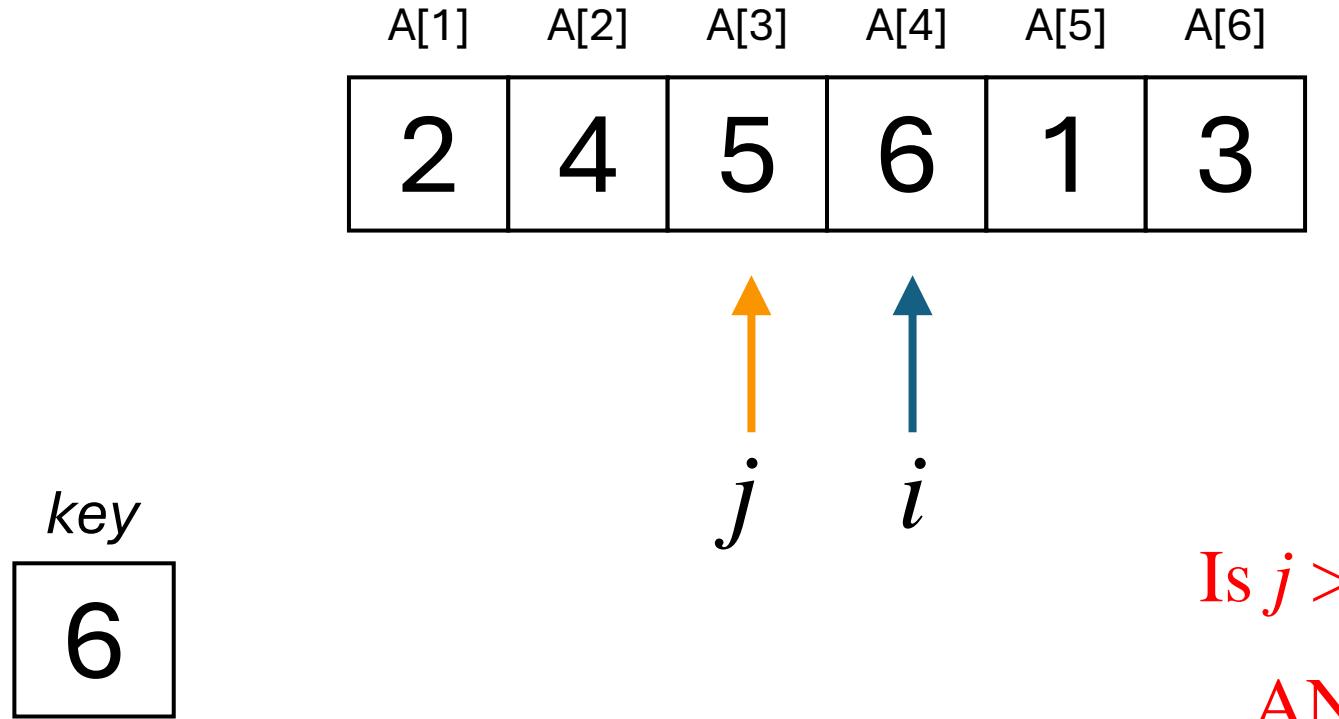
$$i = 4 \quad j = 1 \quad \text{key} = 6$$

## STEP 3



$$i = 4 \quad j = 3 \quad \text{key} = 6$$

## STEP 4



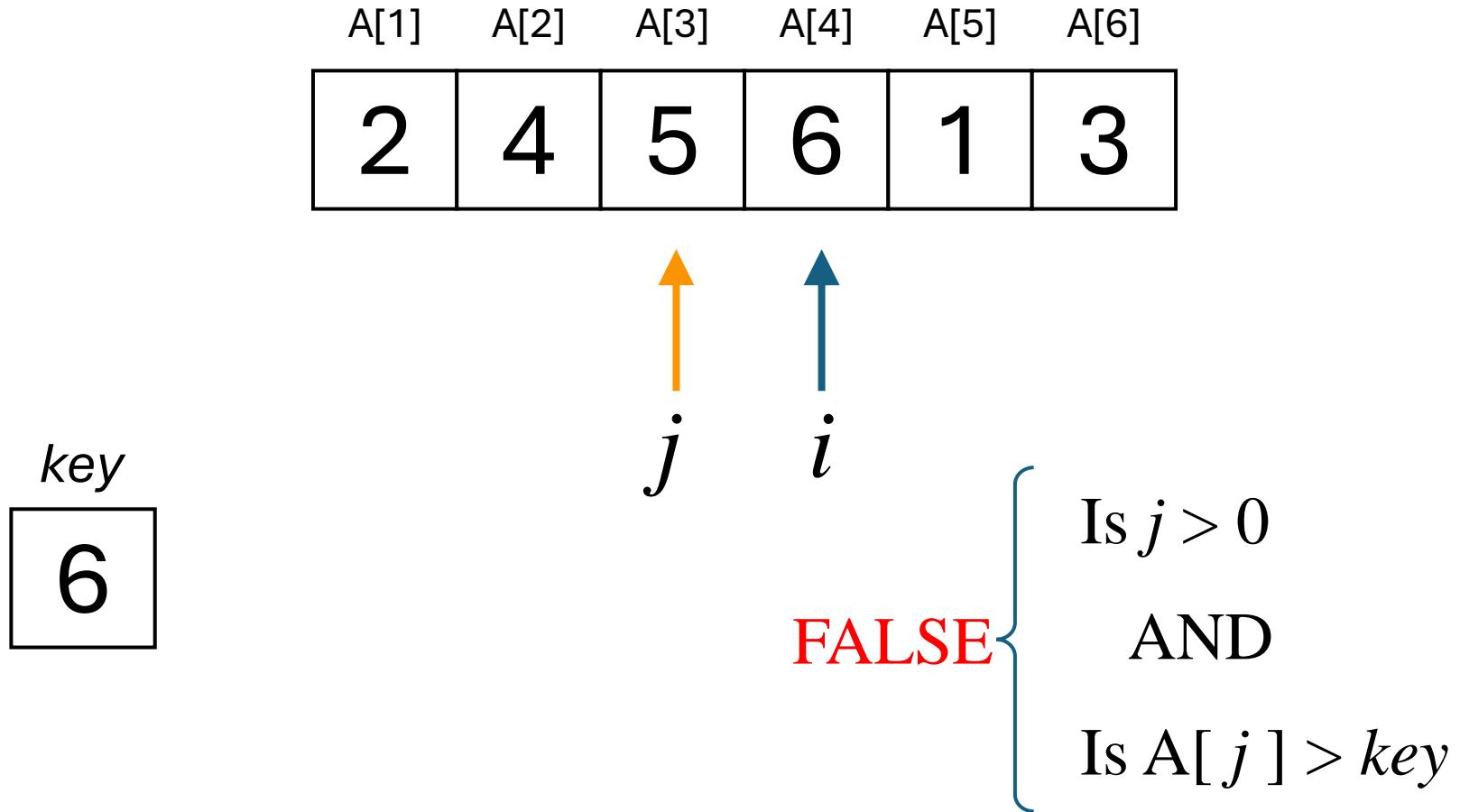
Is  $j > 0$

AND

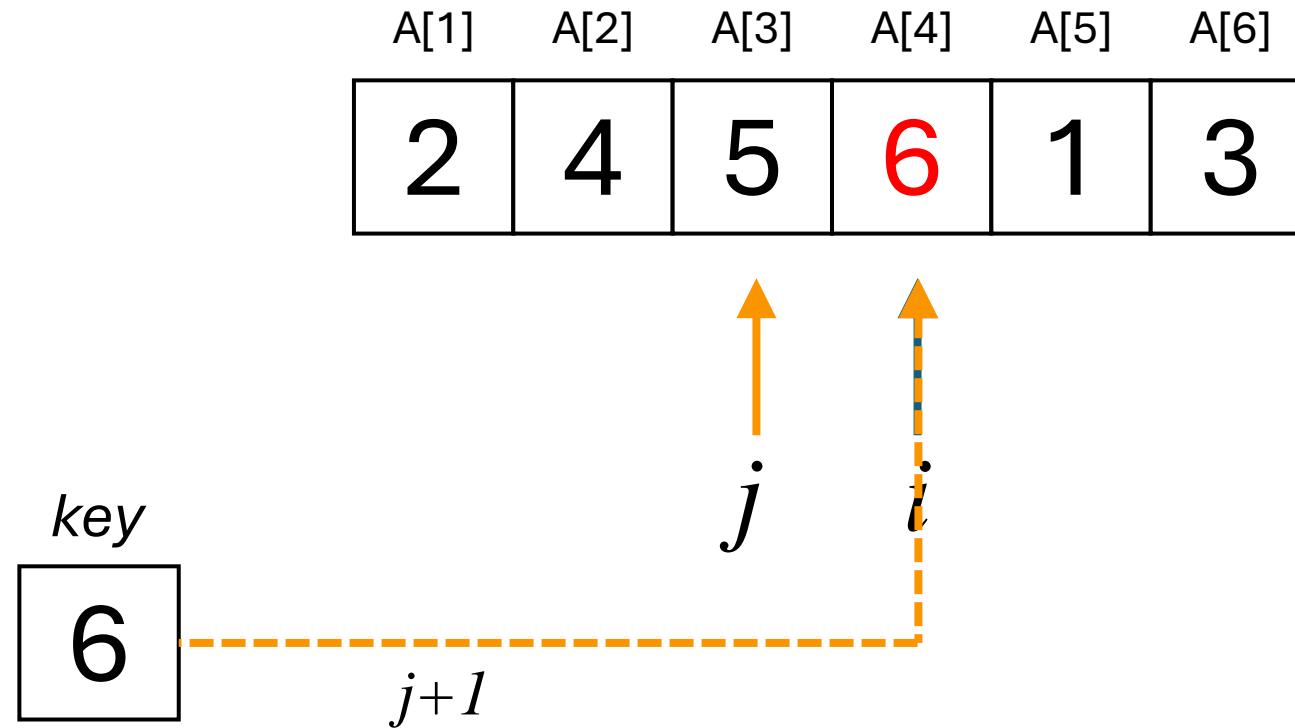
Is  $A[j] > key$

$$i = 4 \quad j = 3 \quad key = 6$$

## STEP 4

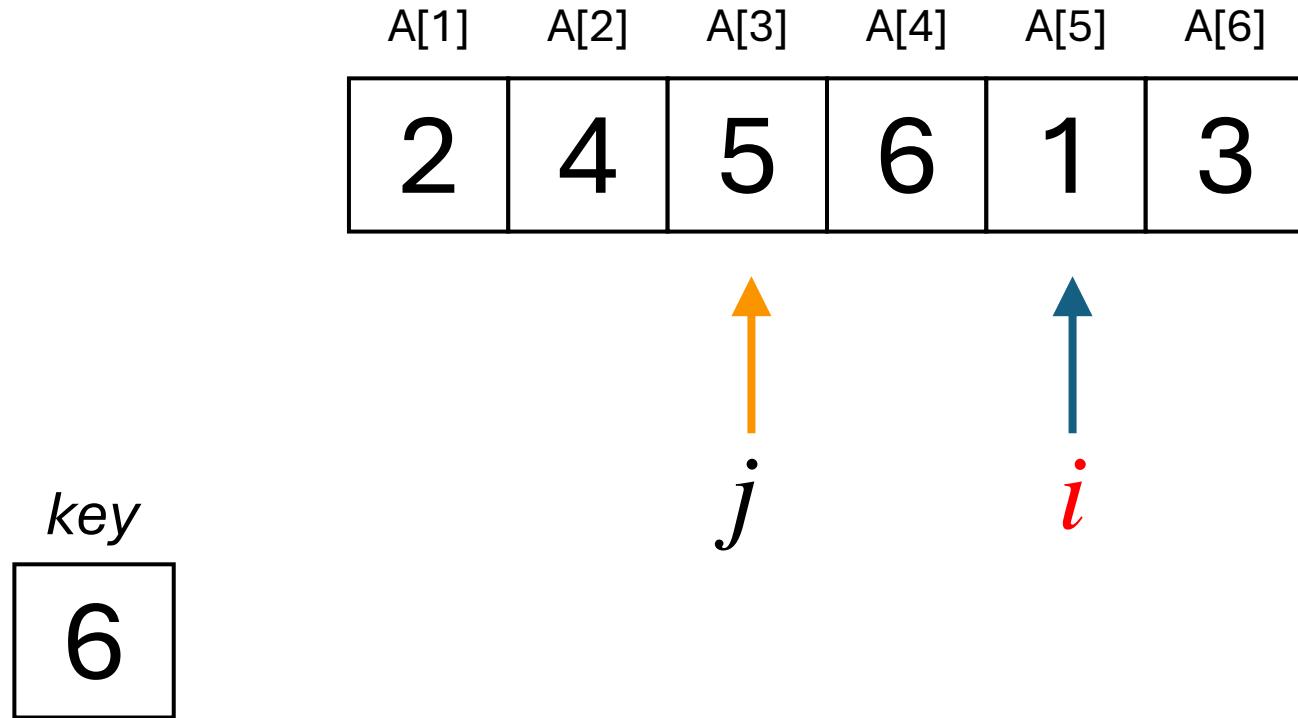


## STEP 7



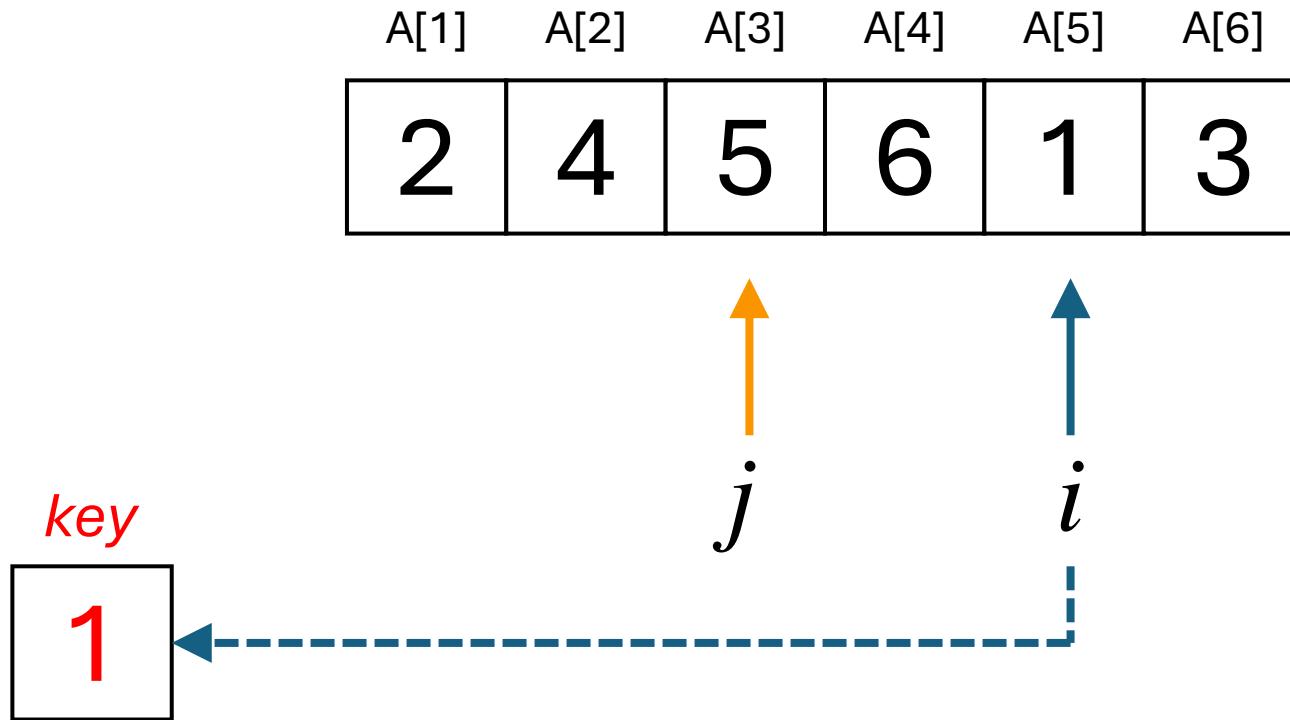
$$i = 4 \quad j = 3 \quad \text{key} = 6$$

# STEP 1



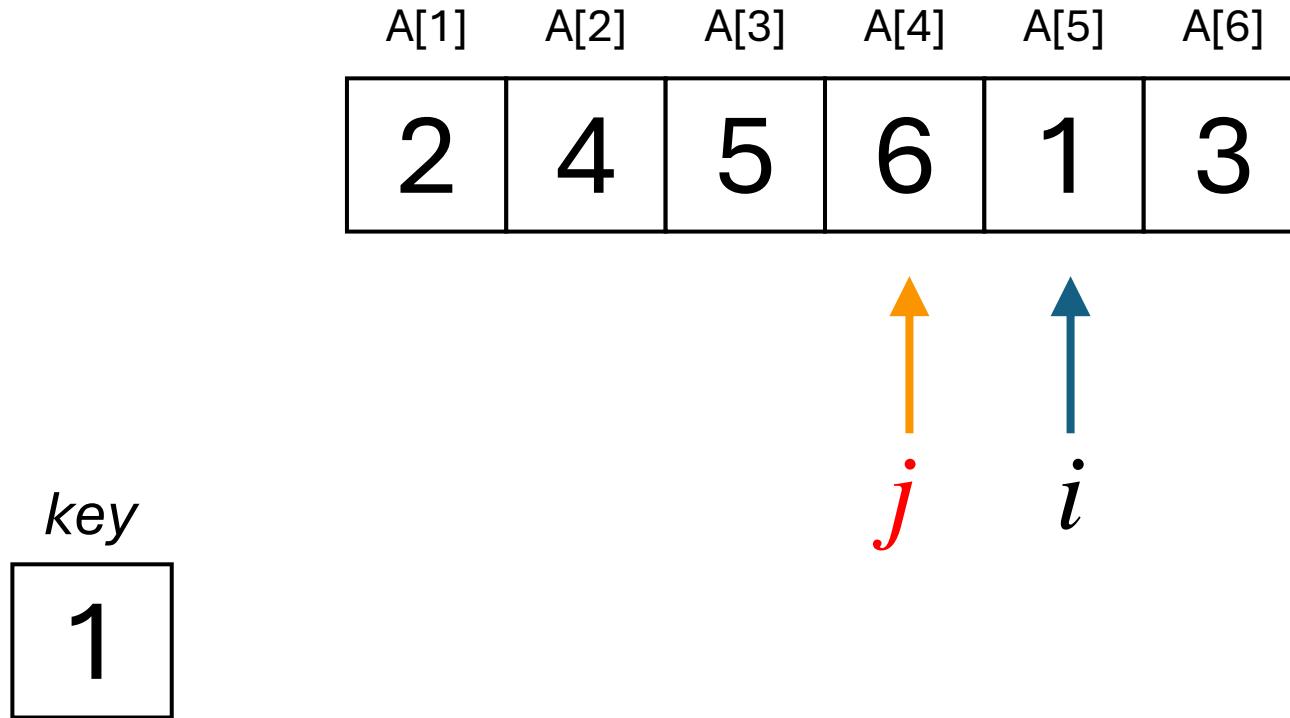
$$i = 5 \quad j = 3 \quad \text{key} = 6$$

## STEP 2



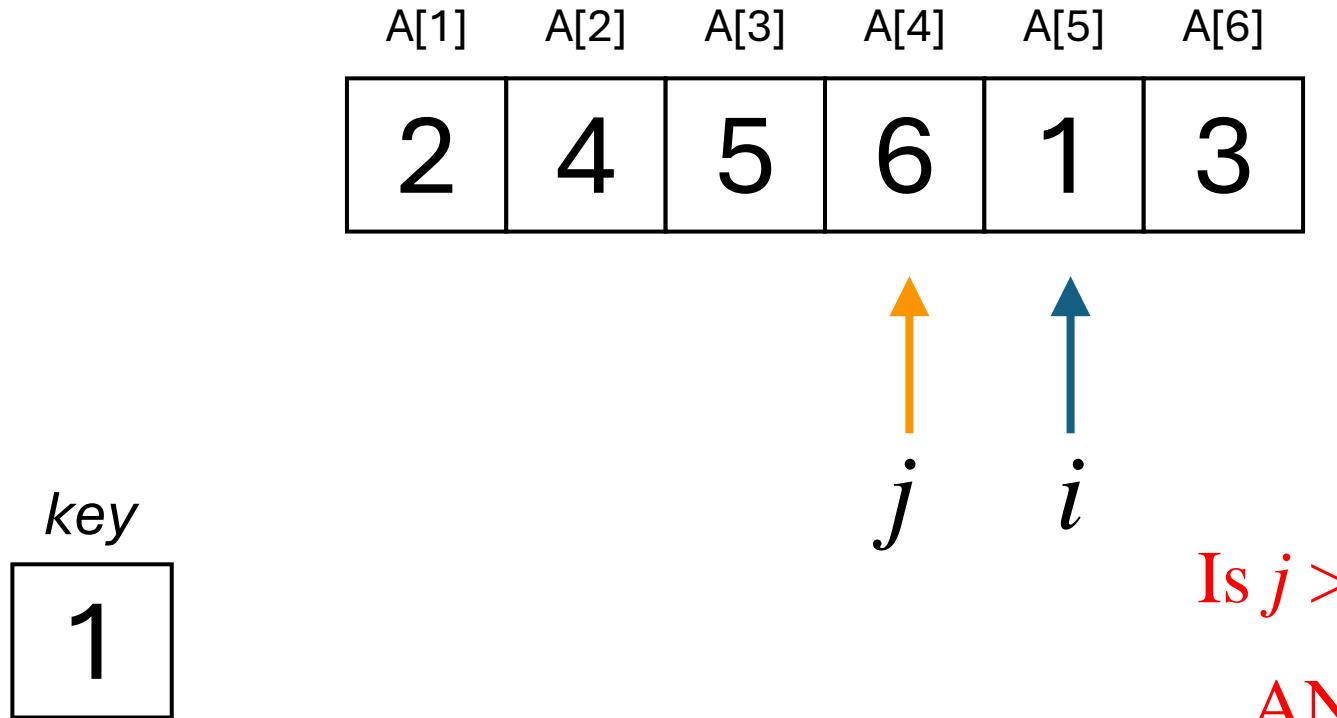
$$i = 5 \quad j = 3 \quad \text{key} = 1$$

## STEP 3



$$i = 5 \quad j = 4 \quad \text{key} = 1$$

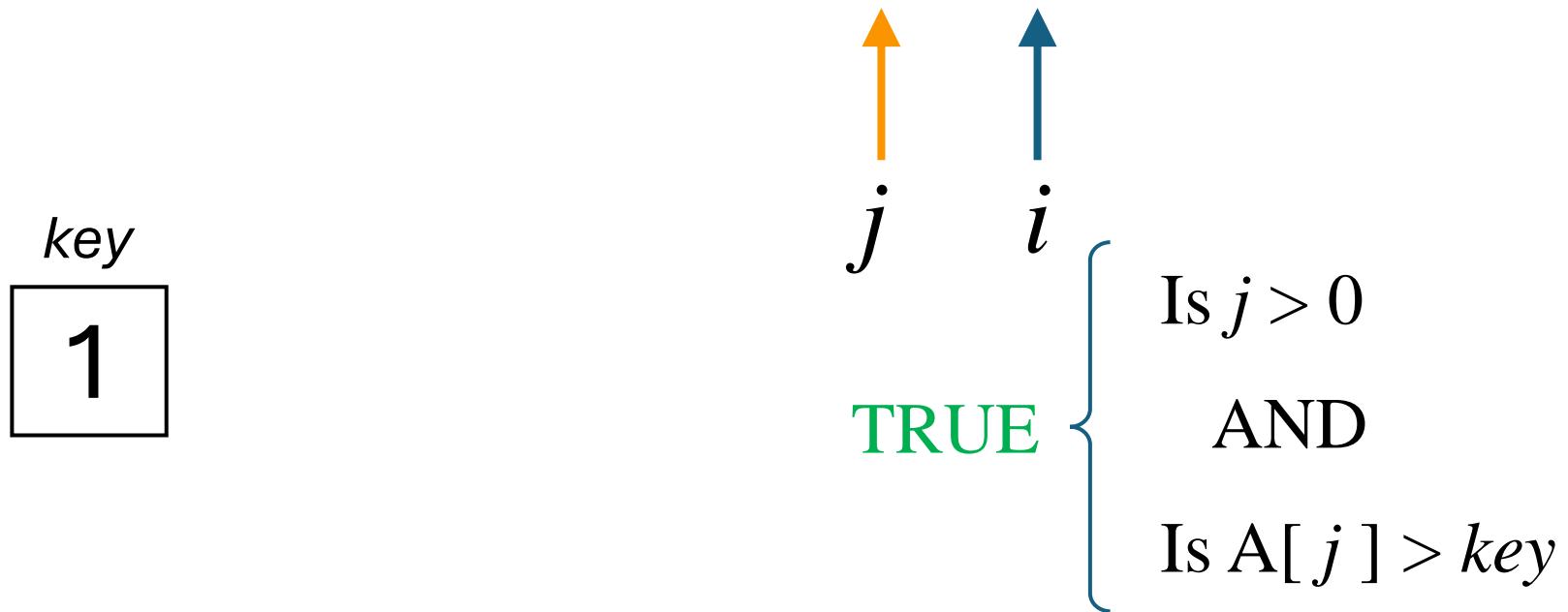
## STEP 4



$$i = 5 \quad j = 4 \quad key = 1$$

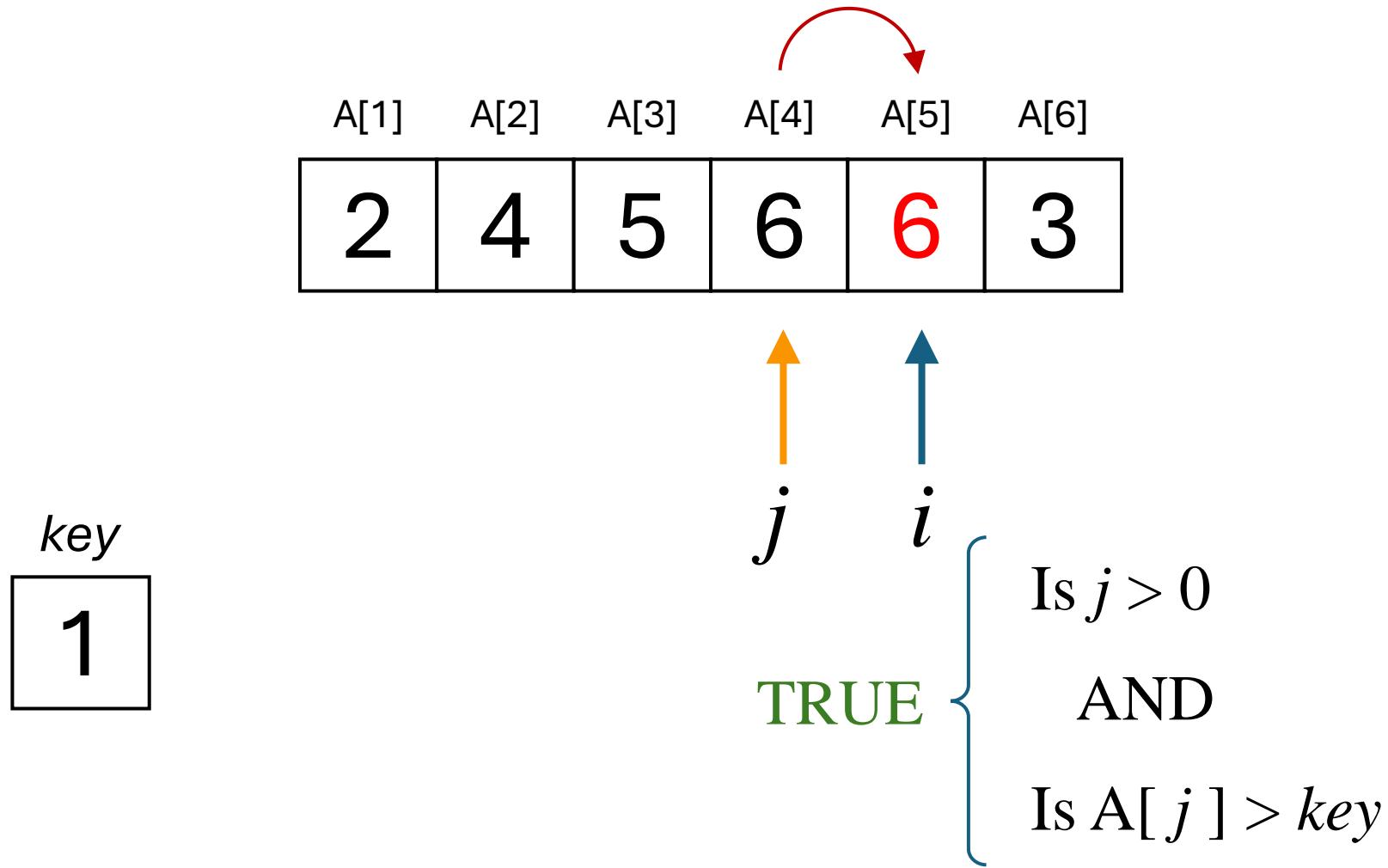
## STEP 4

A[1]	A[2]	A[3]	A[4]	A[5]	A[6]
2	4	5	6	1	3



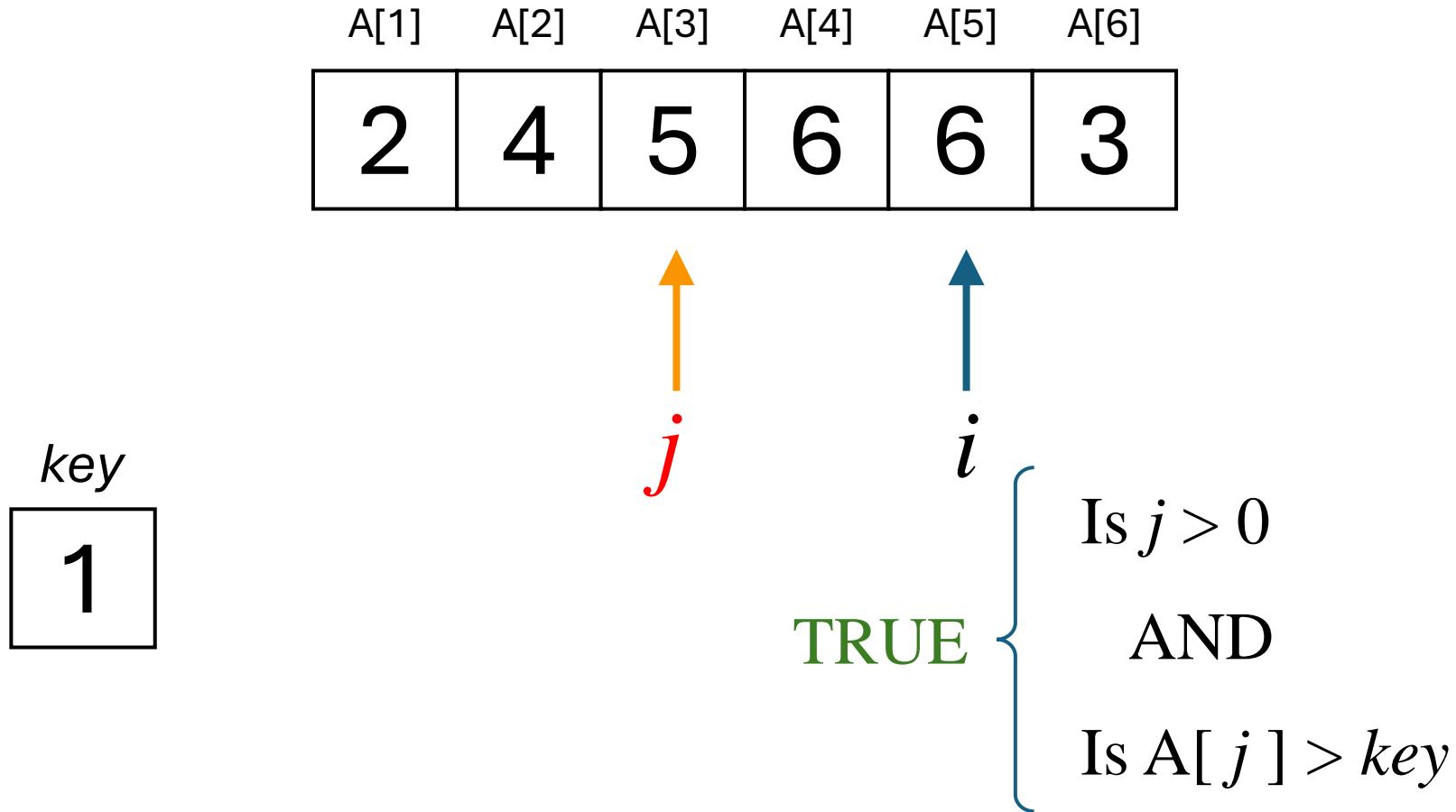
$$i = 5 \quad j = 4 \quad key = 1$$

## STEP 5

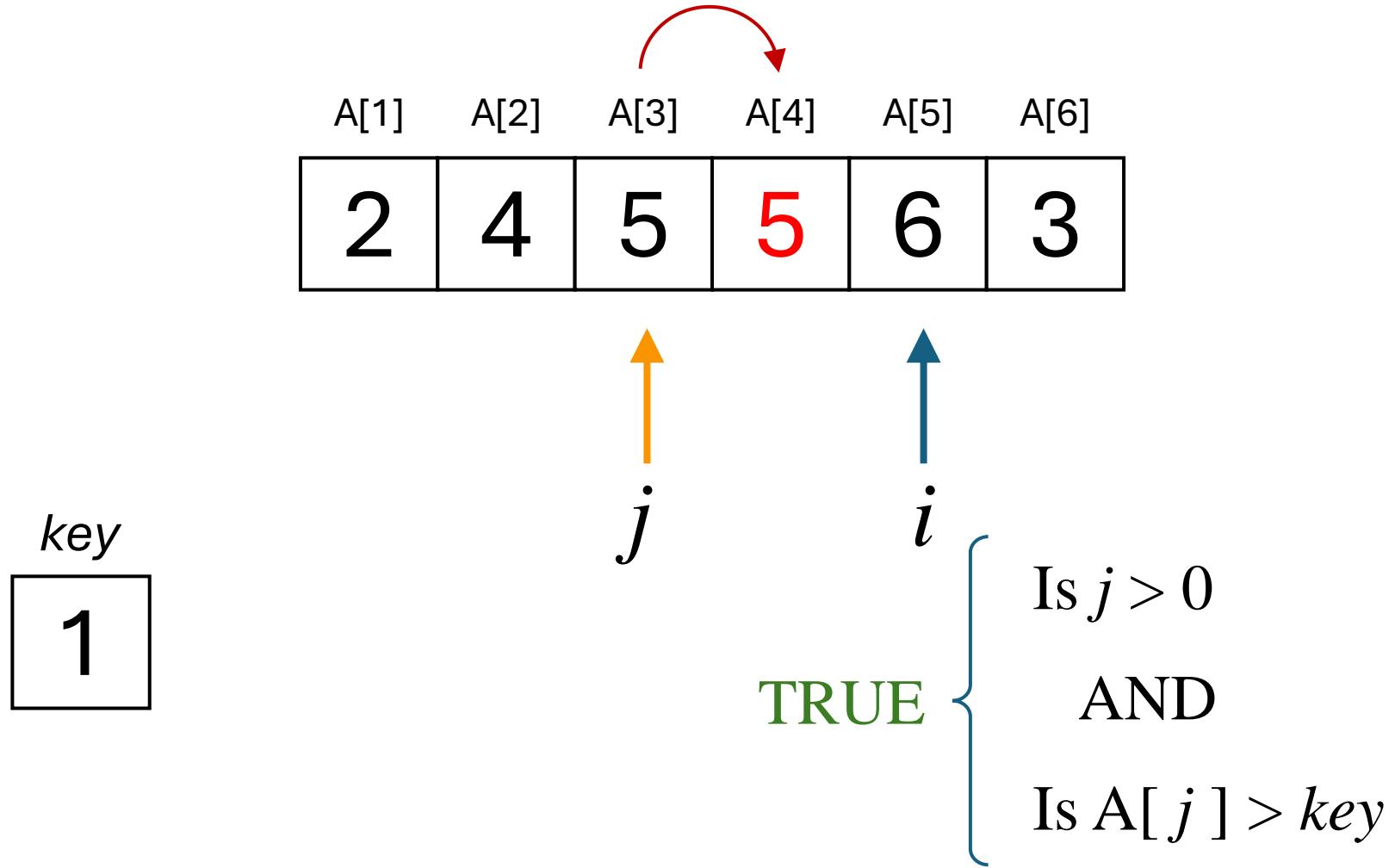


$$i = 5 \quad j = 4 \quad key = 1$$

## STEP 6

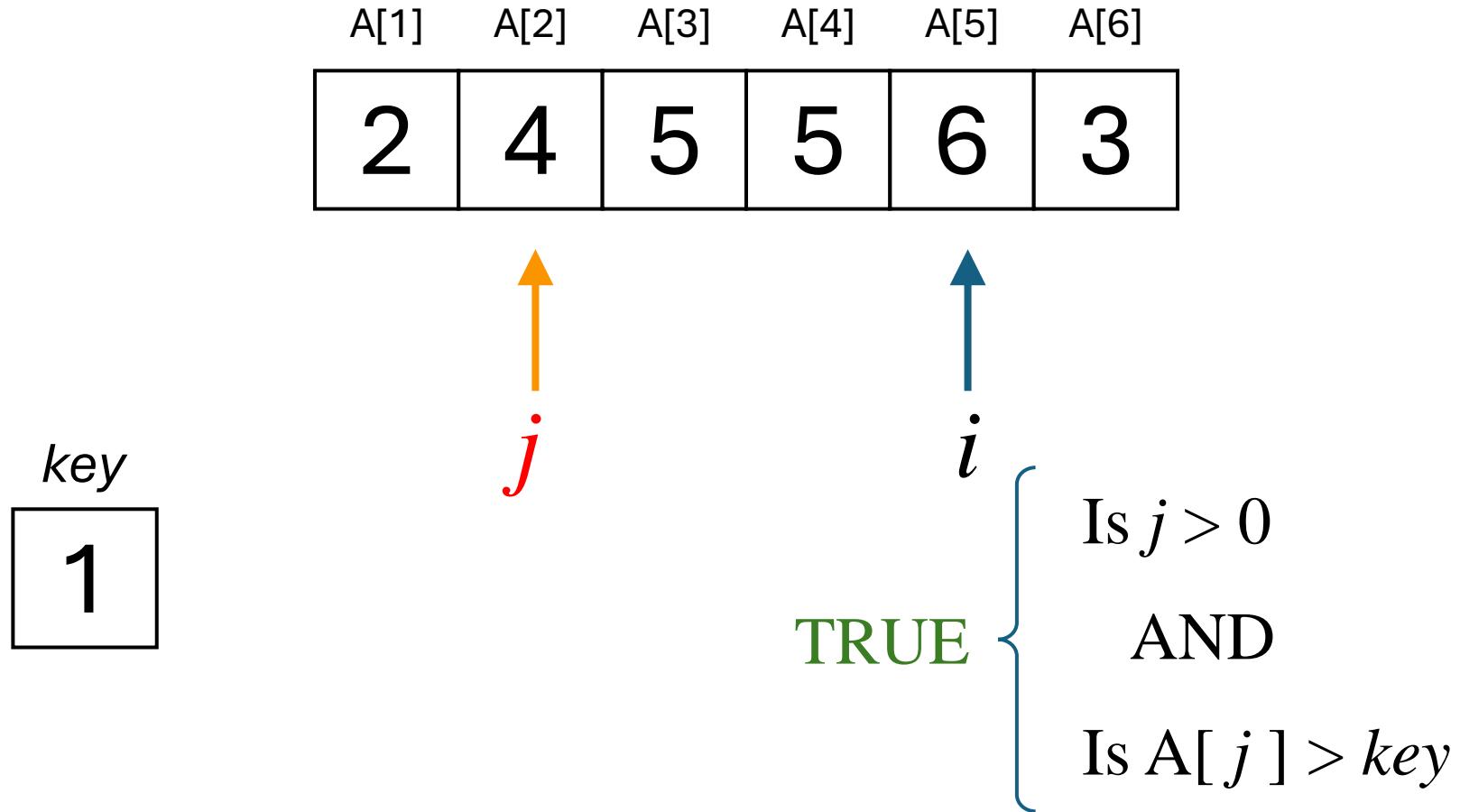


## STEP 5

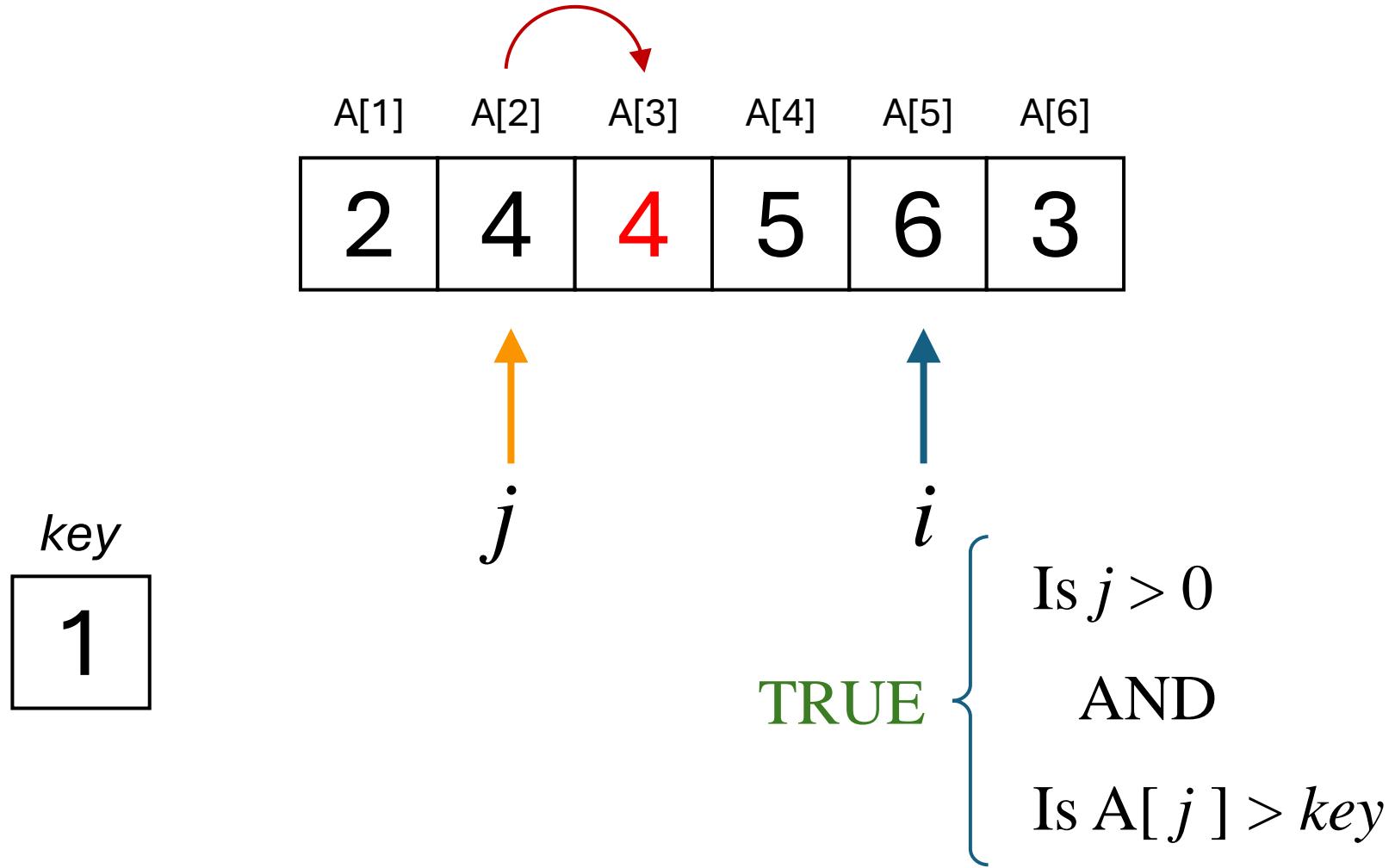


$$i = 5 \quad j = 3 \quad \text{key} = 1$$

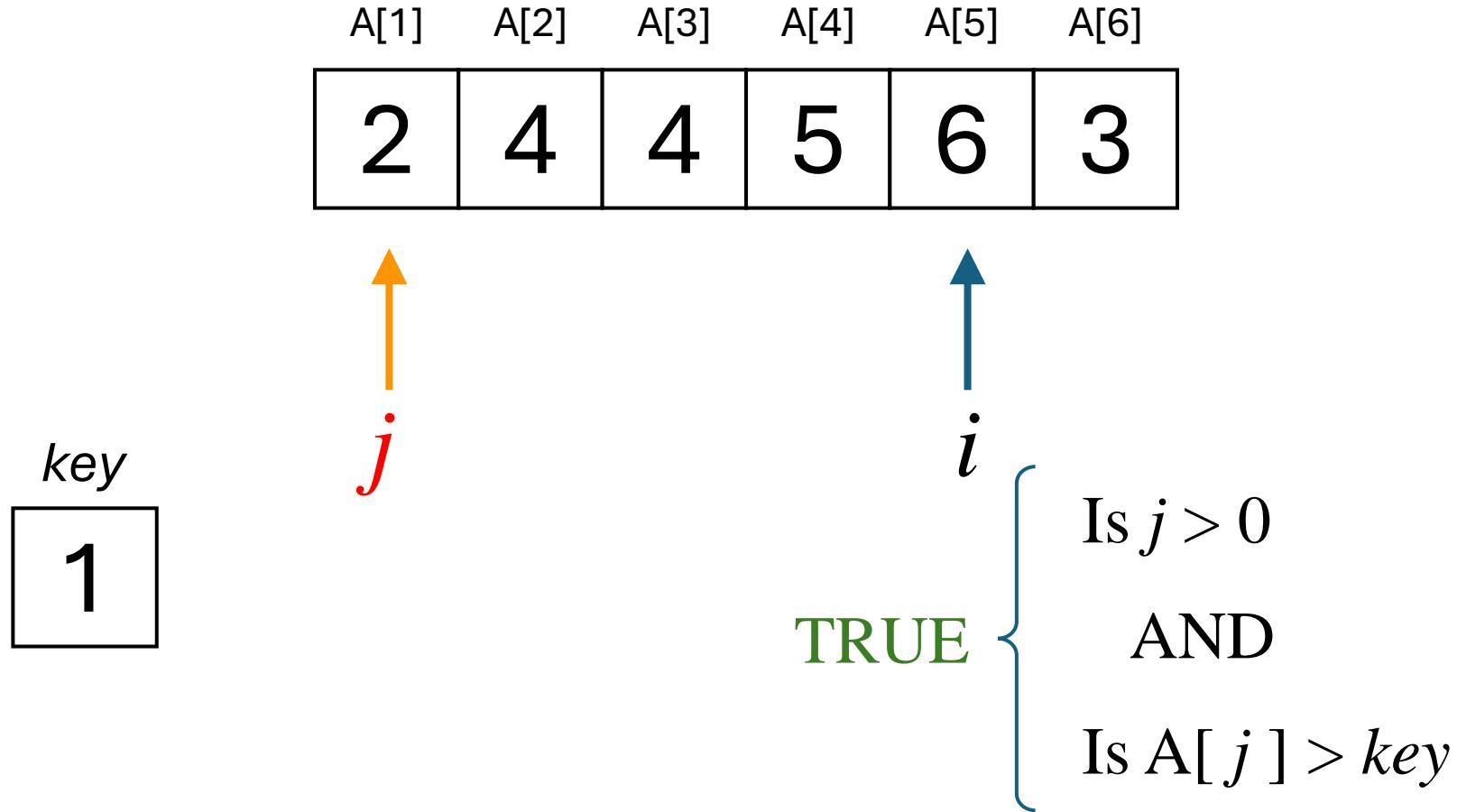
## STEP 6



## STEP 5

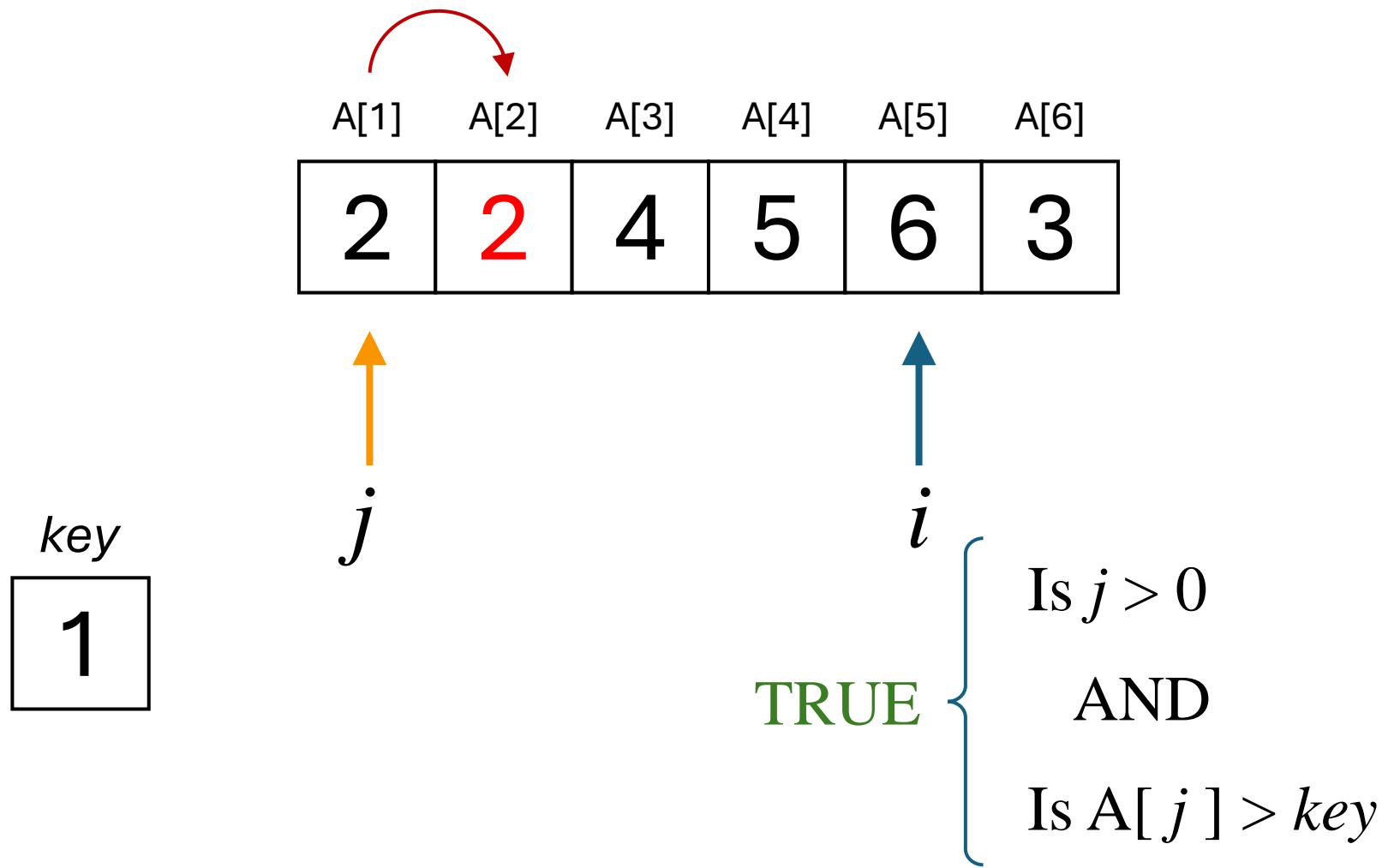


## STEP 6



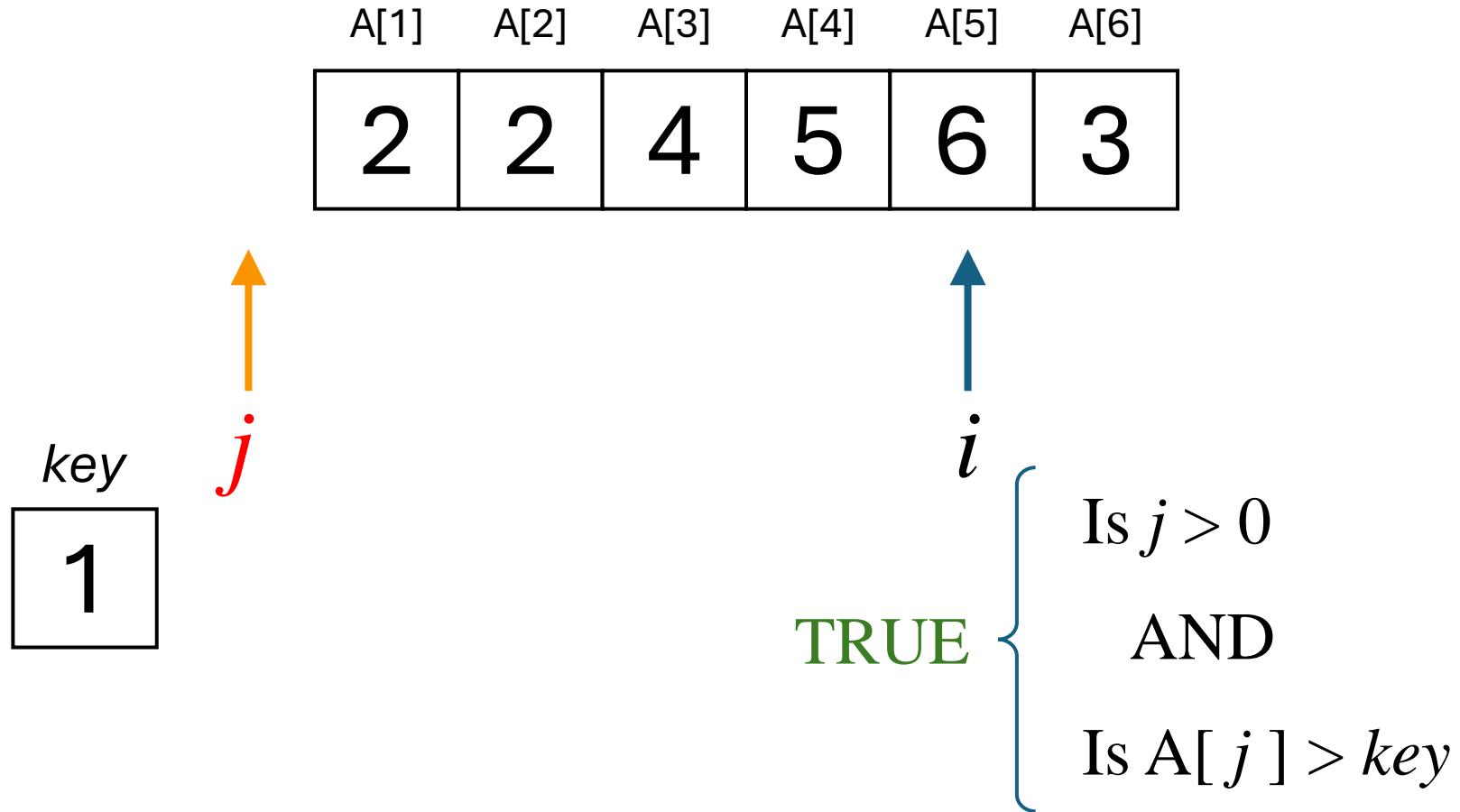
$$i = 5 \quad j = 1 \quad key = 1$$

## STEP 5

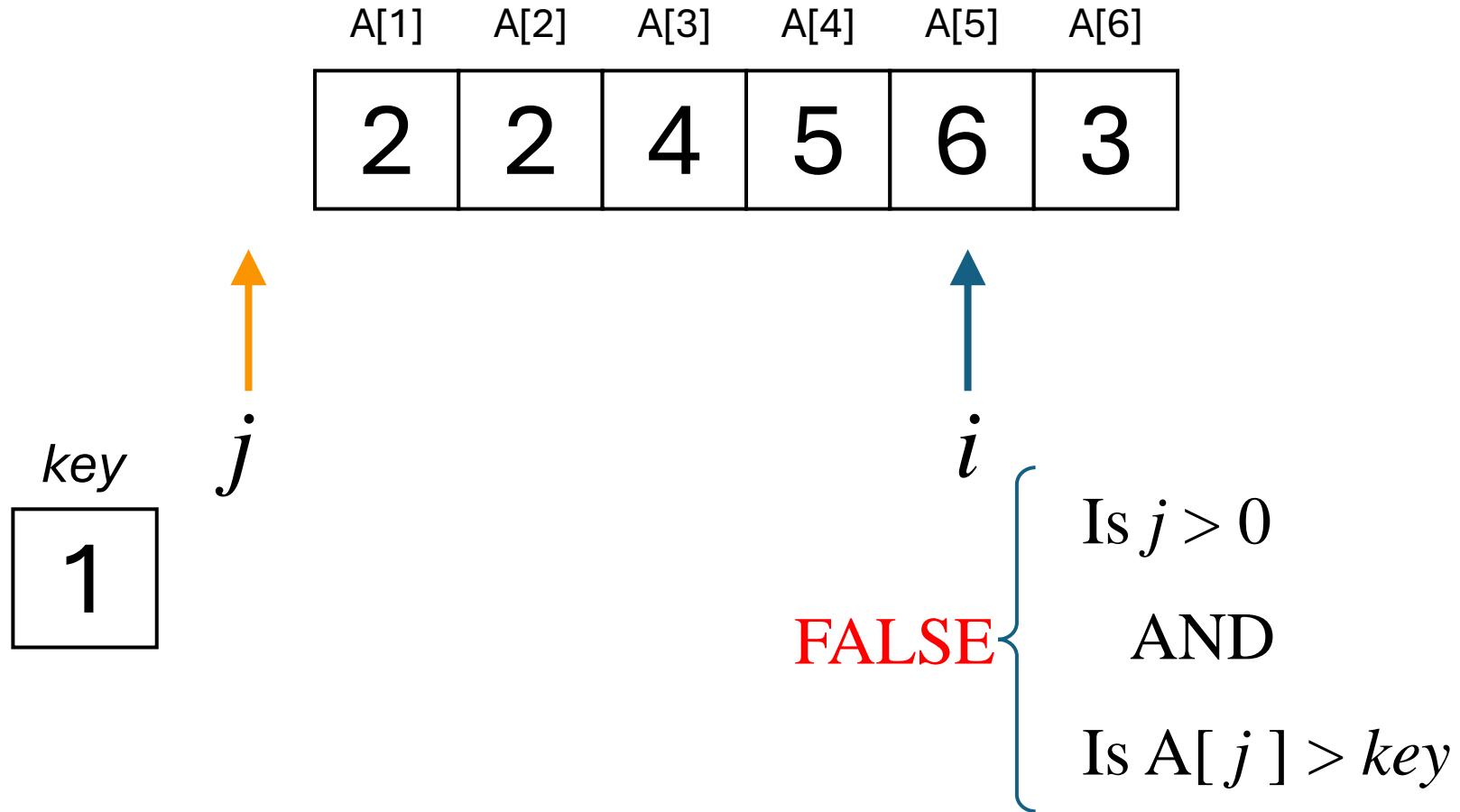


$$i = 5 \quad j = 1 \quad \text{key} = 1$$

## STEP 6

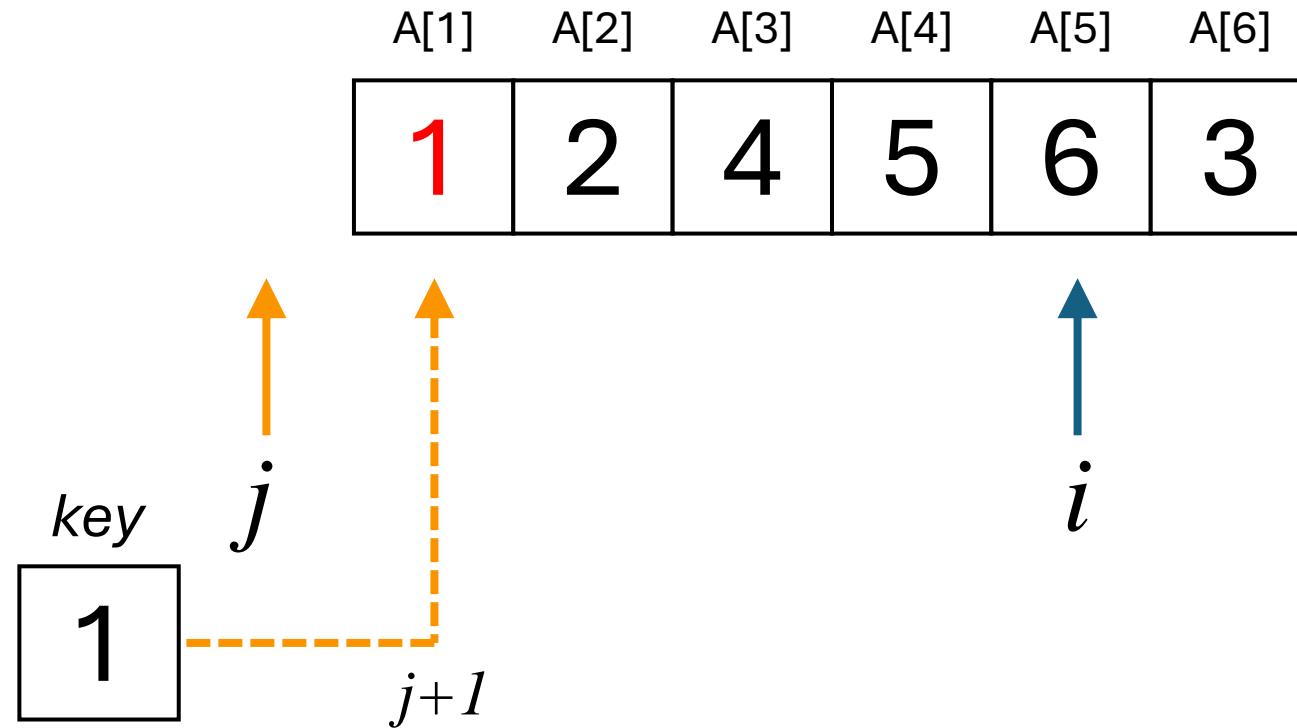


## STEP 6



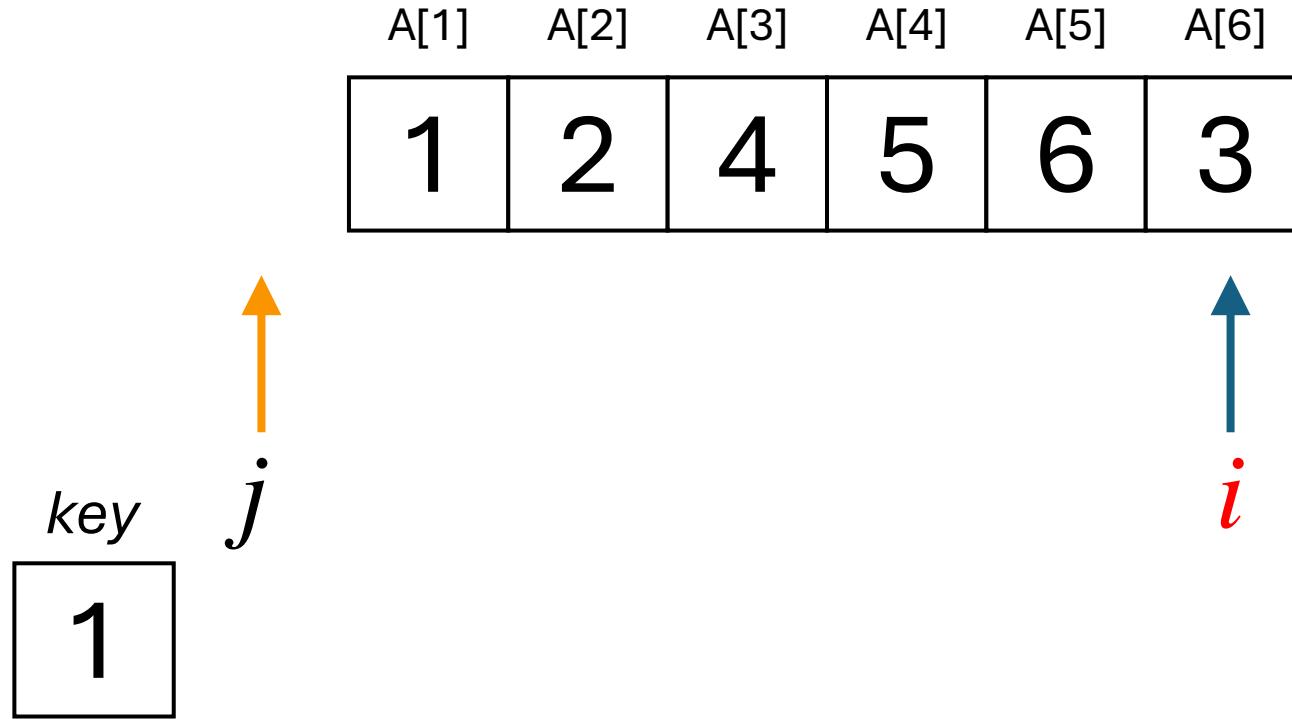
$$i = 5 \quad j = 0 \quad key = 1$$

## STEP 7



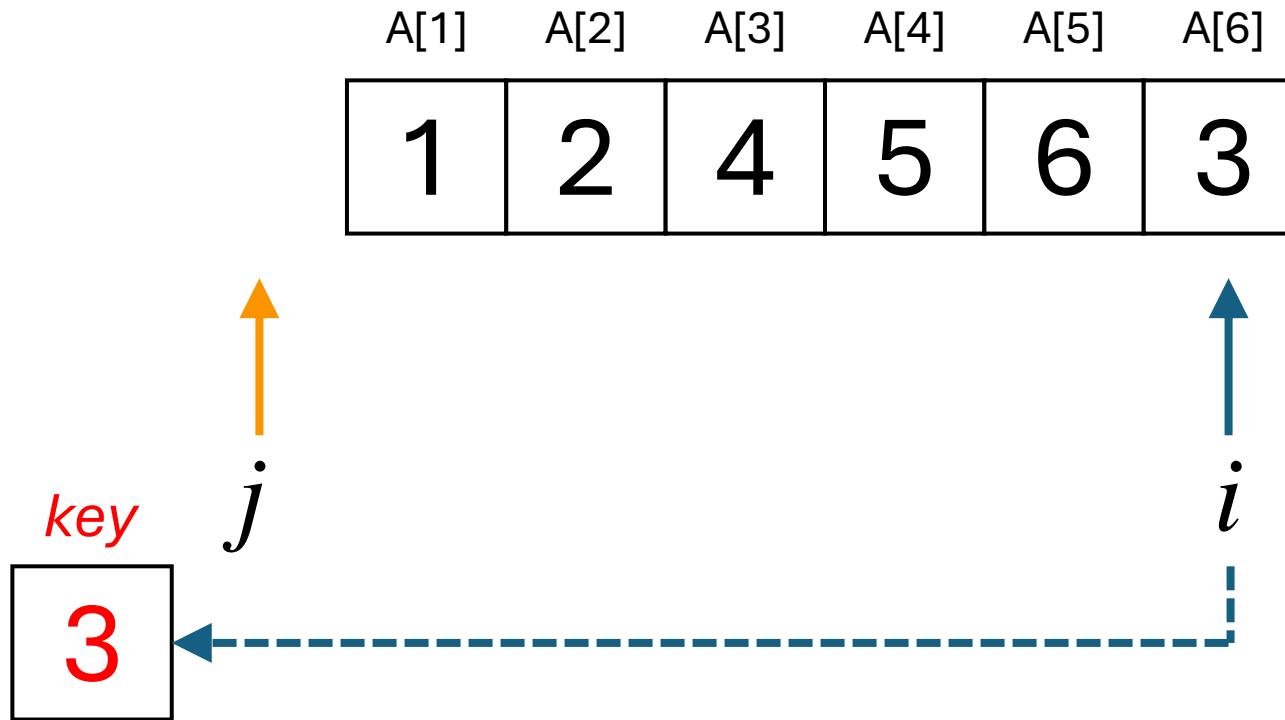
$$i = 5 \quad j = 0 \quad key = 1$$

# STEP 1



$$i = 6 \quad j = 0 \quad key = 1$$

## STEP 2



$$i = 6 \quad j = 0 \quad \text{key} = 3$$

## STEP 3

A[1]	A[2]	A[3]	A[4]	A[5]	A[6]
1	2	4	5	6	3



$$i = 6 \quad j = 5 \quad \text{key} = 3$$

## STEP 4

A[1]	A[2]	A[3]	A[4]	A[5]	A[6]
1	2	4	5	6	3



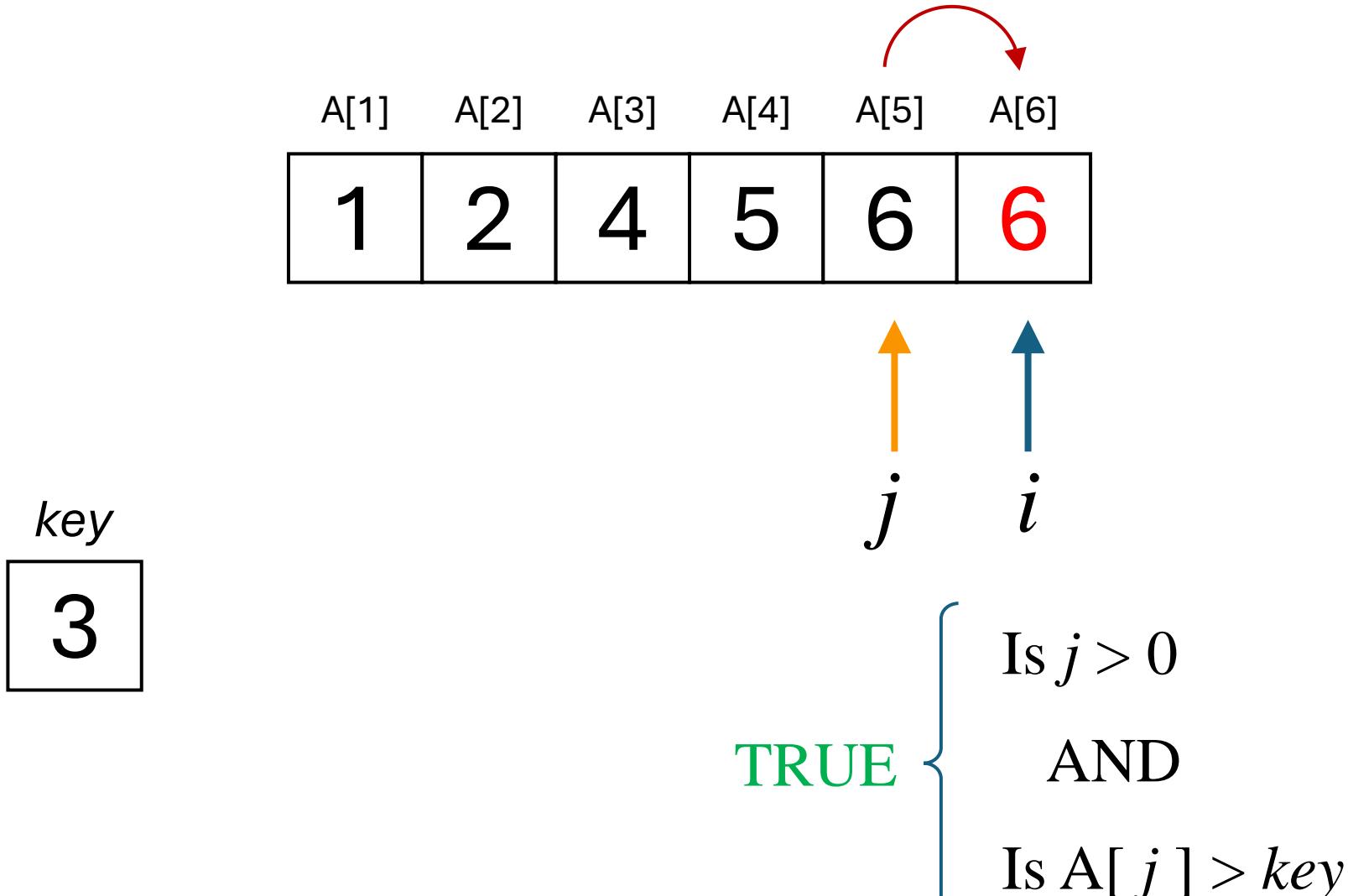
$key$   
3

TRUE {

- Is  $j > 0$
- AND
- Is  $A[j] > key$

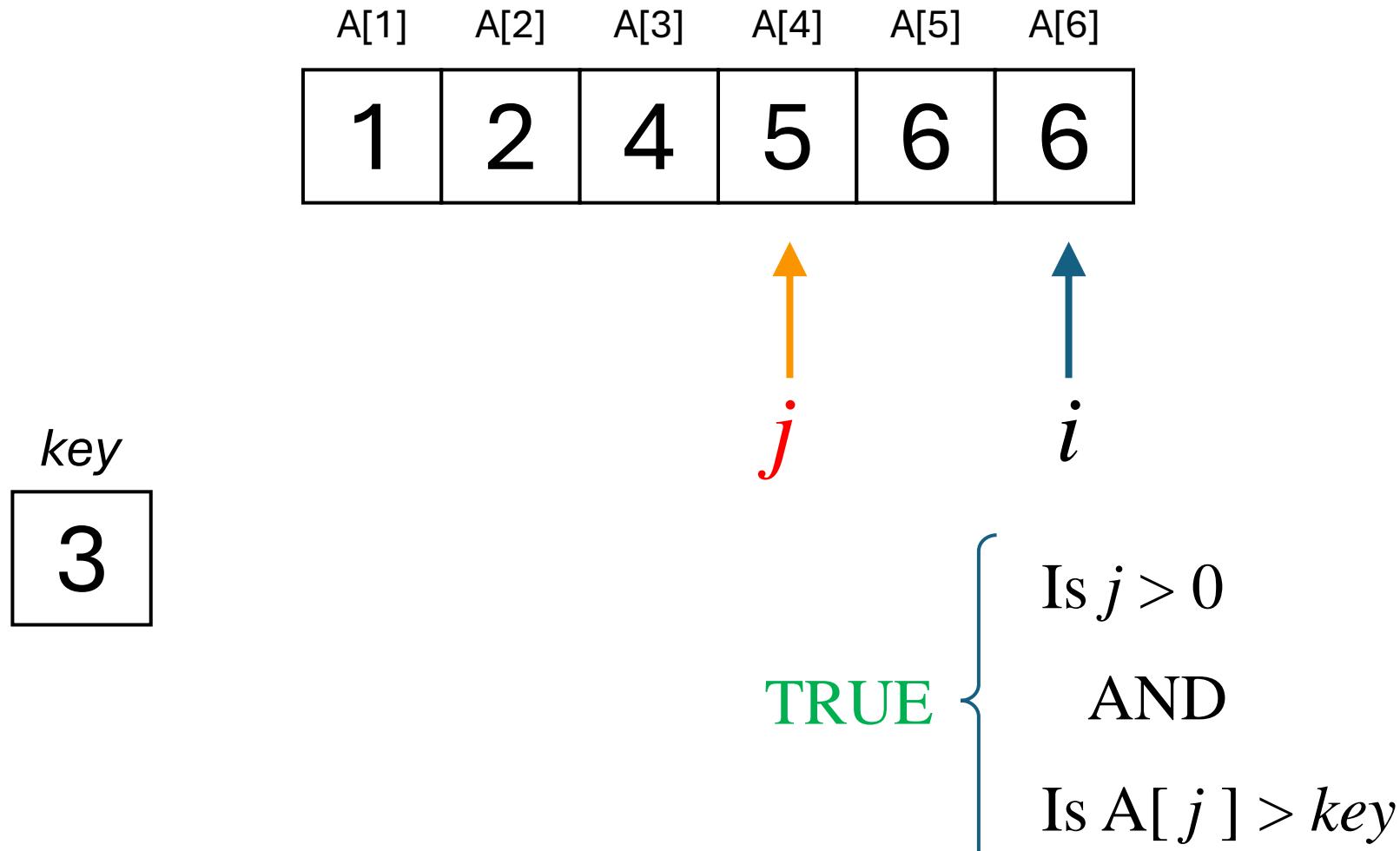
$$i = 6 \quad j = 5 \quad key = 3$$

## STEP 5



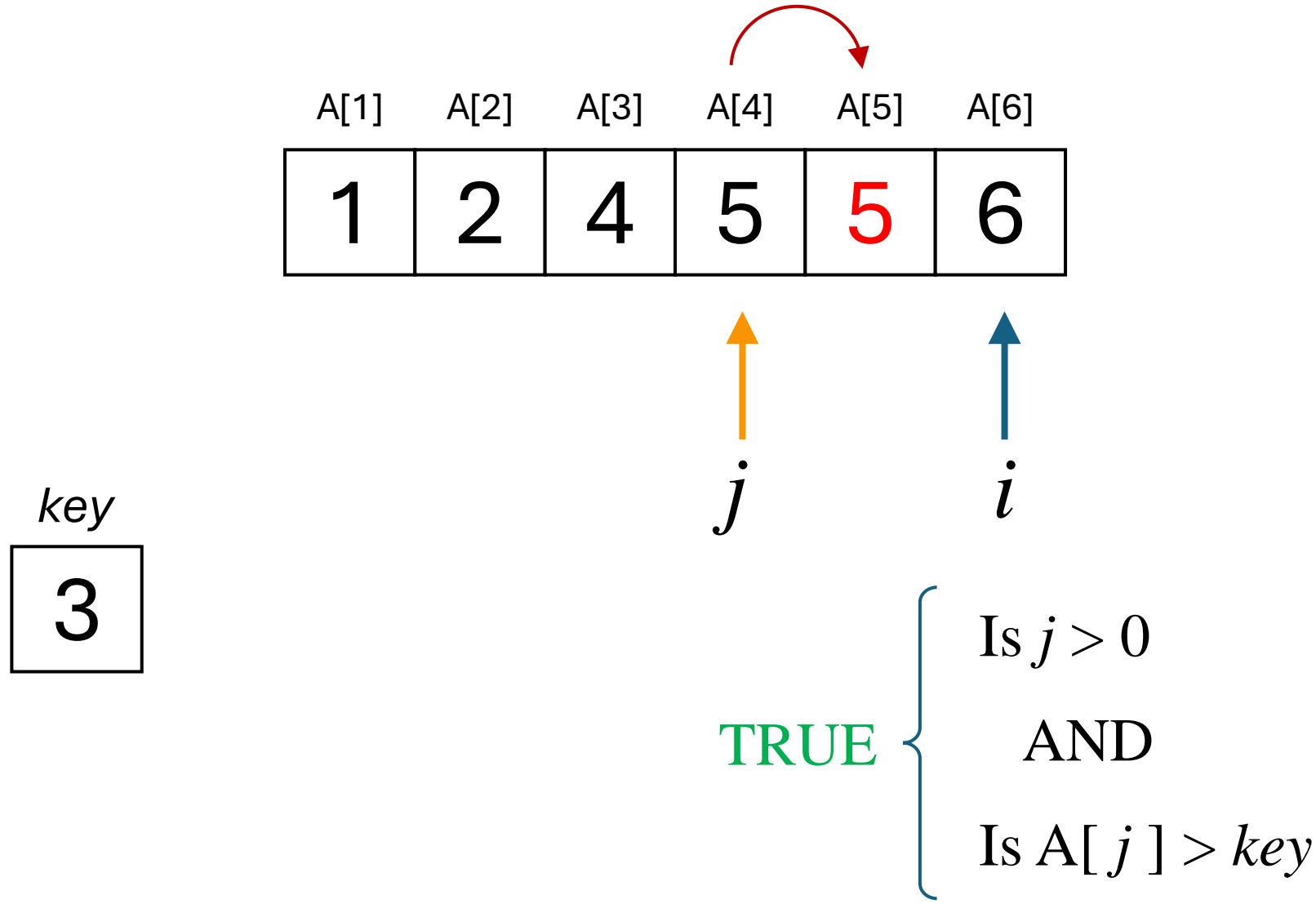
$$i = 6 \quad j = 5 \quad key = 3$$

## STEP 6



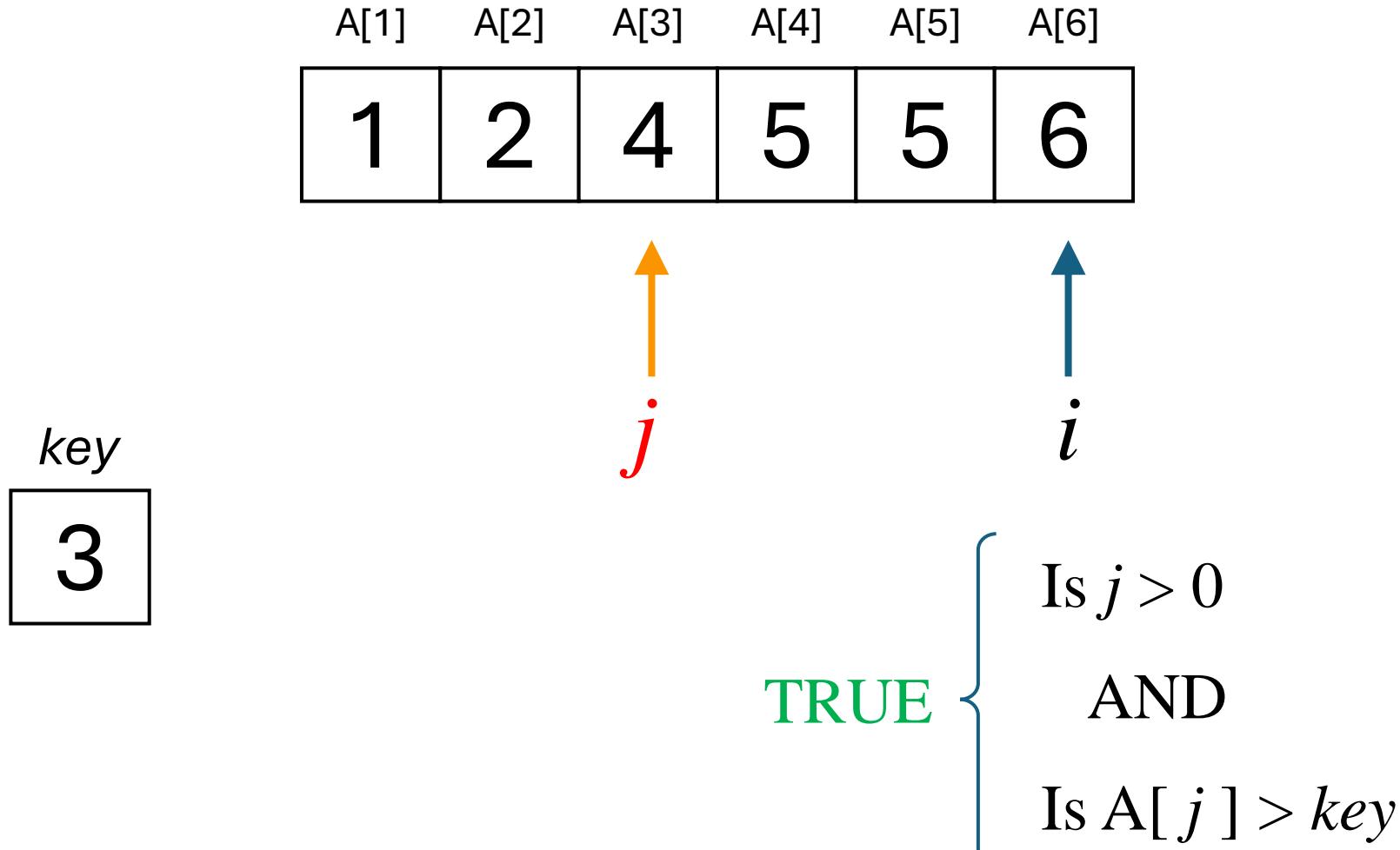
$$i = 6 \quad j = 4 \quad key = 3$$

## STEP 5

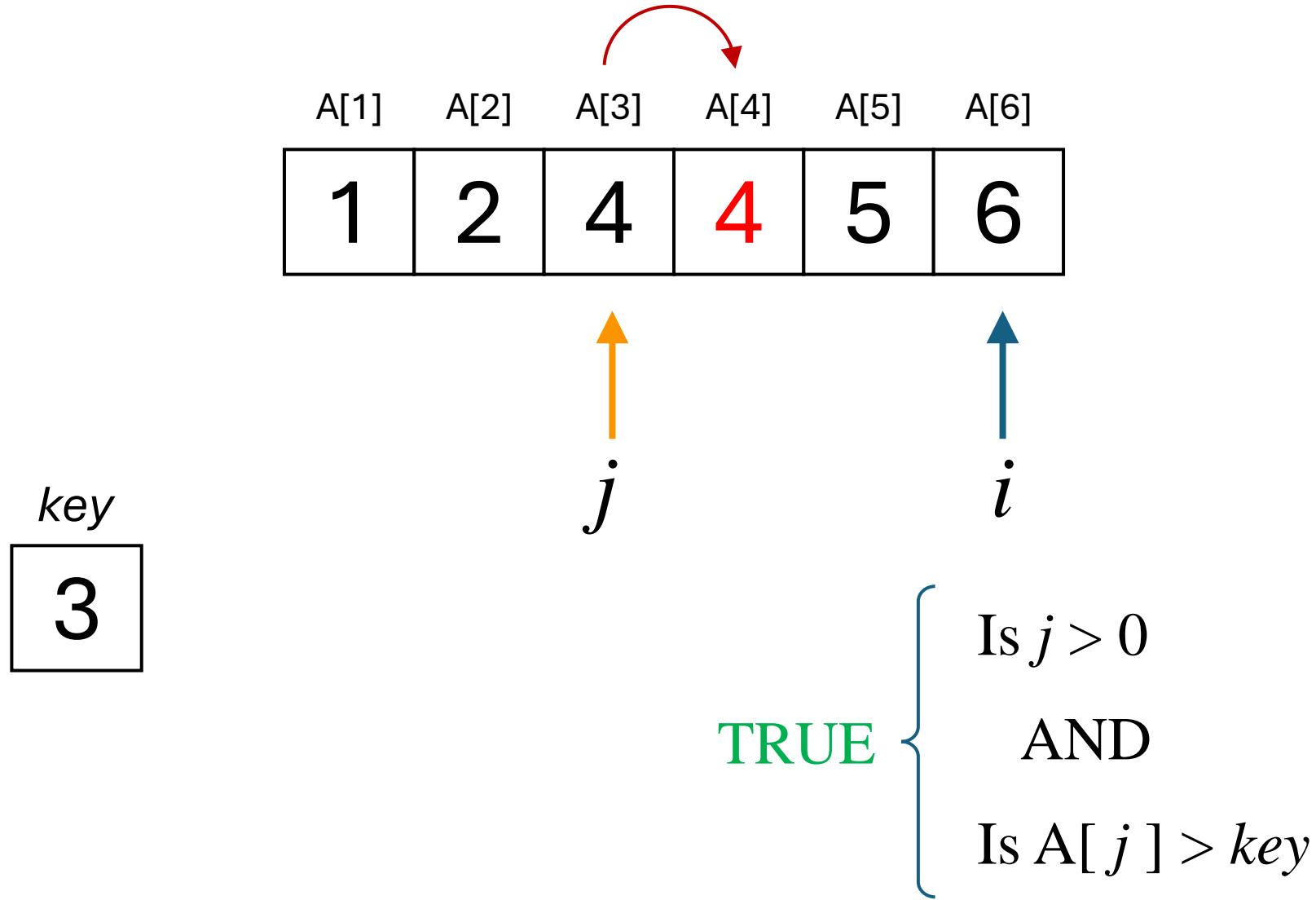


$$i = 6 \quad j = 4 \quad key = 3$$

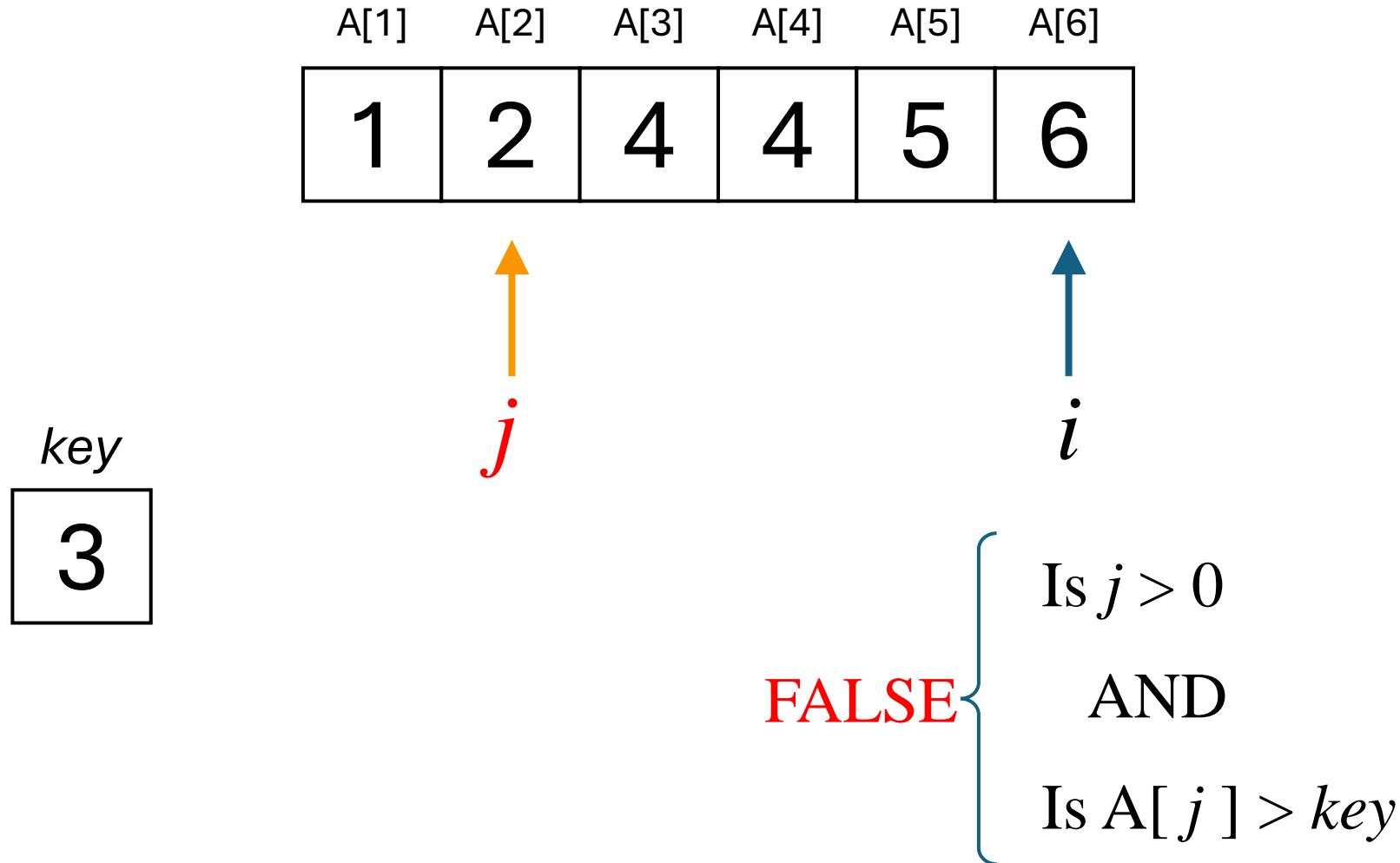
## STEP 6



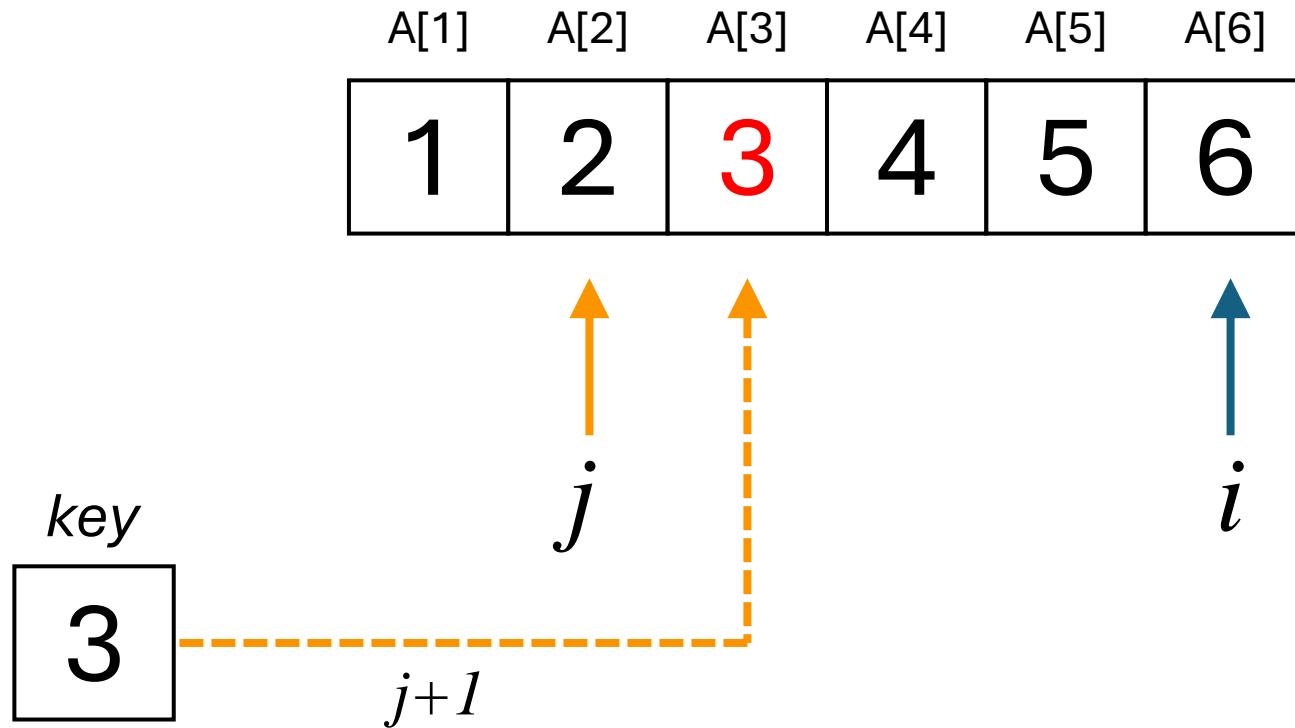
## STEP 5



## STEP 6



## STEP 7



$$i = 6 \quad j = 2 \quad key = 3$$

**END**

A[1]	A[2]	A[3]	A[4]	A[5]	A[6]
1	2	3	4	5	6