

### 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

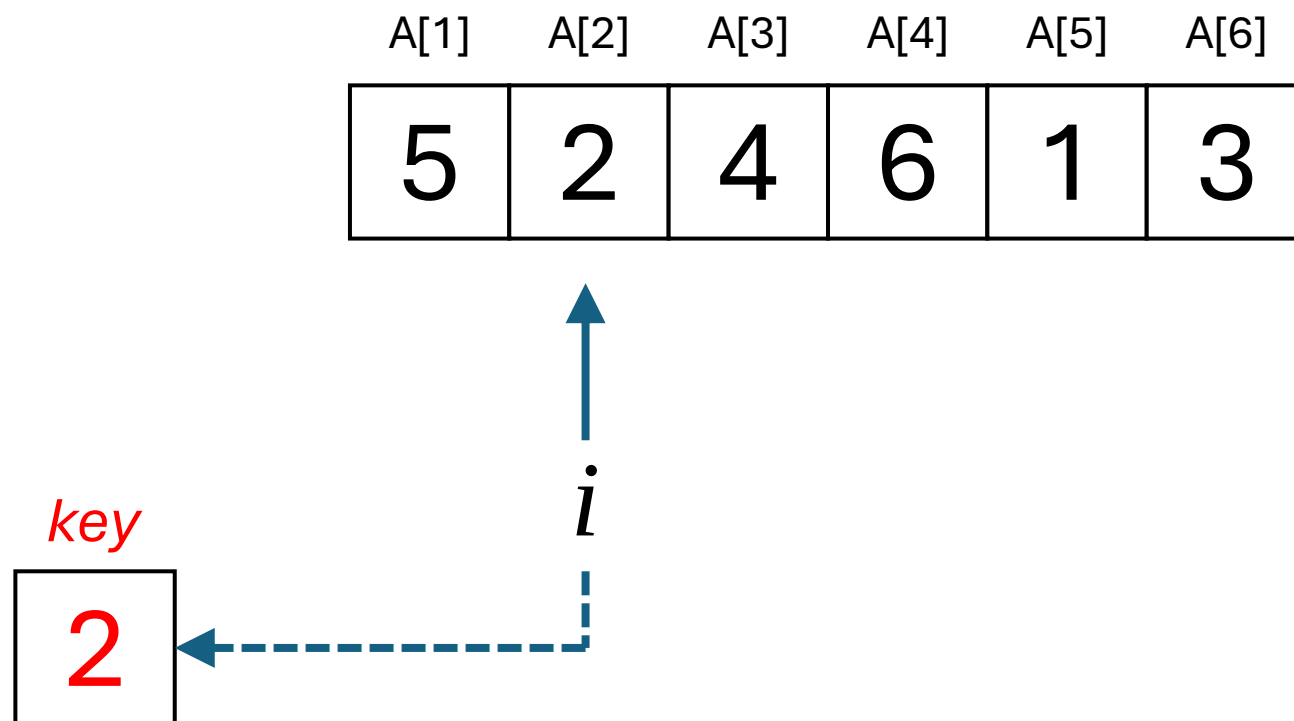
| A[1] | A[2] | A[3] | A[4] | A[5] | A[6] |
|------|------|------|------|------|------|
| 5    | 2    | 4    | 6    | 1    | 3    |



*i*

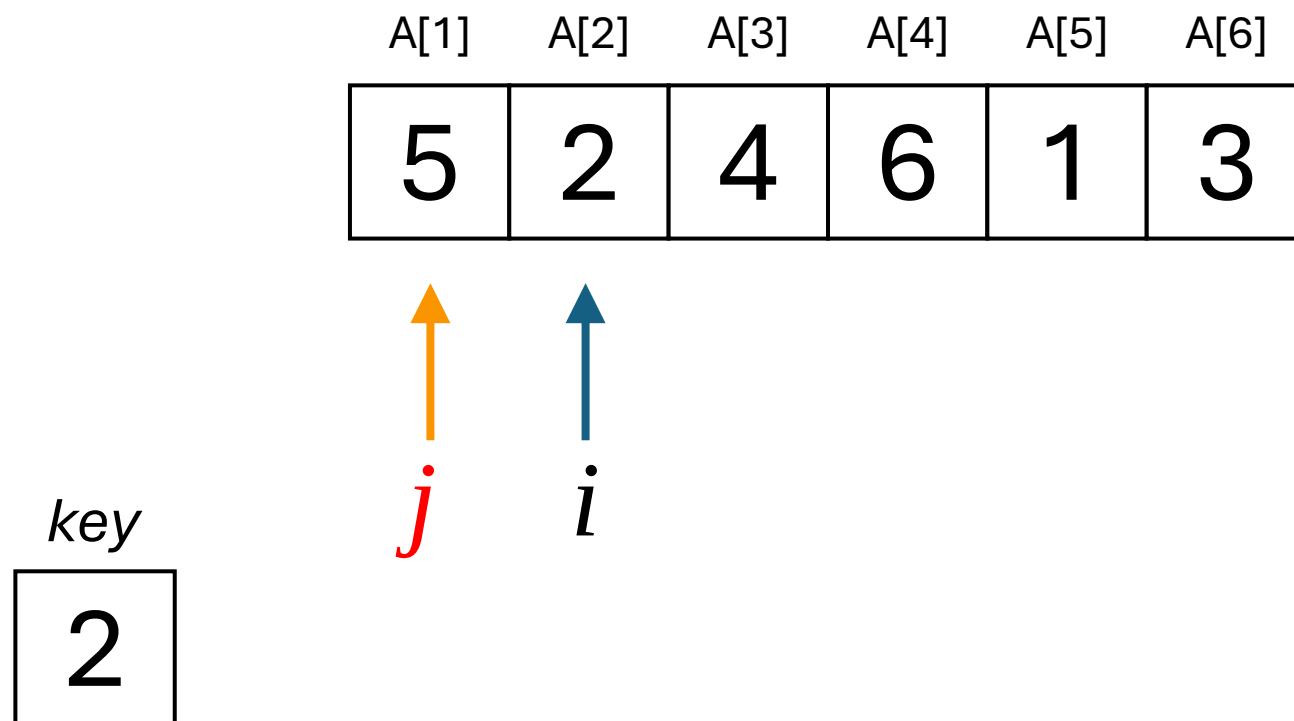
$$i = 2$$

## STEP 2



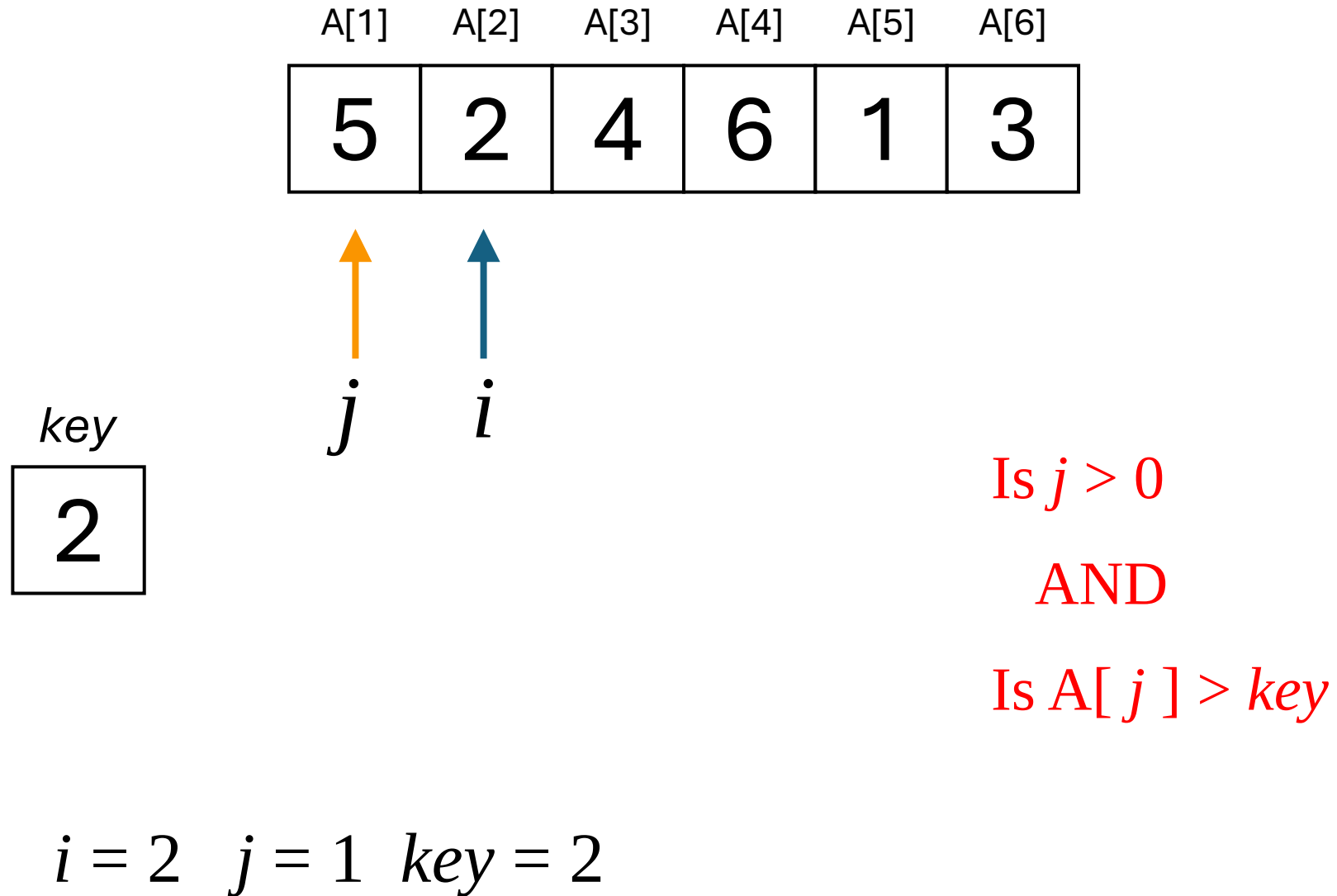
$$i = 2 \quad key = 2$$

## STEP 3

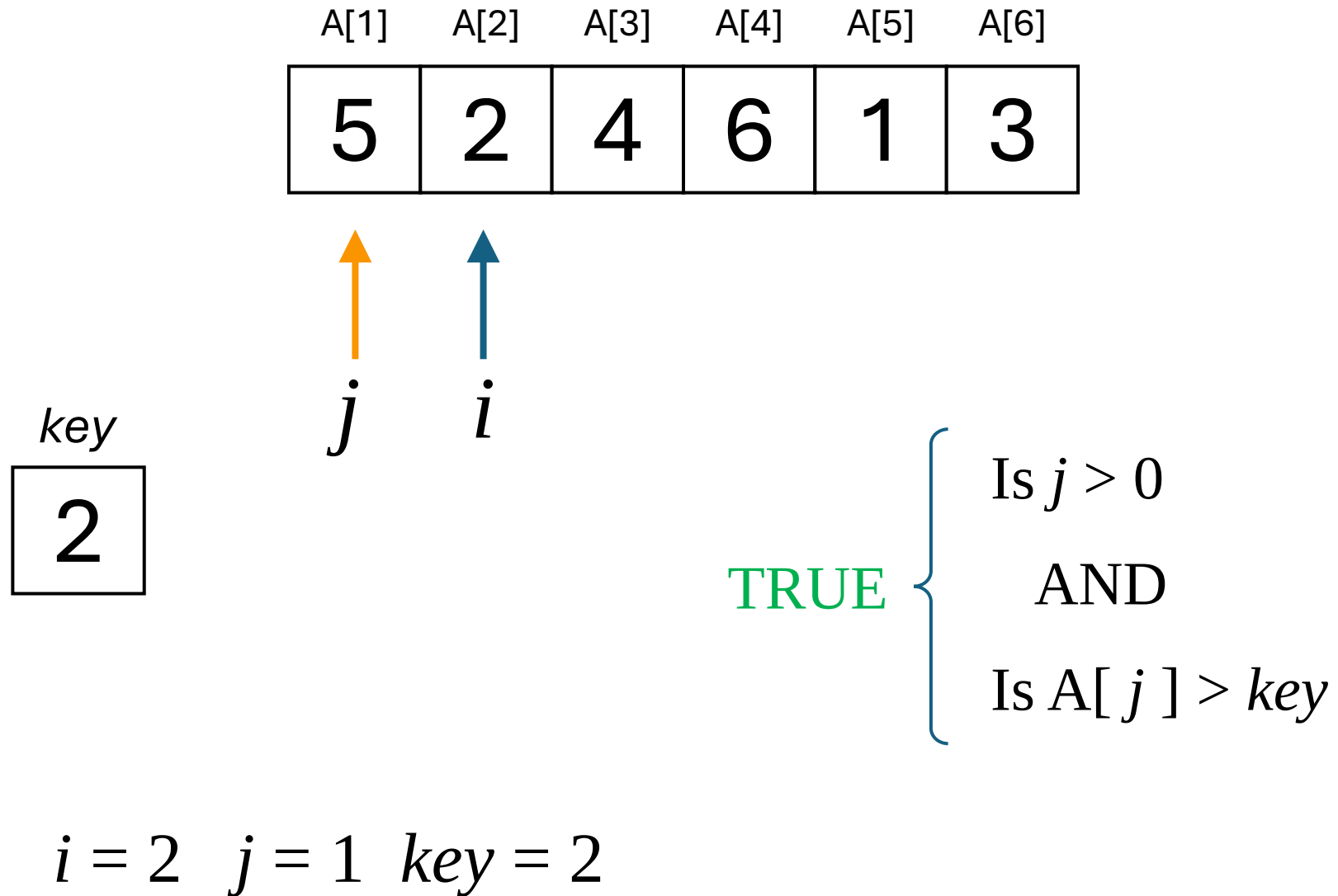


$$i = 2 \quad j = 1 \quad key = 2$$

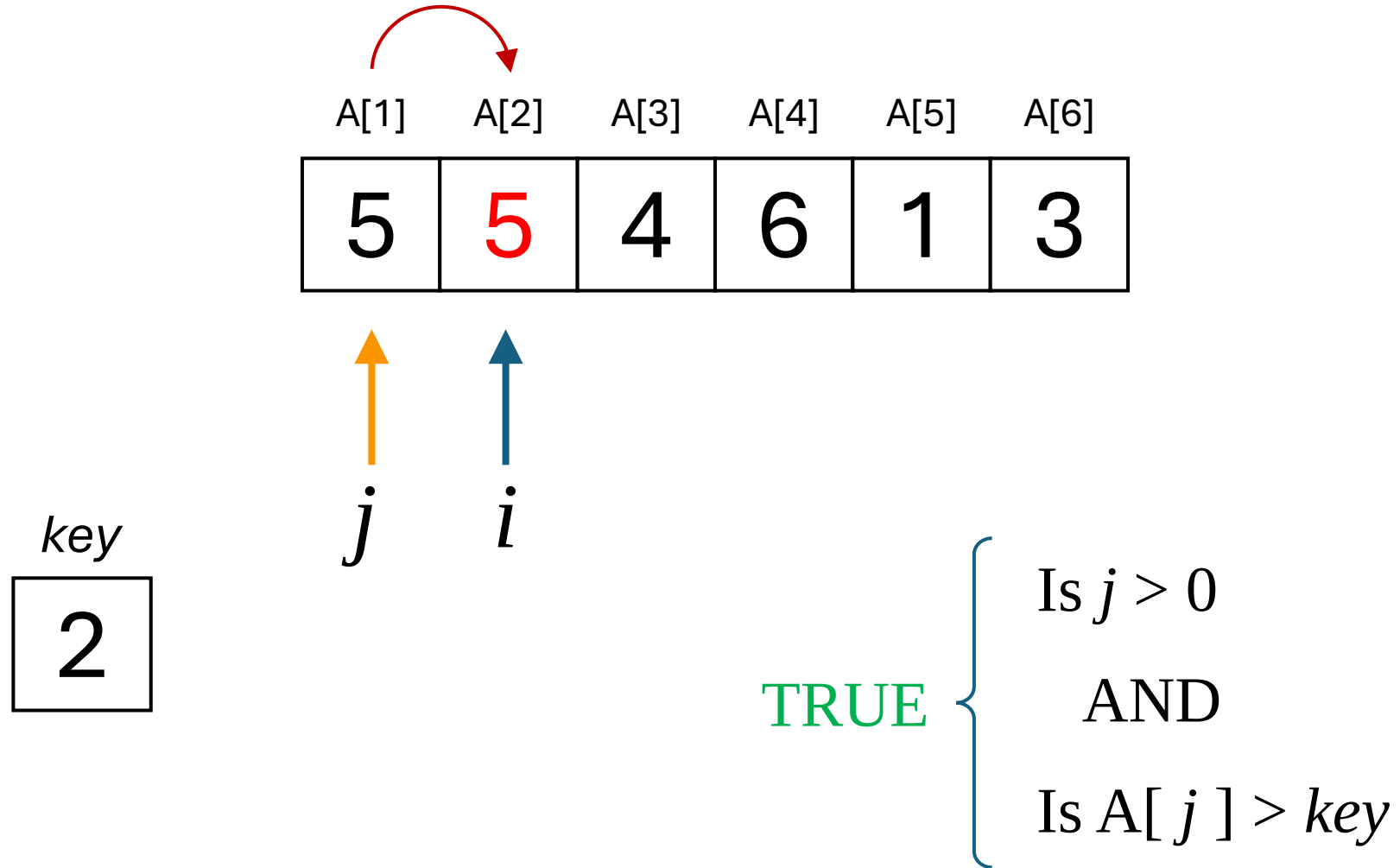
## STEP 4



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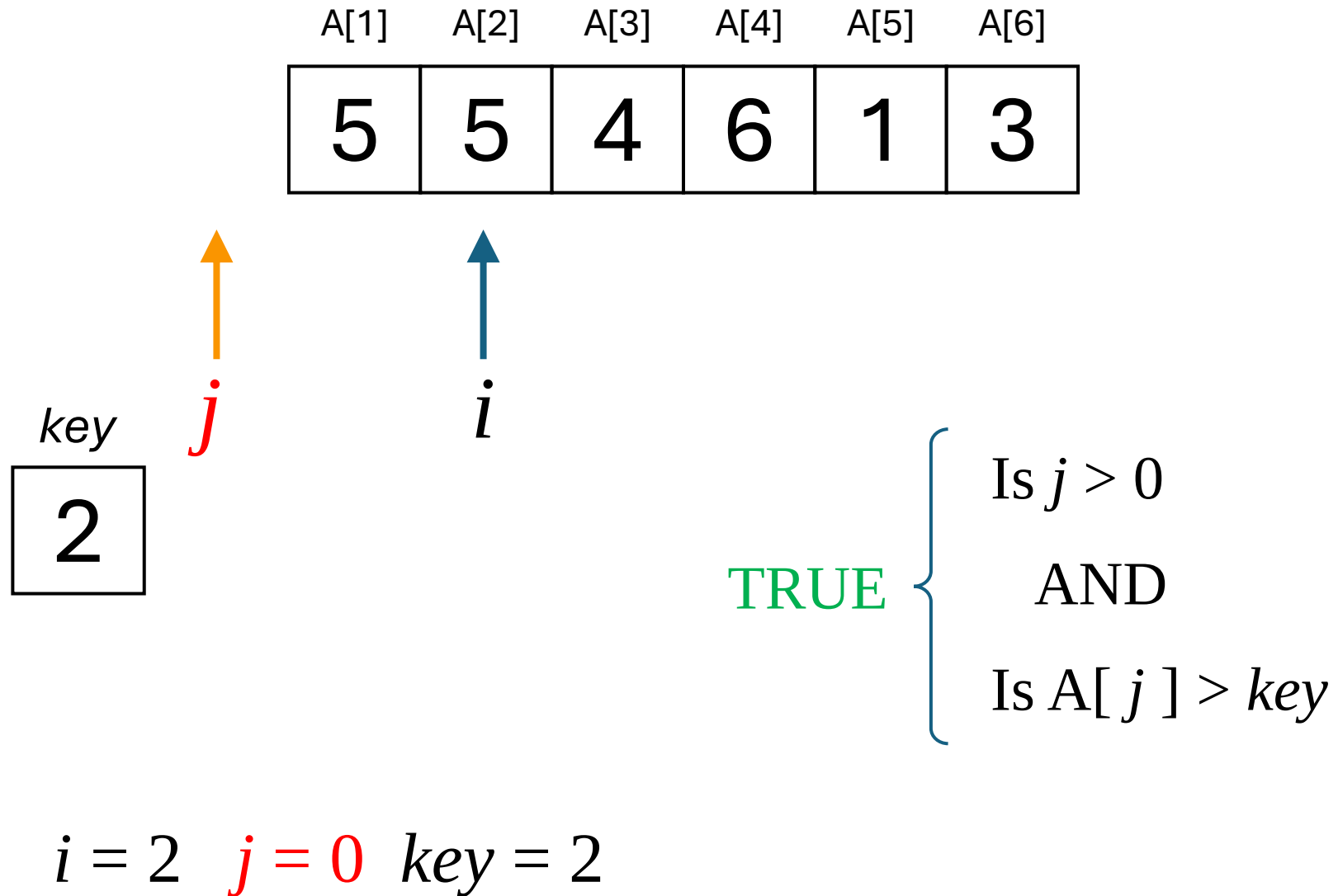


## STEP 5

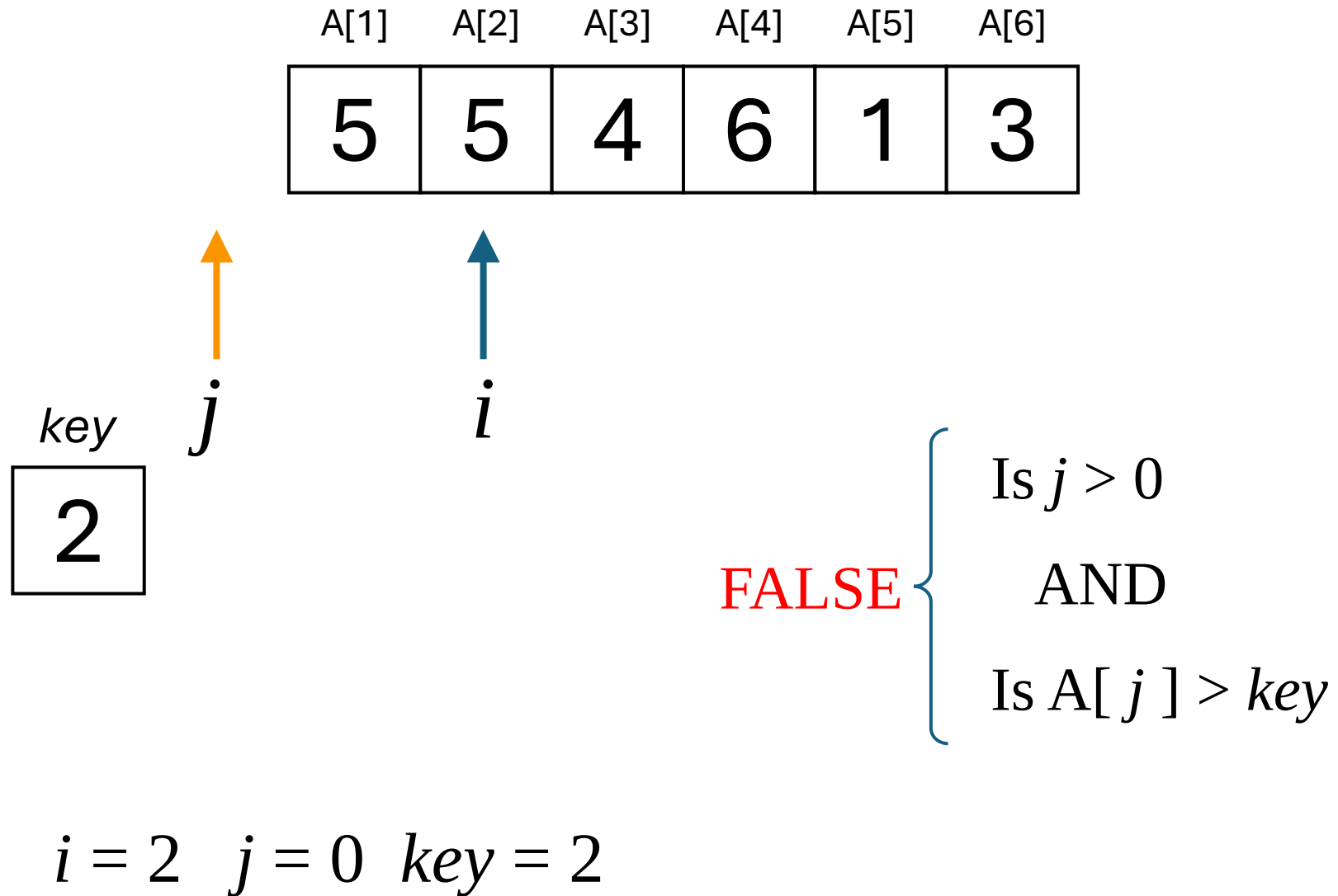


$$i = 2 \quad j = 1 \quad key = 2$$

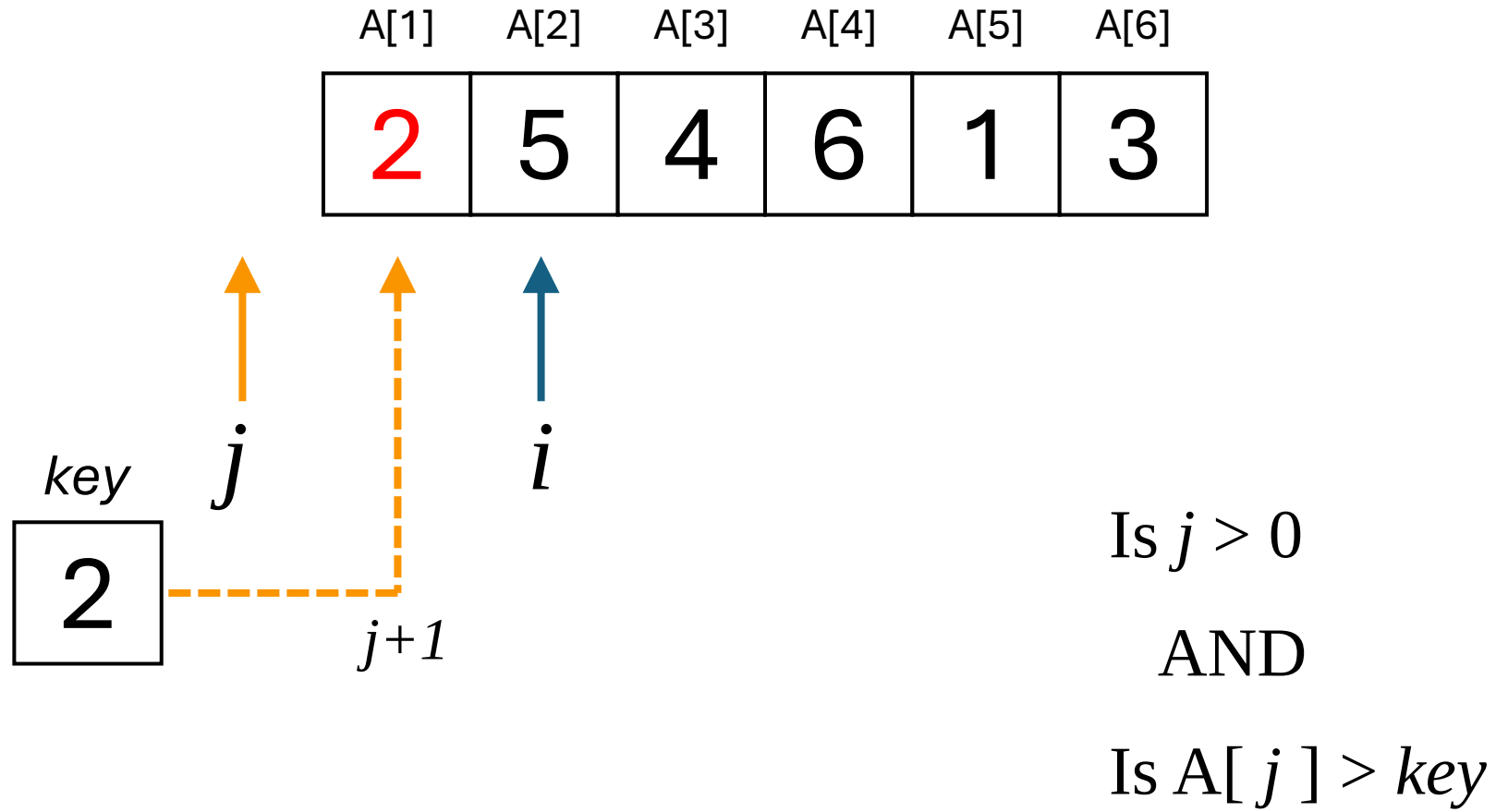
## STEP 6



## STEP 6

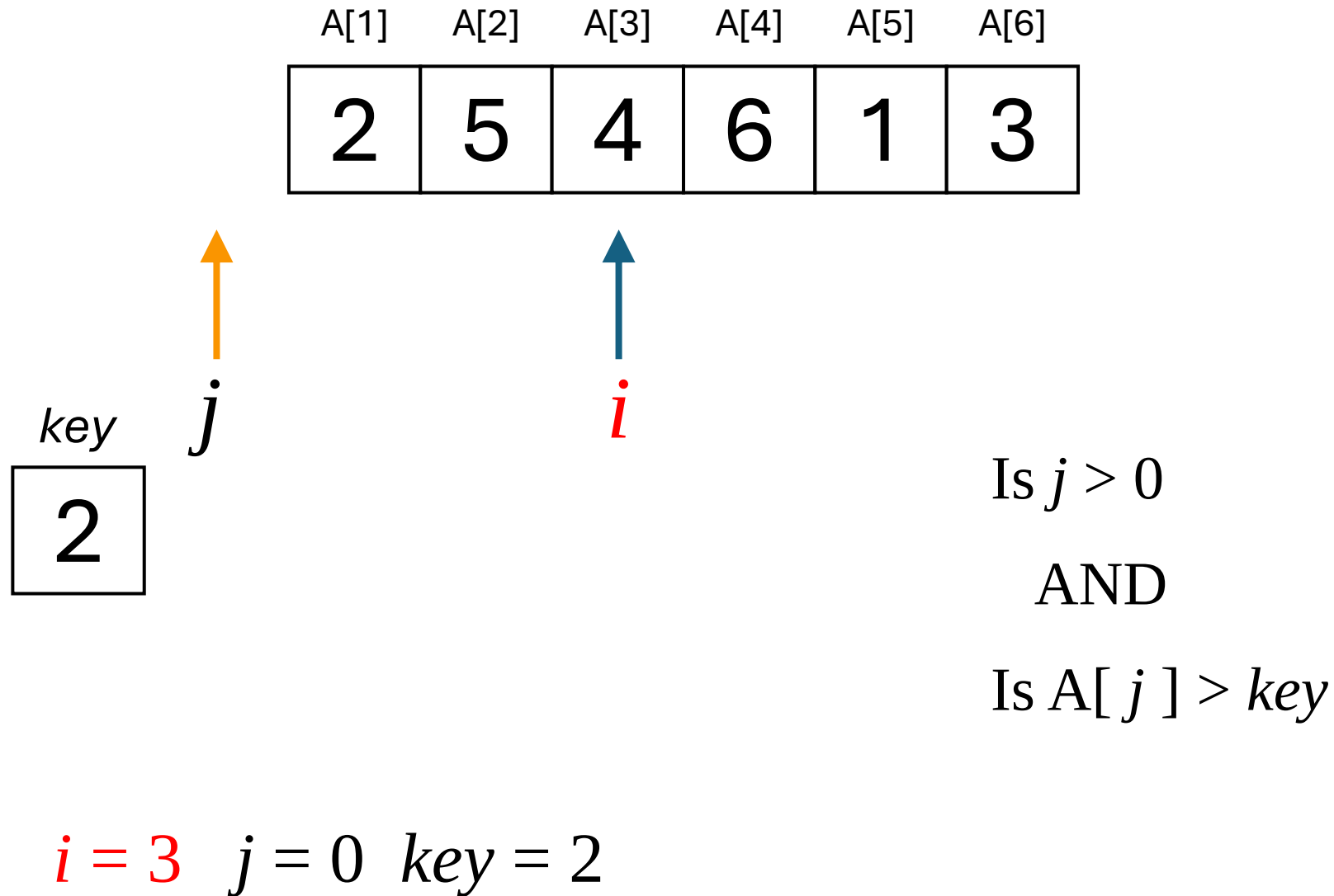


## STEP 7

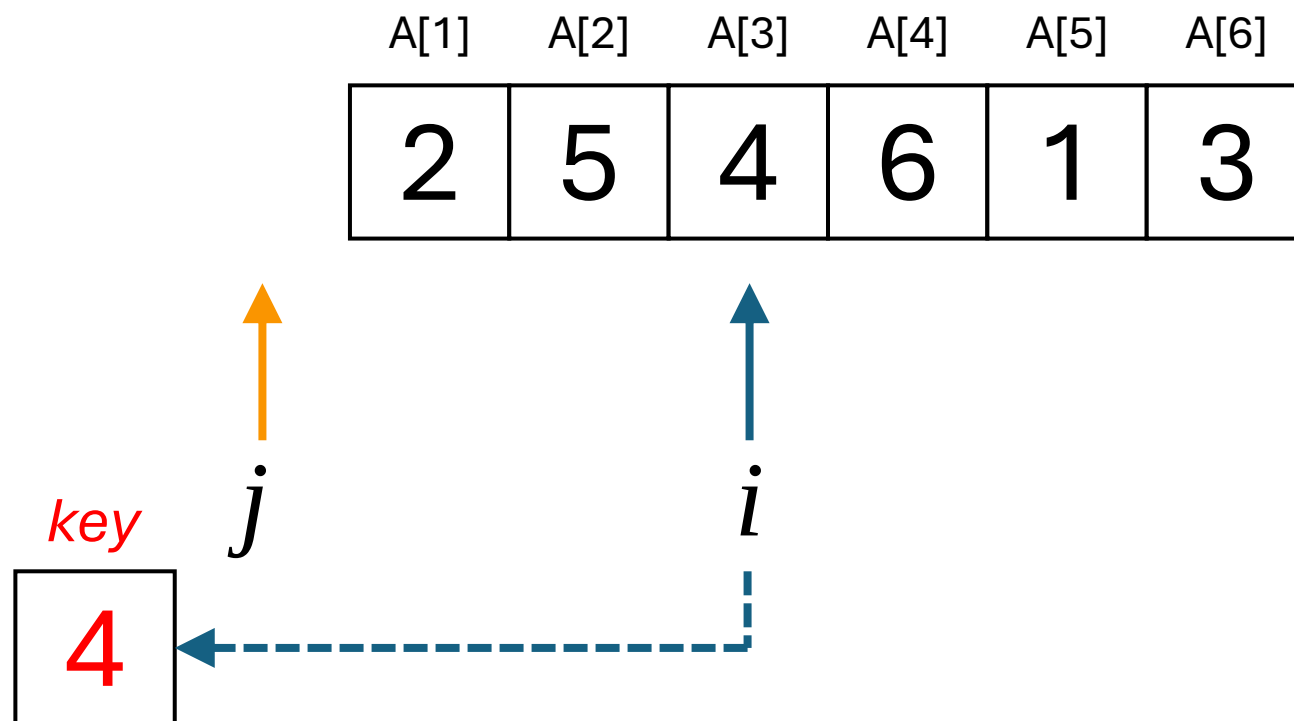


$$i = 2 \quad j = 0 \quad key = 2$$

## STEP 1

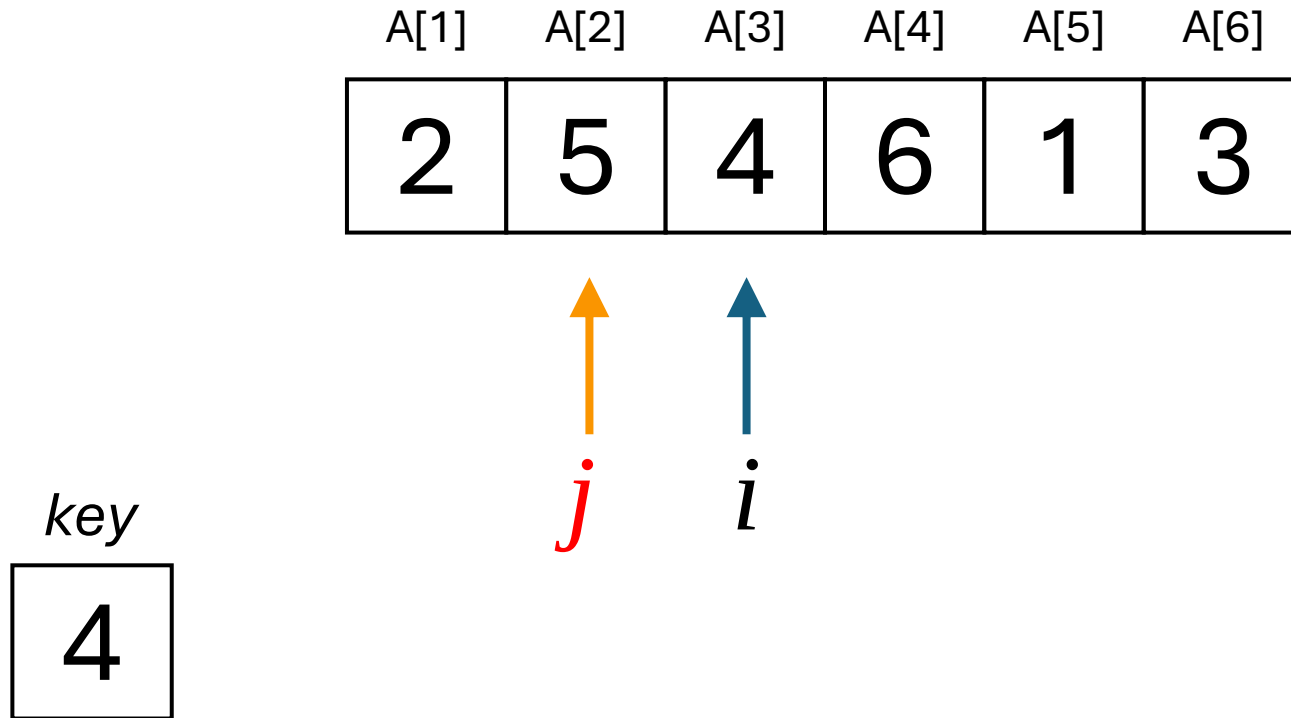


## STEP 2



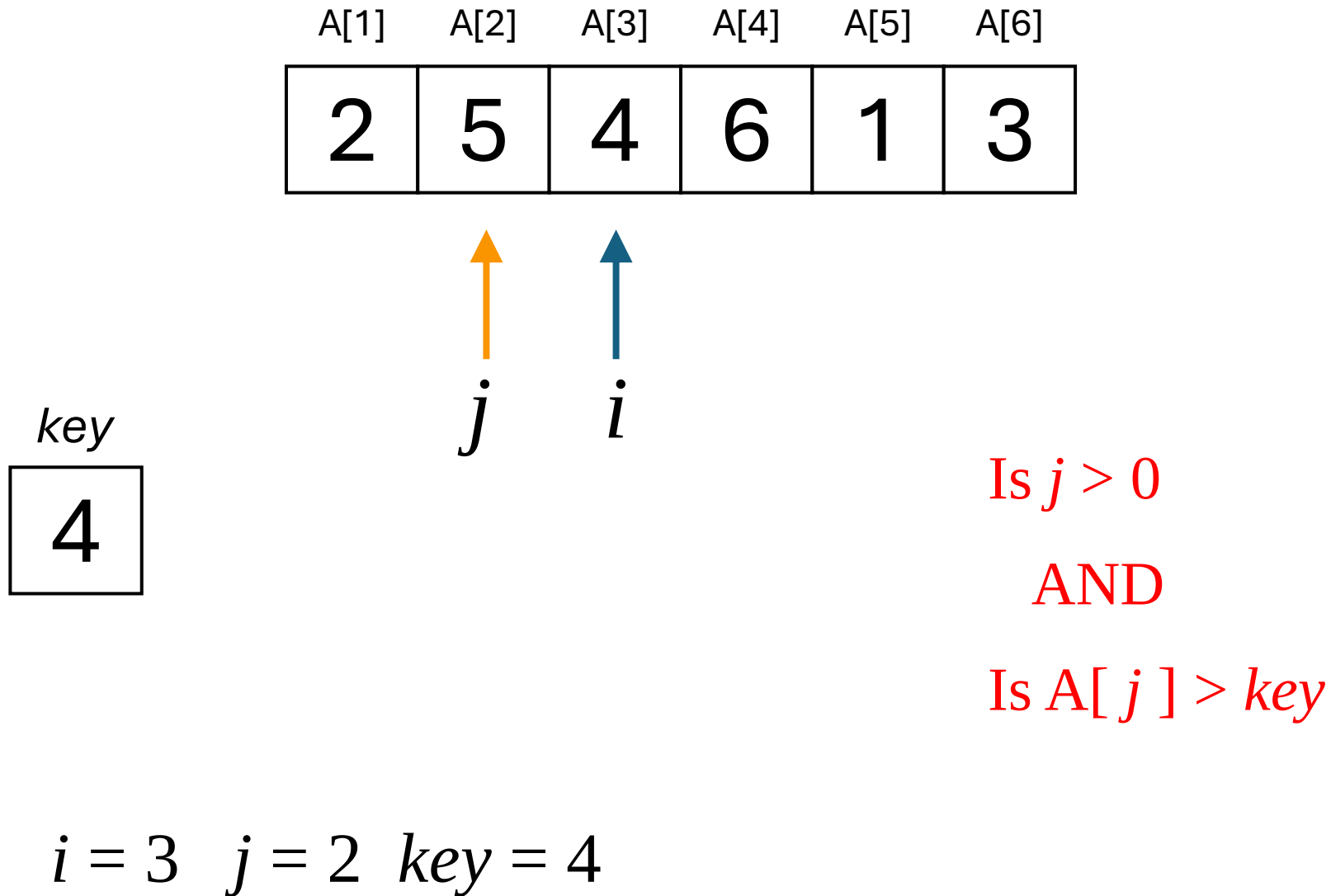
$$i = 3 \quad j = 0 \quad \textit{key} = 4$$

## STEP 3

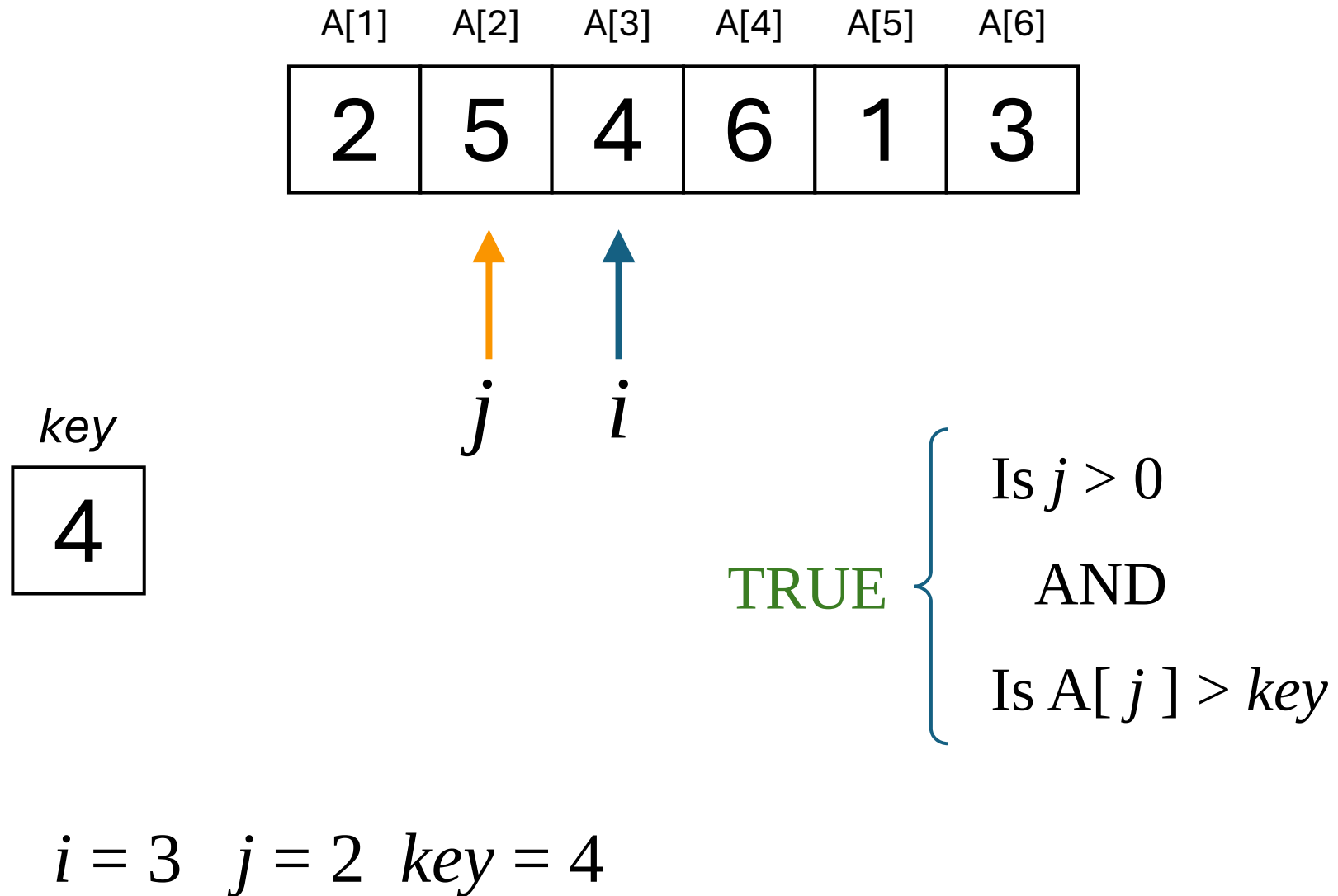


$$i = 3 \quad j = 2 \quad key = 4$$

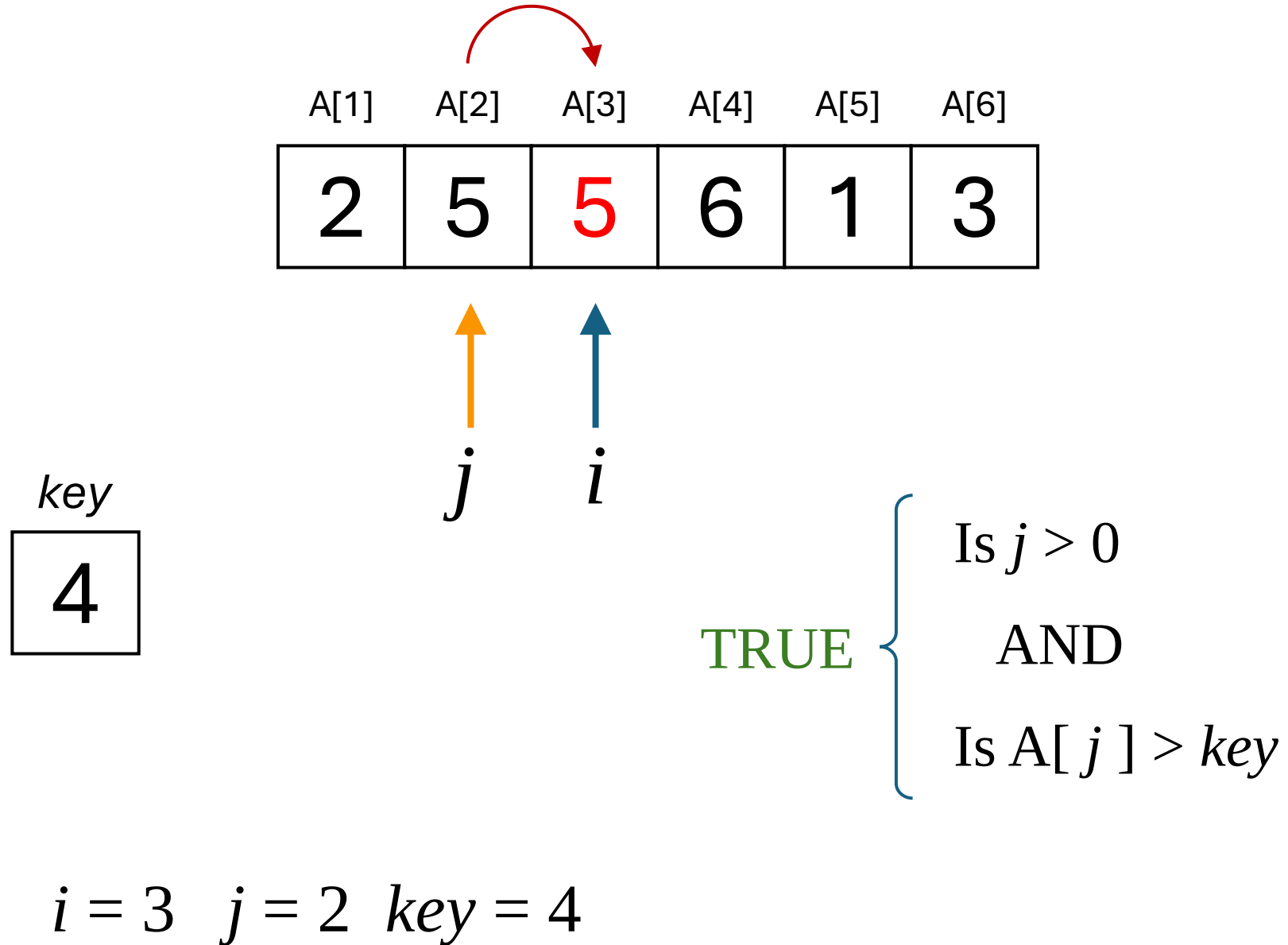
## STEP 4



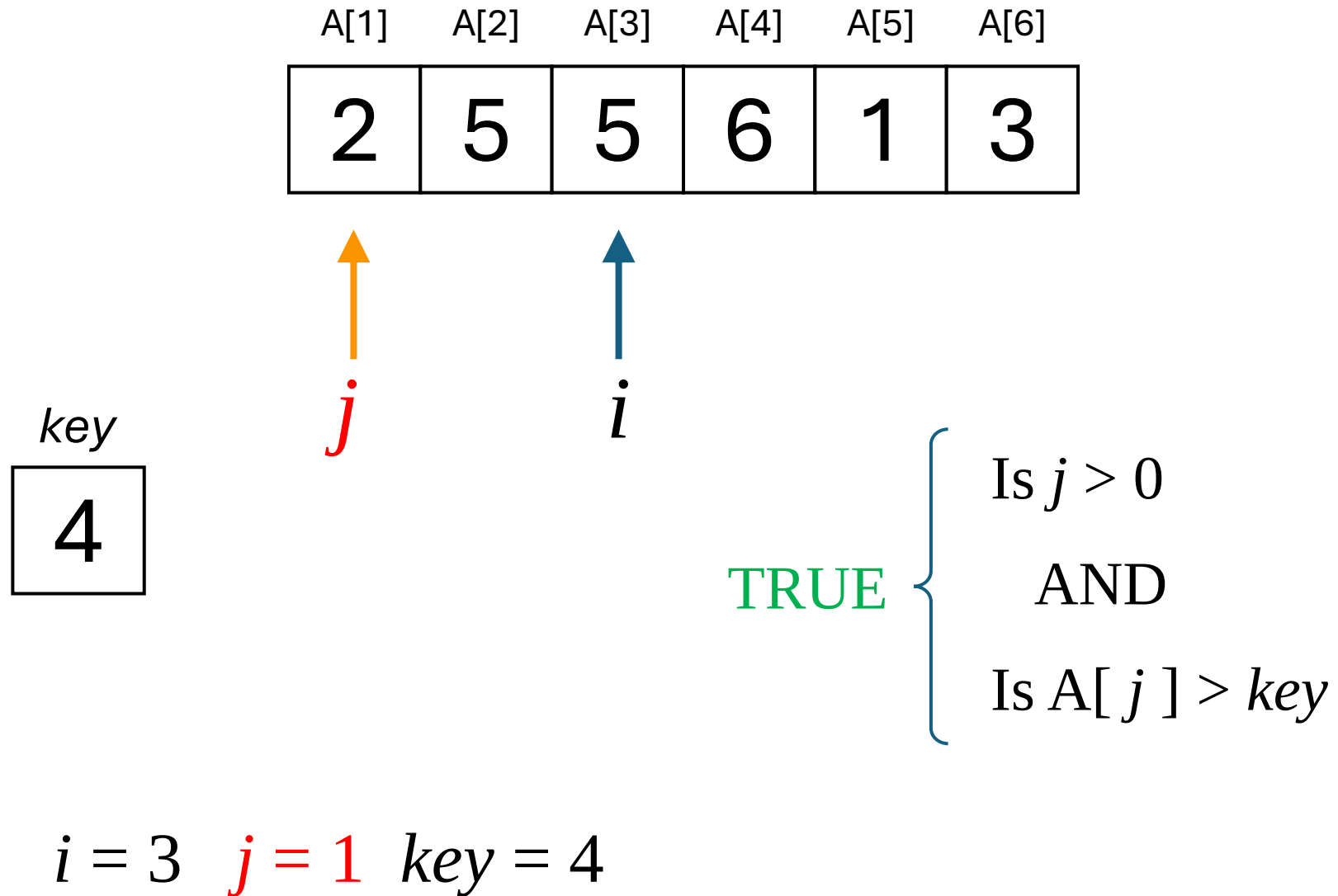
## STEP 4



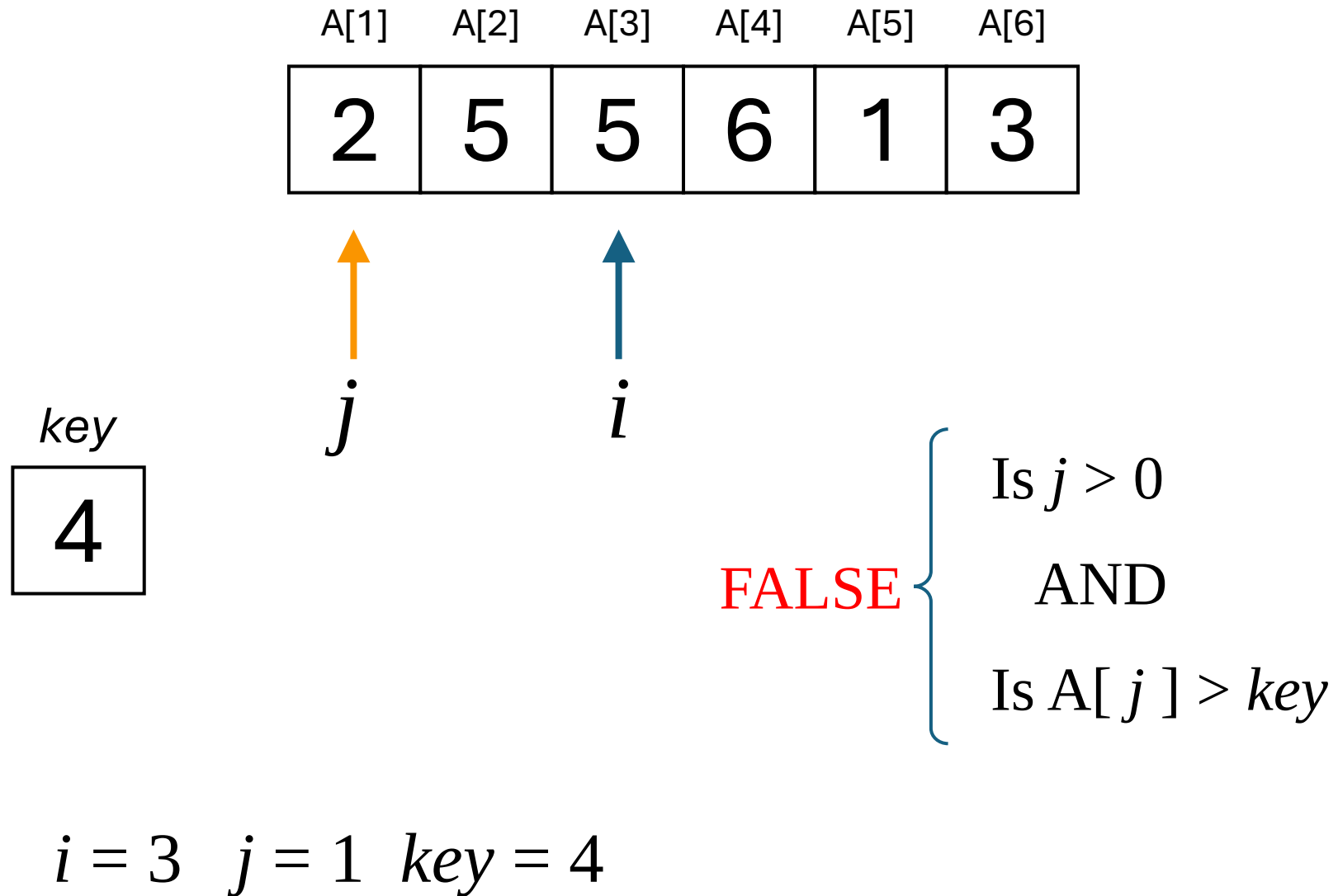
## STEP 5



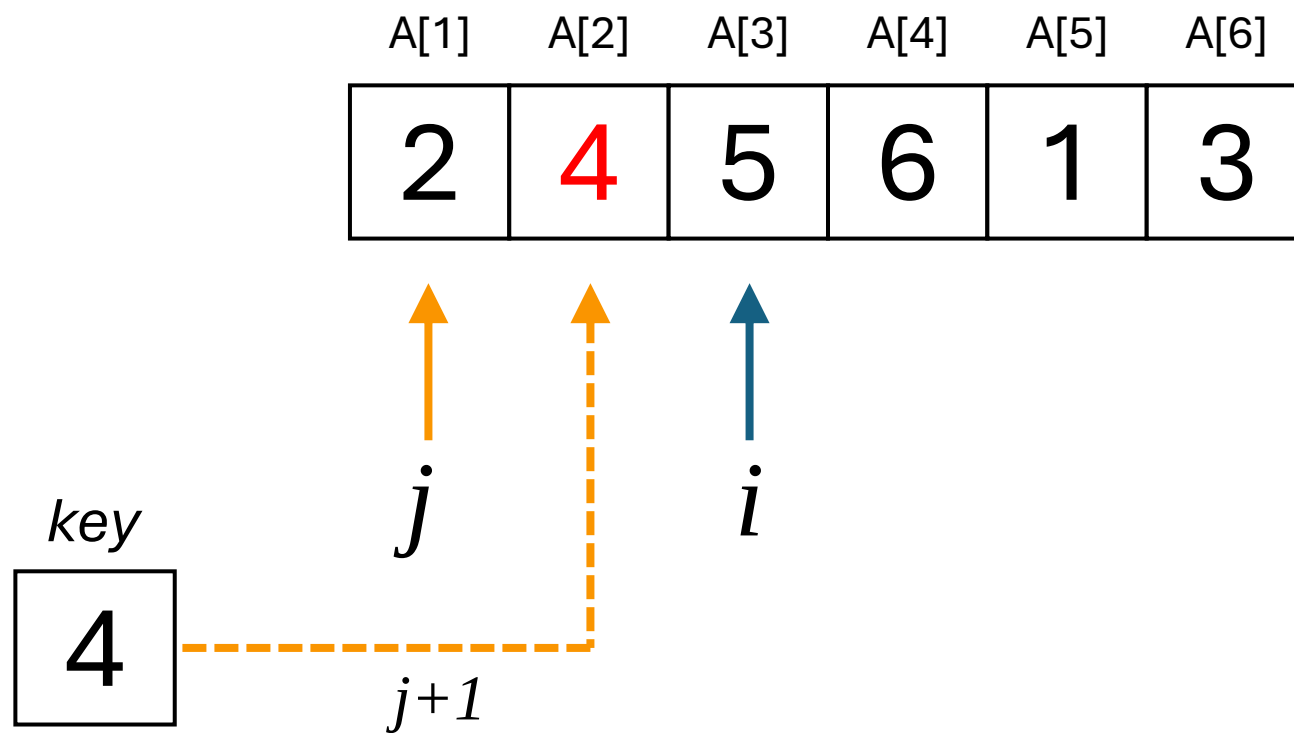
## STEP 6



## STEP 6

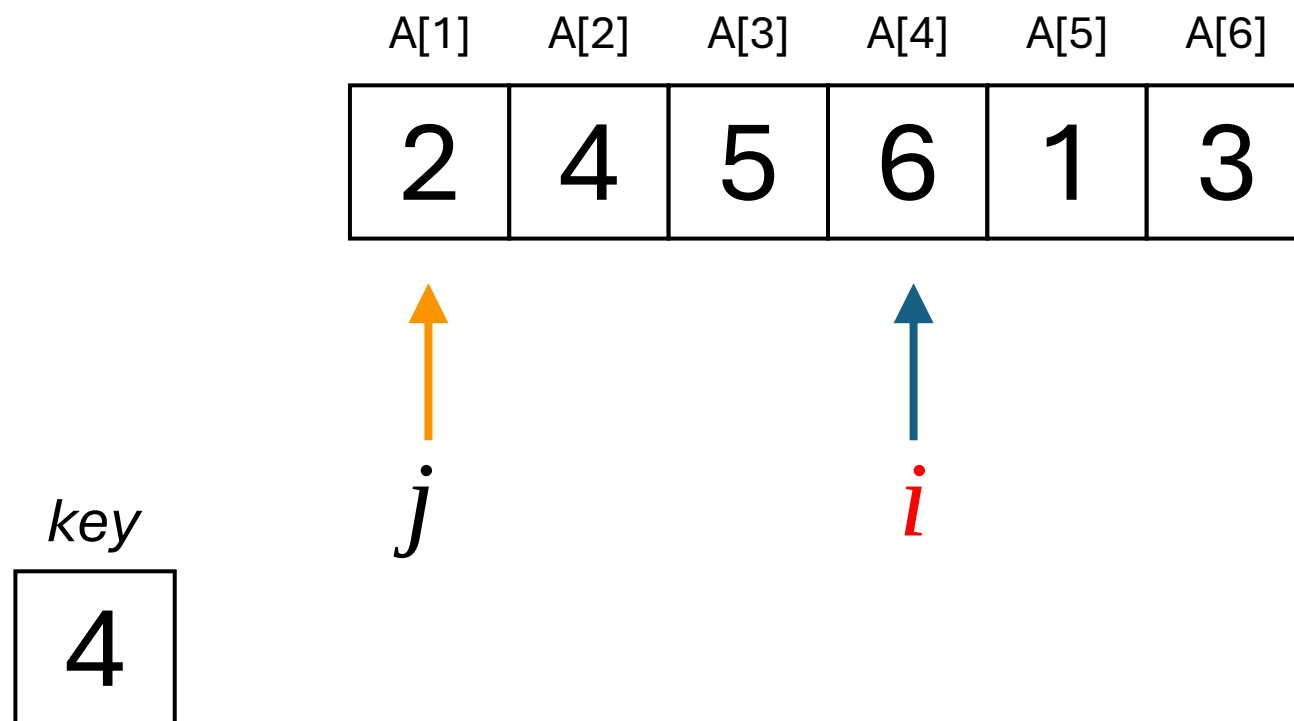


## STEP 7



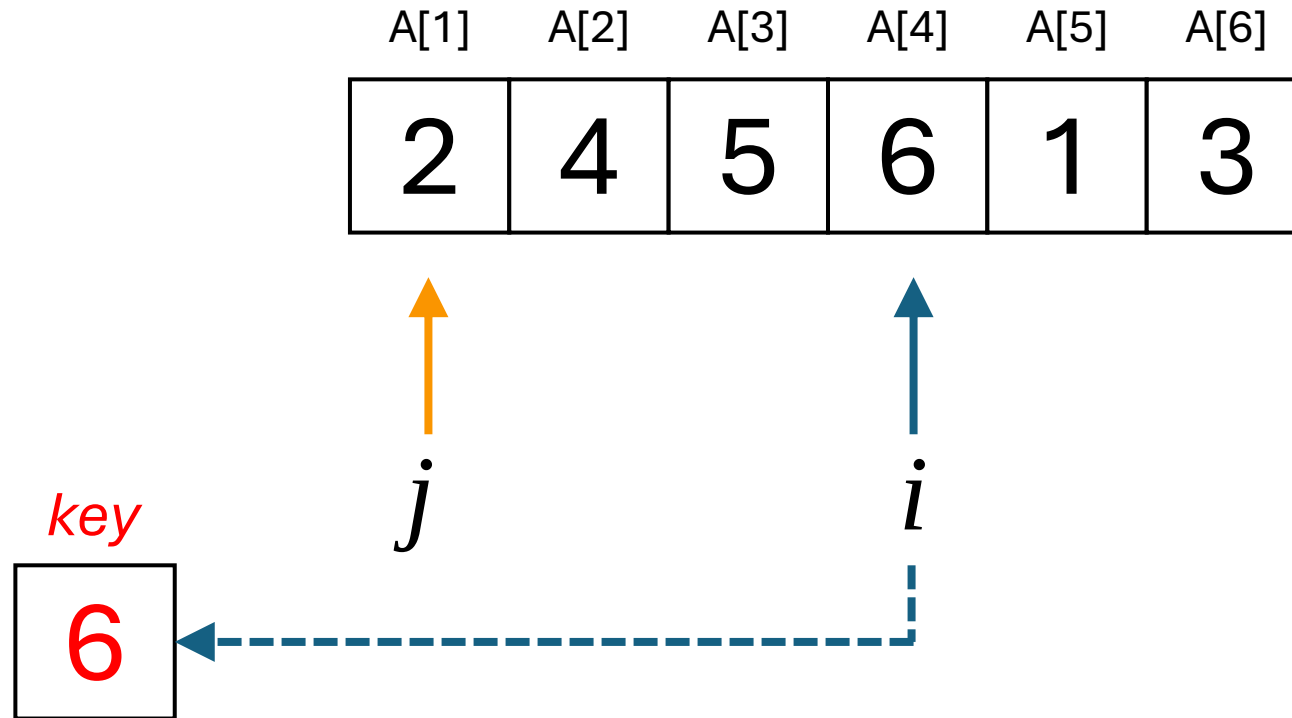
$$i = 3 \quad j = 1 \quad \text{key} = 4$$

# STEP 1



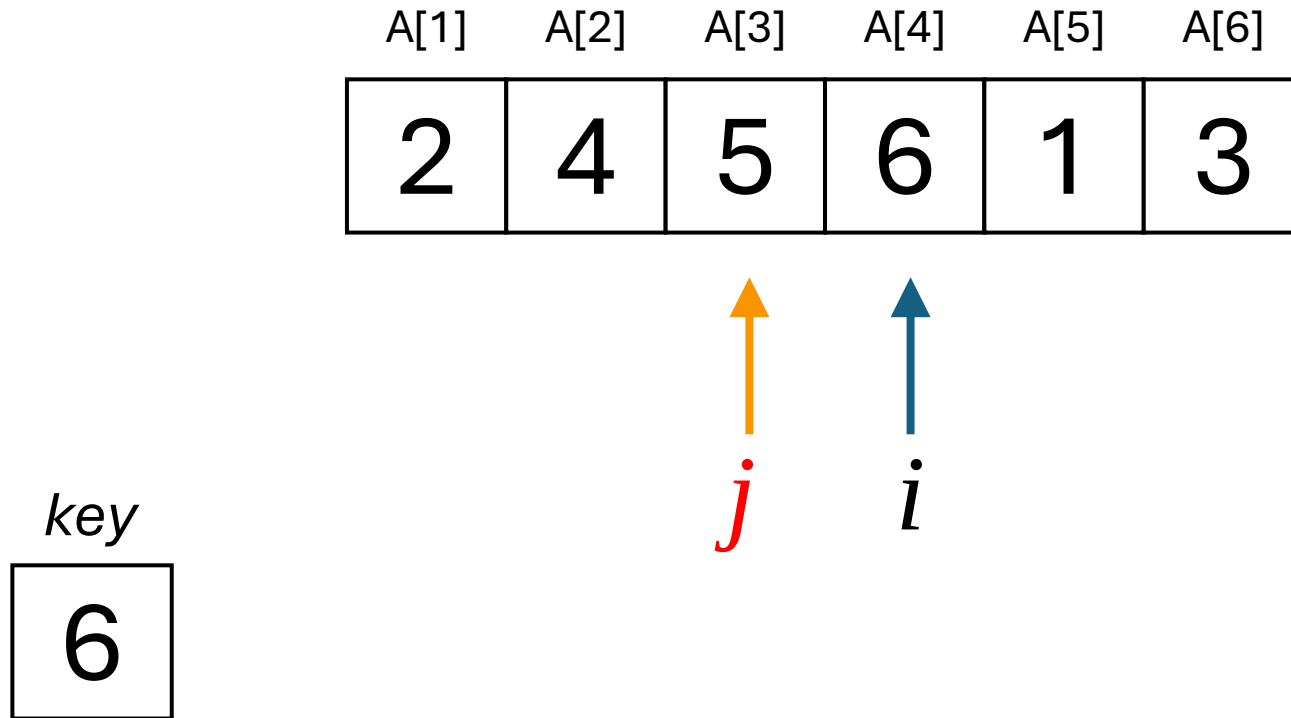
$$i = 4 \quad j = 1 \quad key = 2$$

## STEP 2



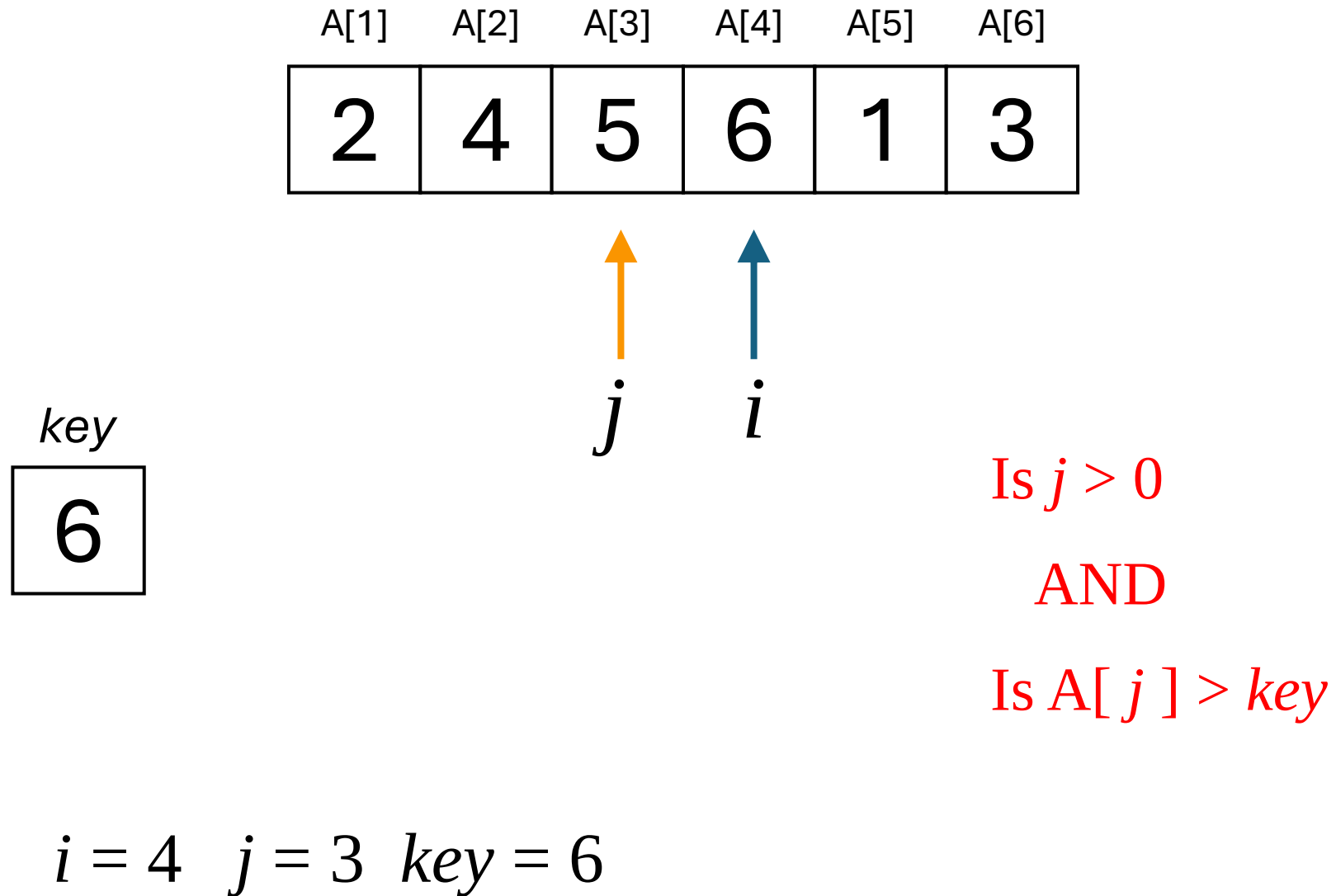
$$i = 4 \quad j = 1 \quad \text{key} = 6$$

## STEP 3

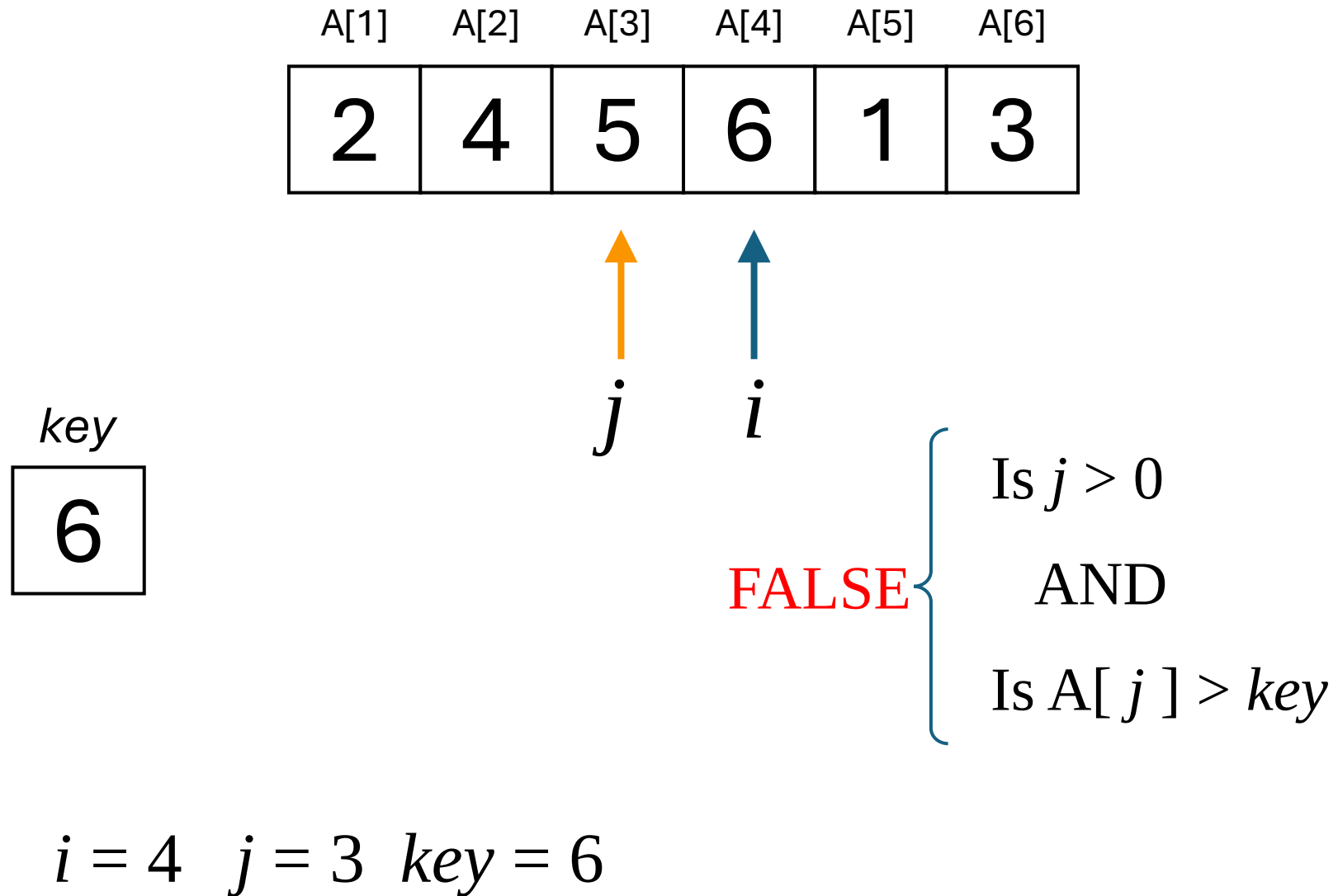


$$i = 4 \quad j = 3 \quad key = 6$$

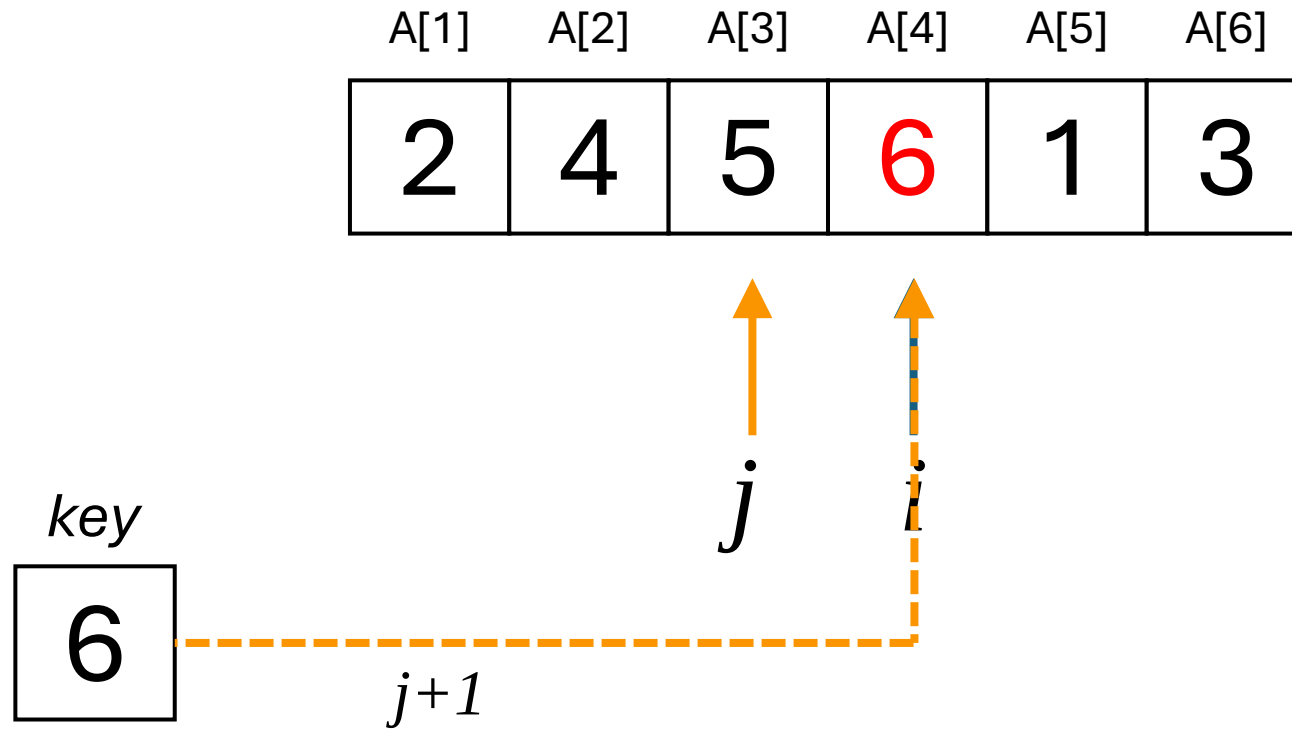
## STEP 4



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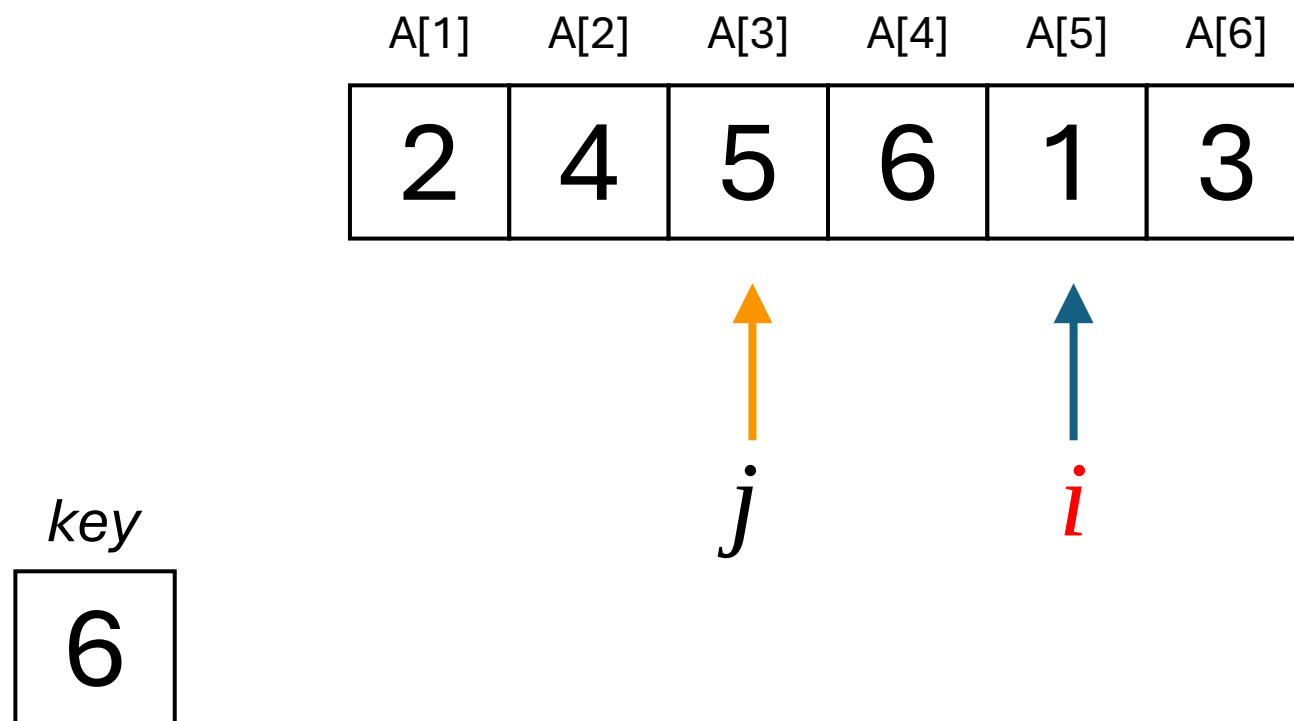


## STEP 7



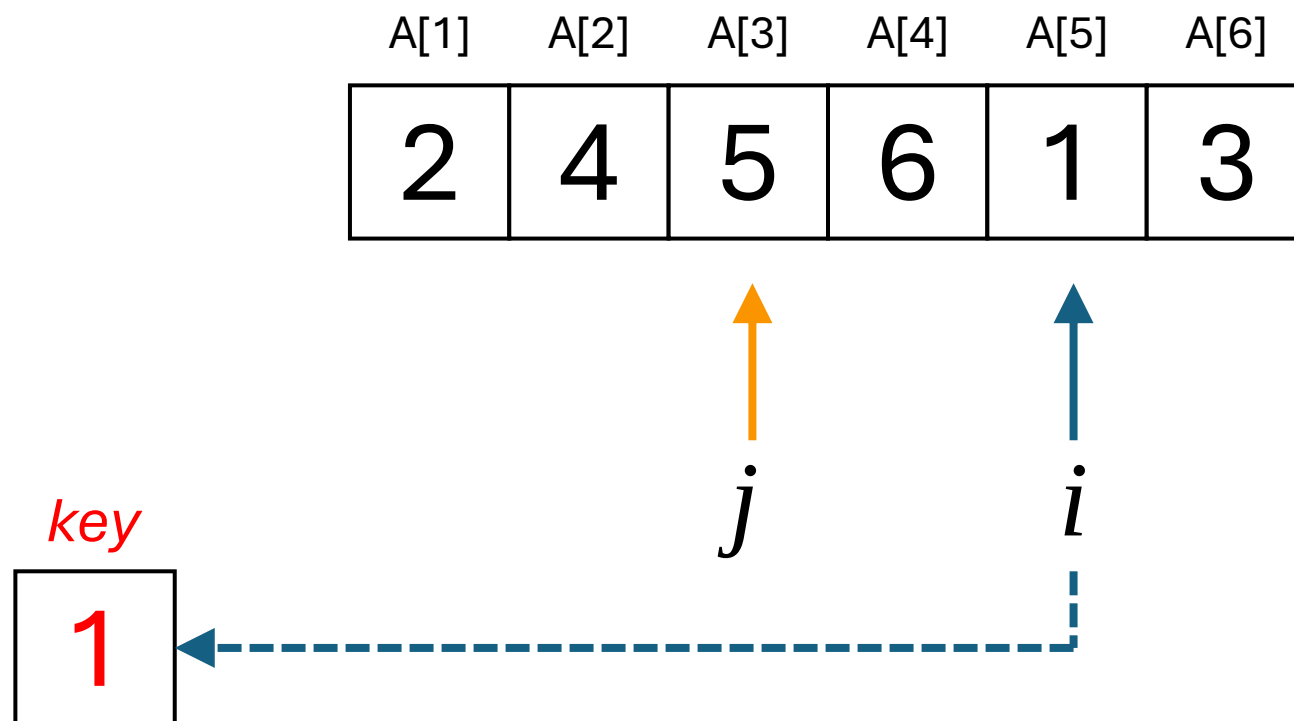
$$i = 4 \quad j = 3 \quad \text{key} = 6$$

# STEP 1



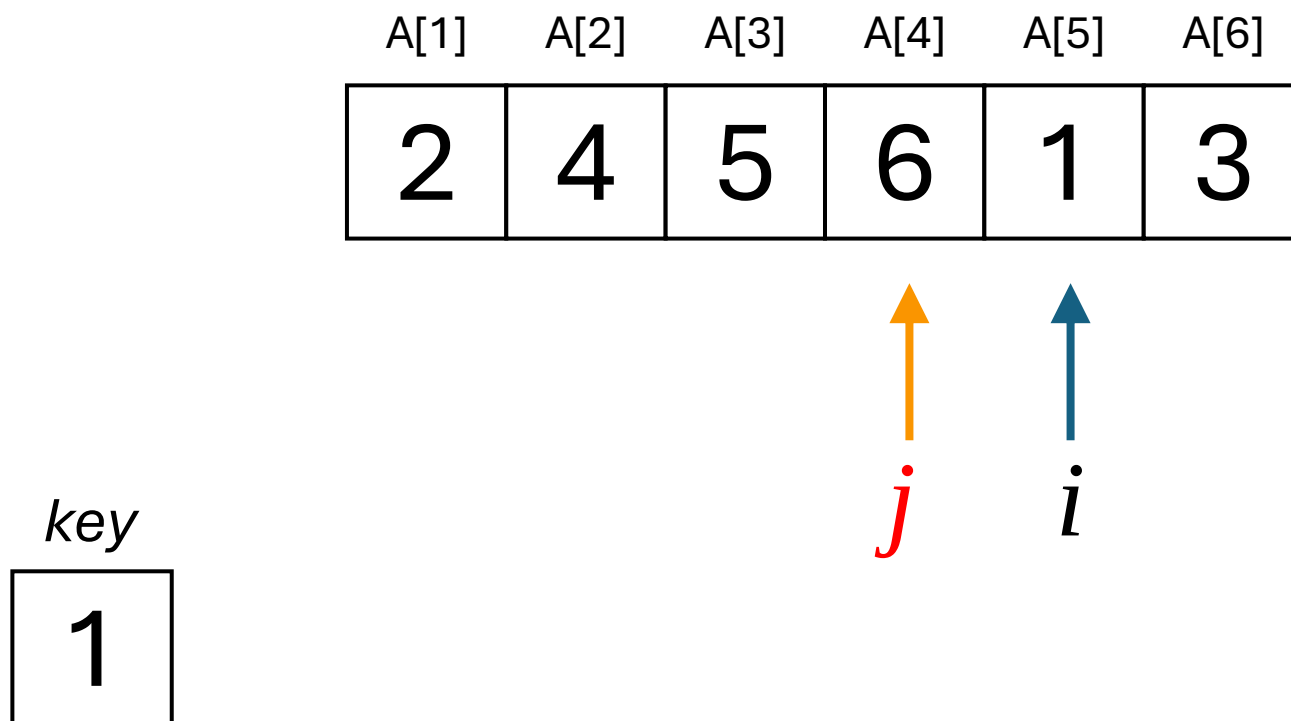
$$i = 5 \quad j = 3 \quad key = 6$$

## STEP 2



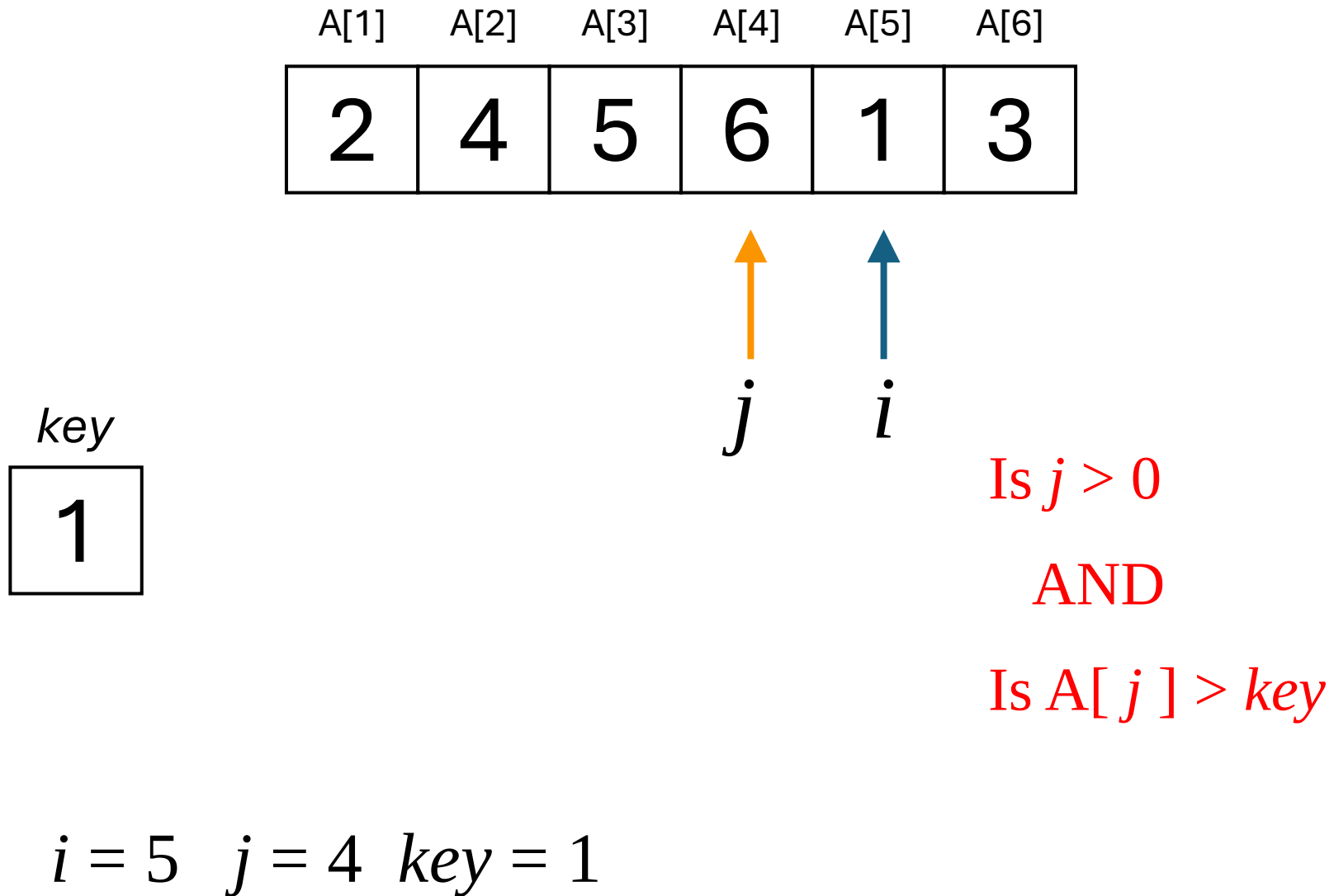
$$i = 5 \quad j = 3 \quad \text{key} = 1$$

## STEP 3

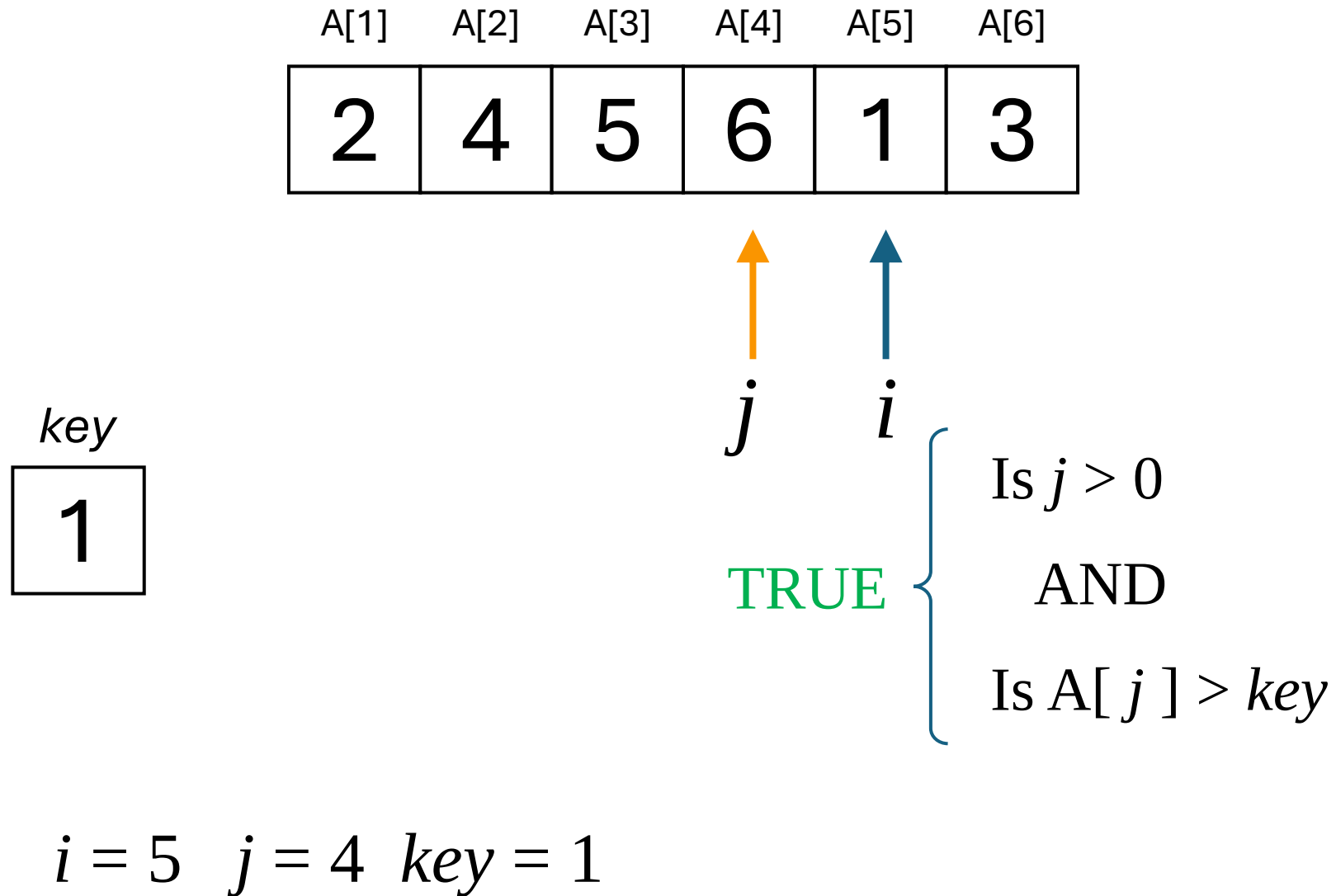


$$i = 5 \quad j = 4 \quad key = 1$$

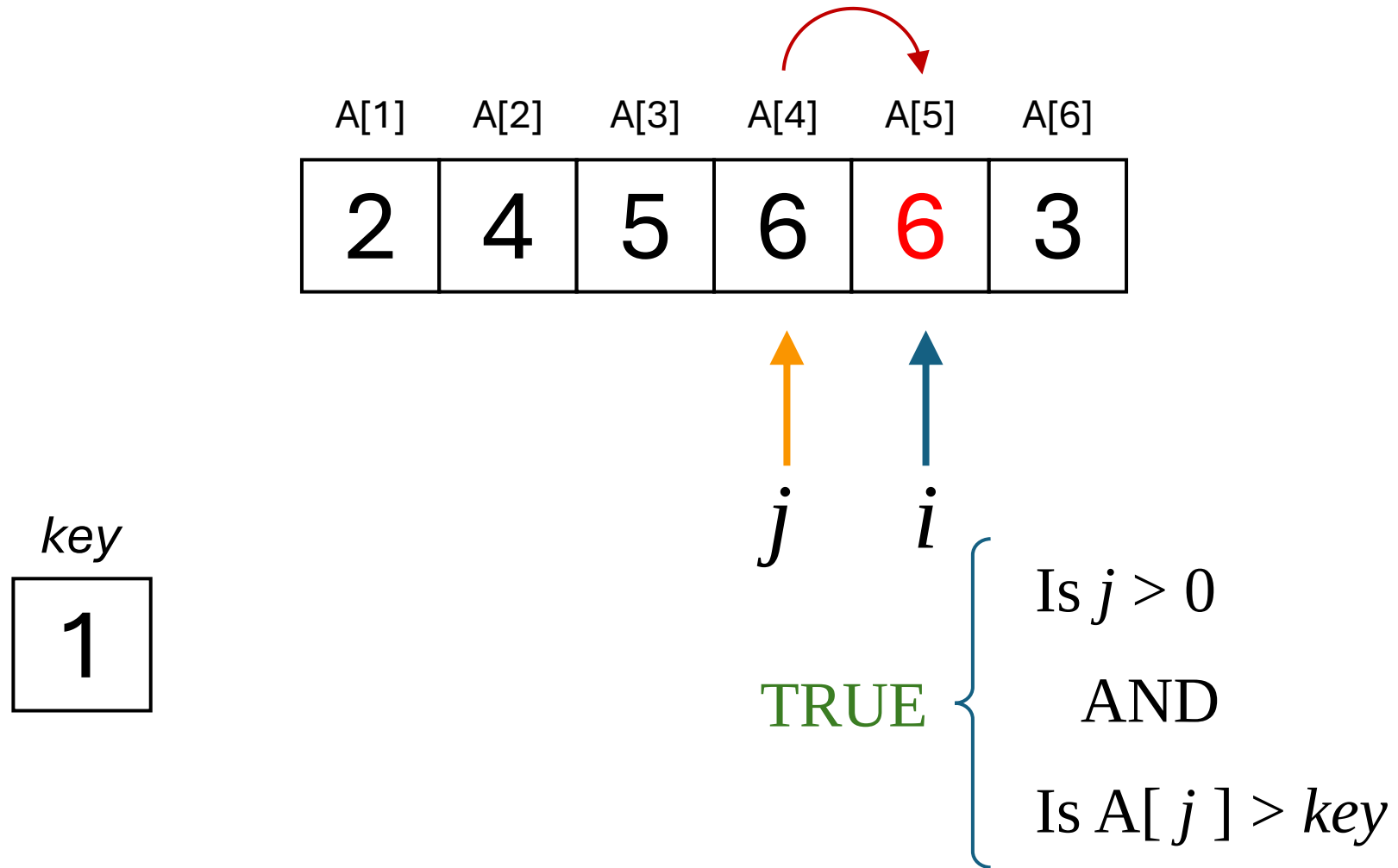
## STEP 4



## STEP 4

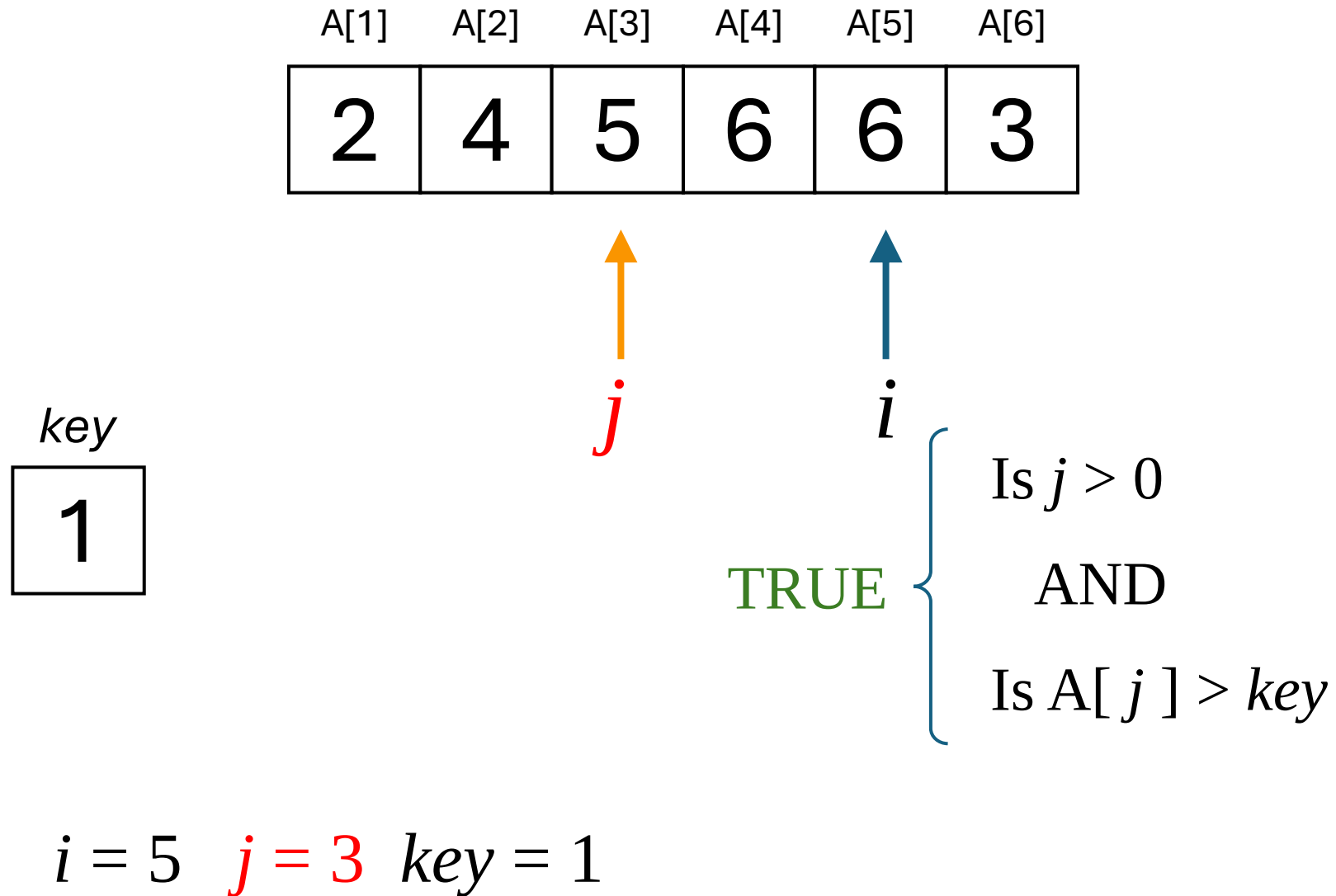


## STEP 5

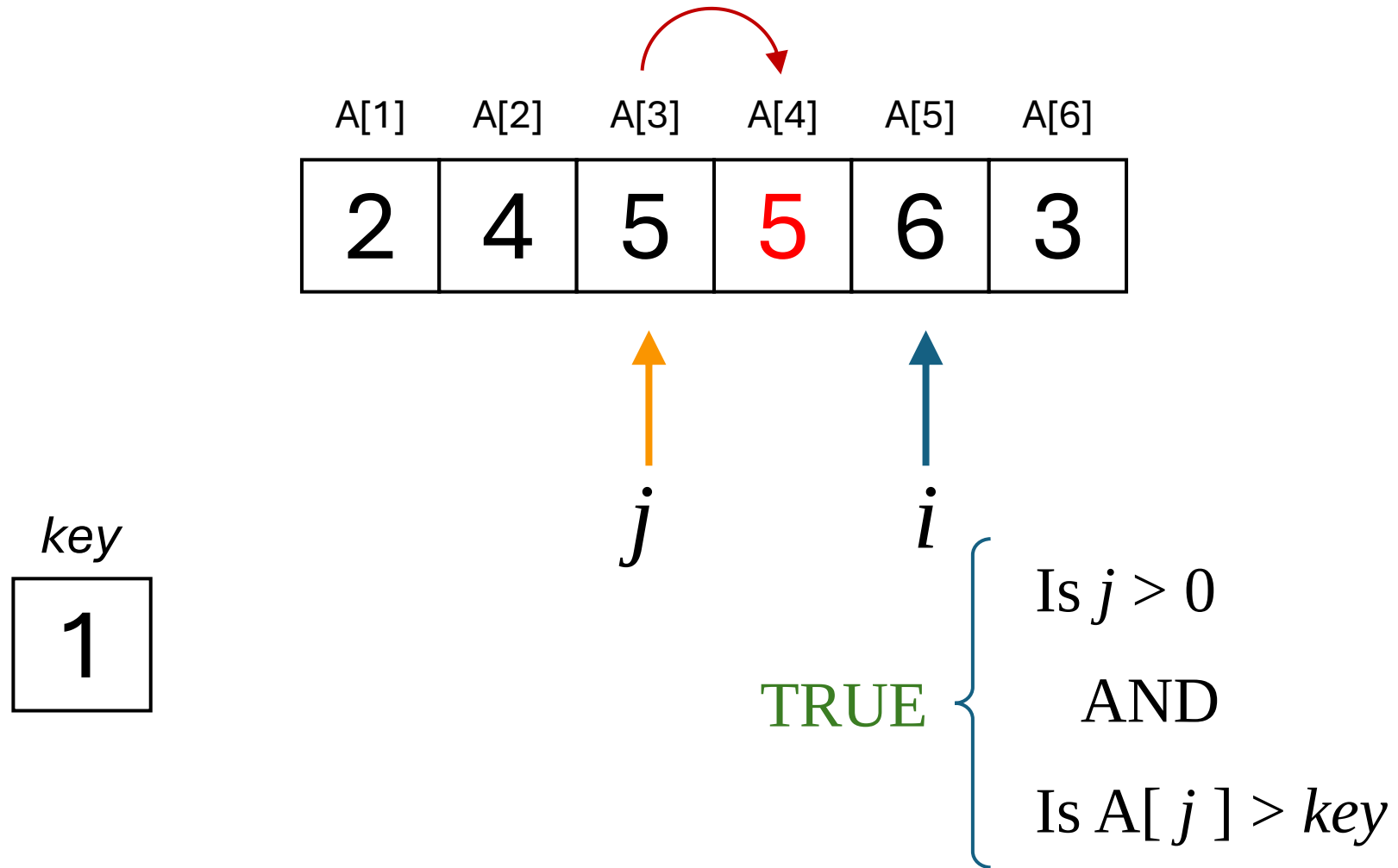


$$i = 5 \quad j = 4 \quad key = 1$$

## STEP 6

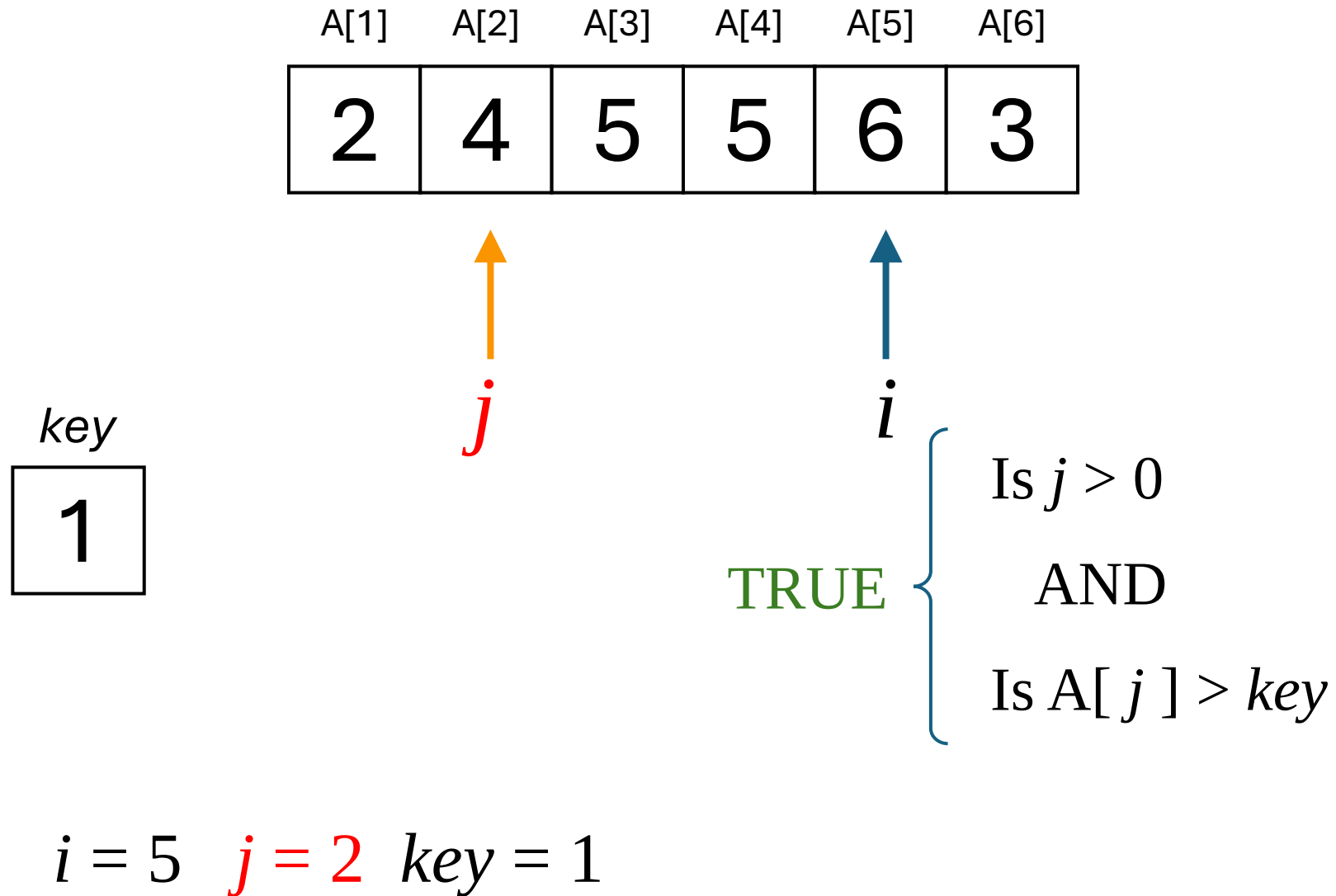


## STEP 5

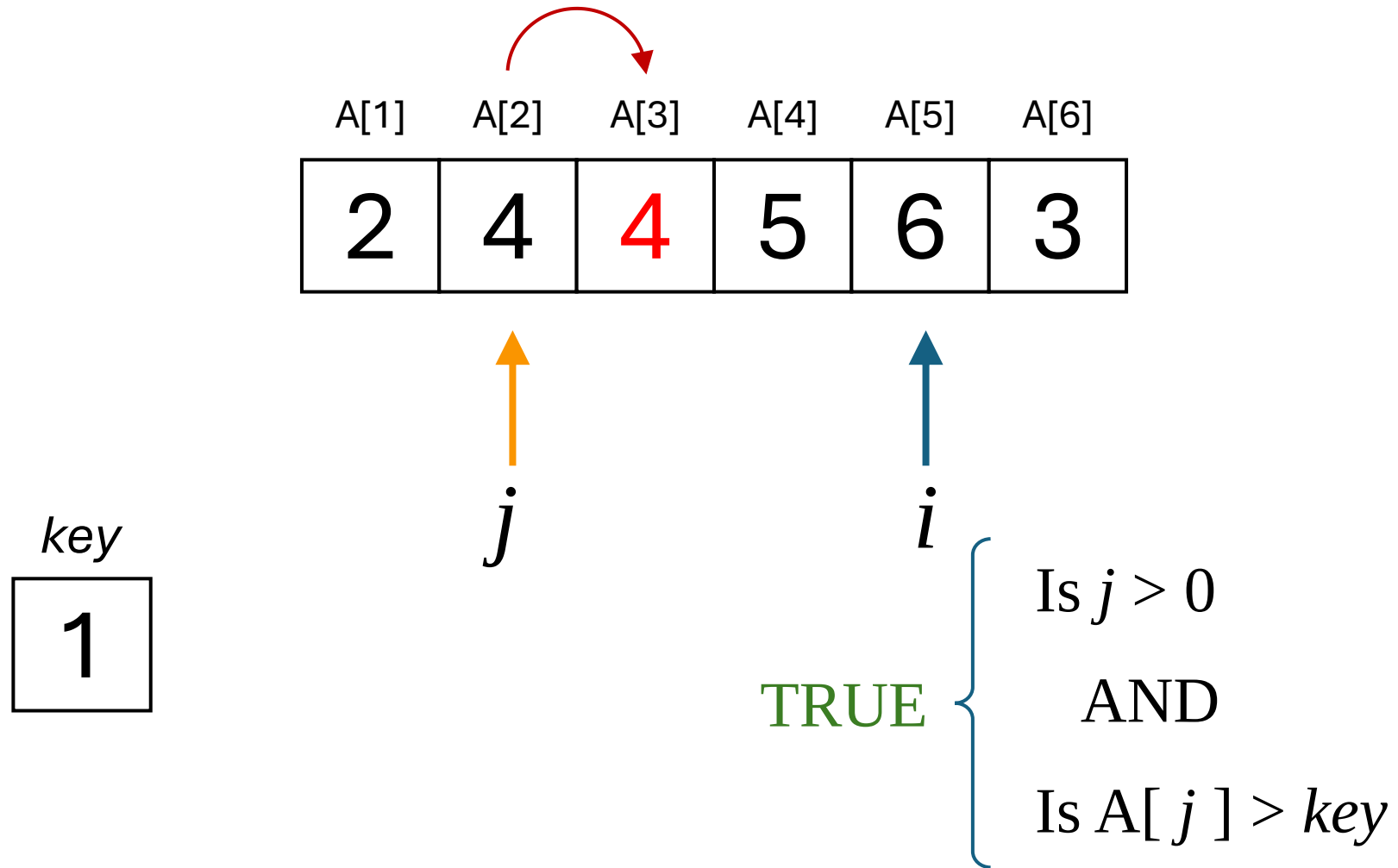


$$i = 5 \quad j = 3 \quad key = 1$$

## STEP 6

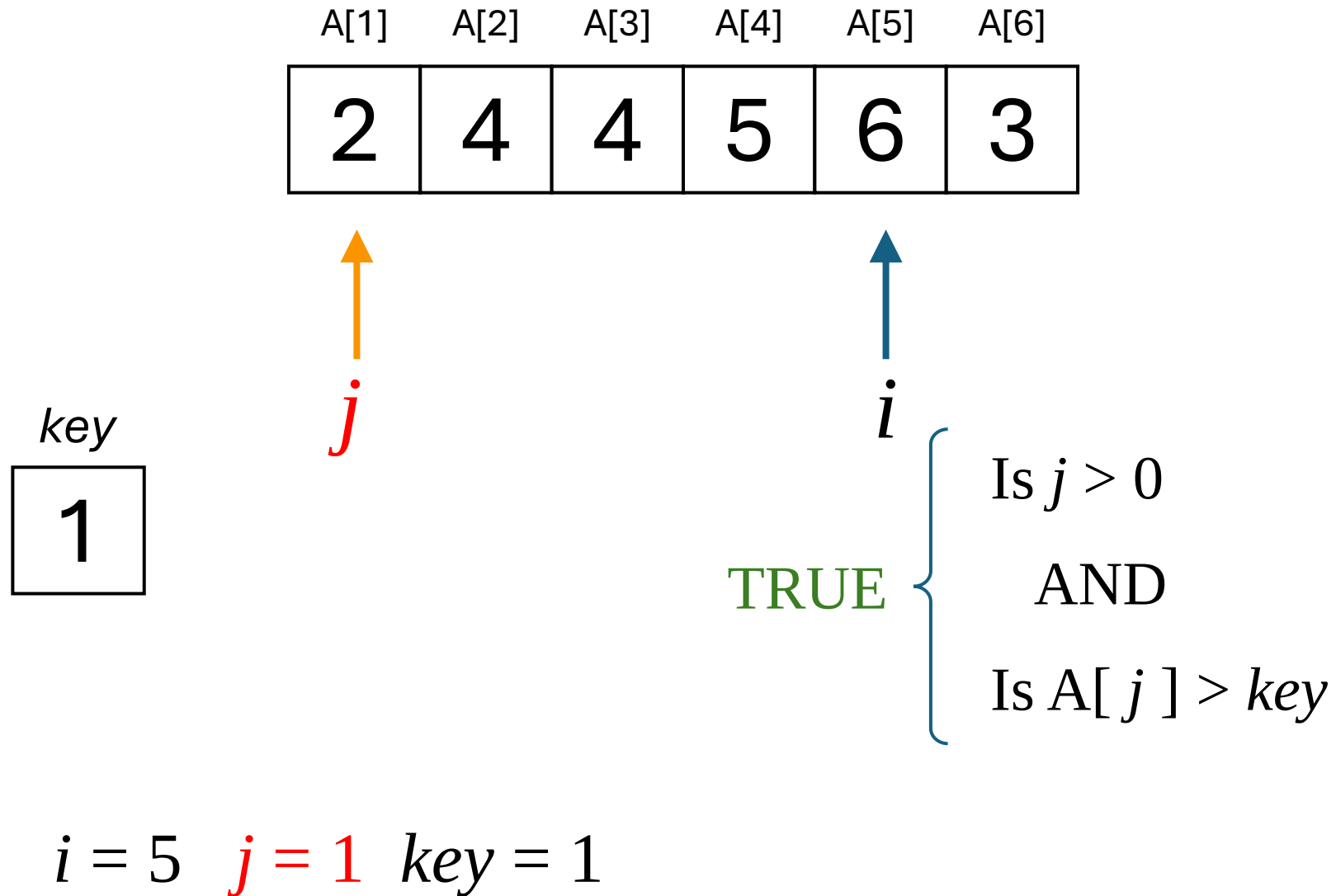


## STEP 5

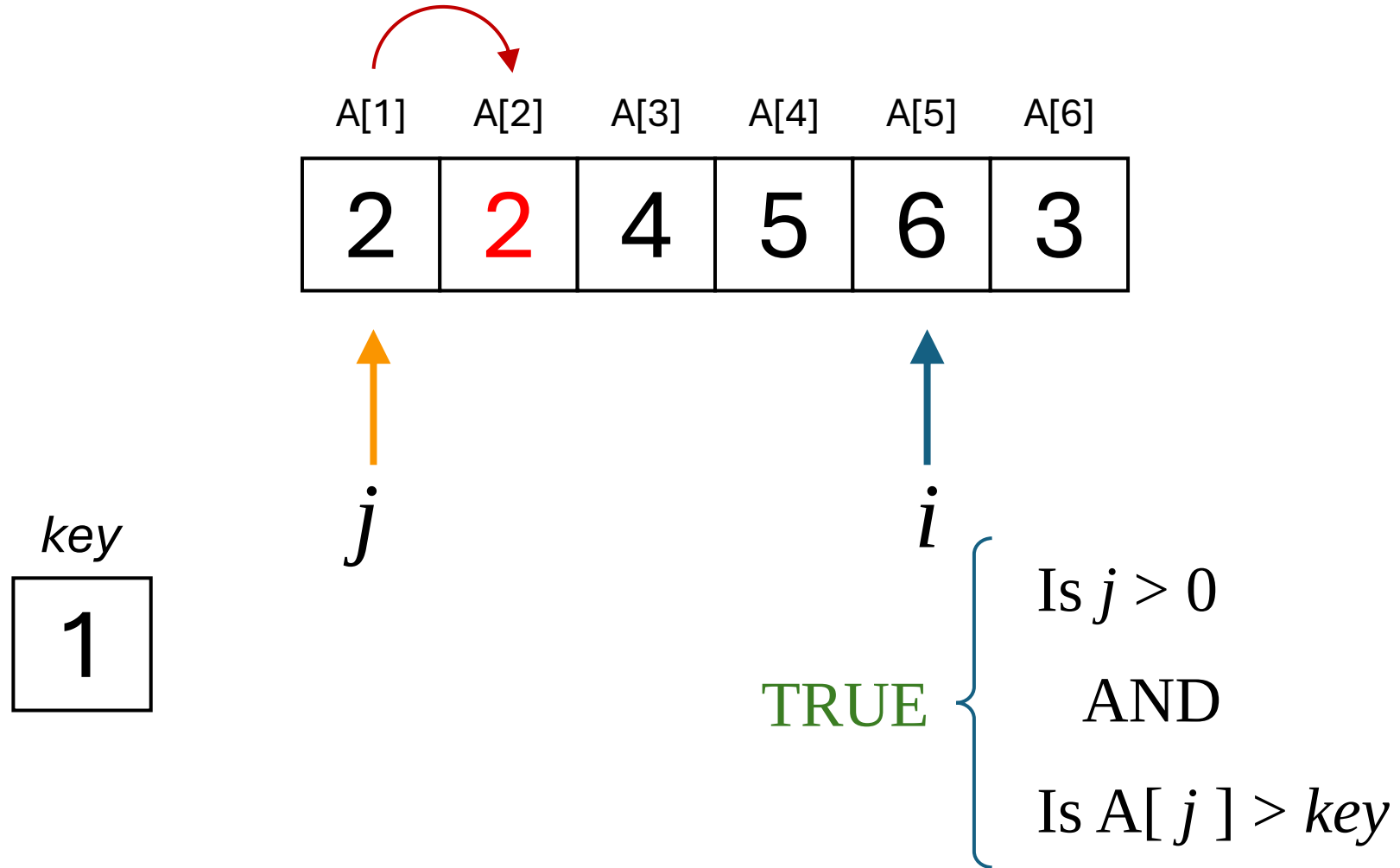


$$i = 5 \quad j = 2 \quad key = 1$$

## STEP 6

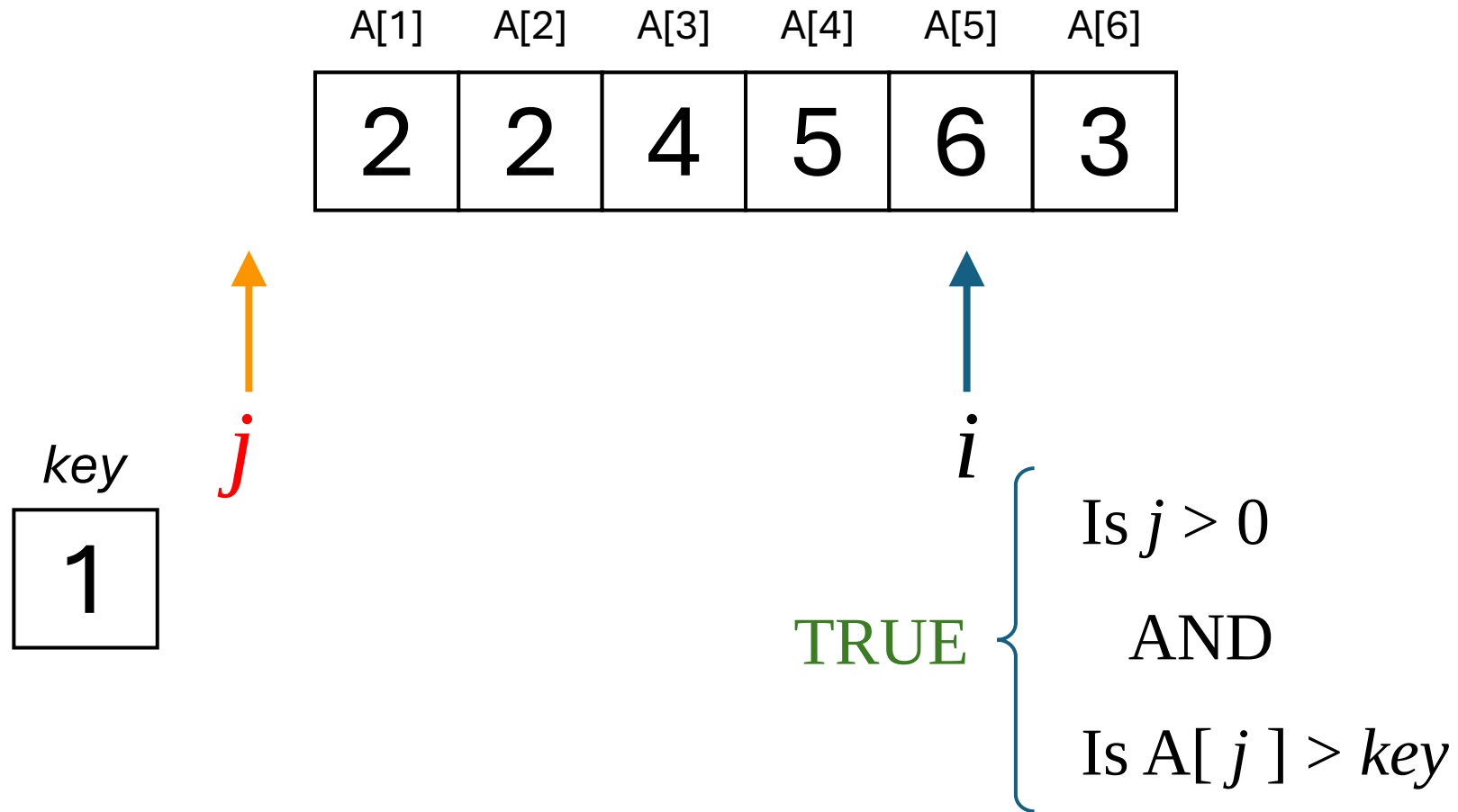


## STEP 5



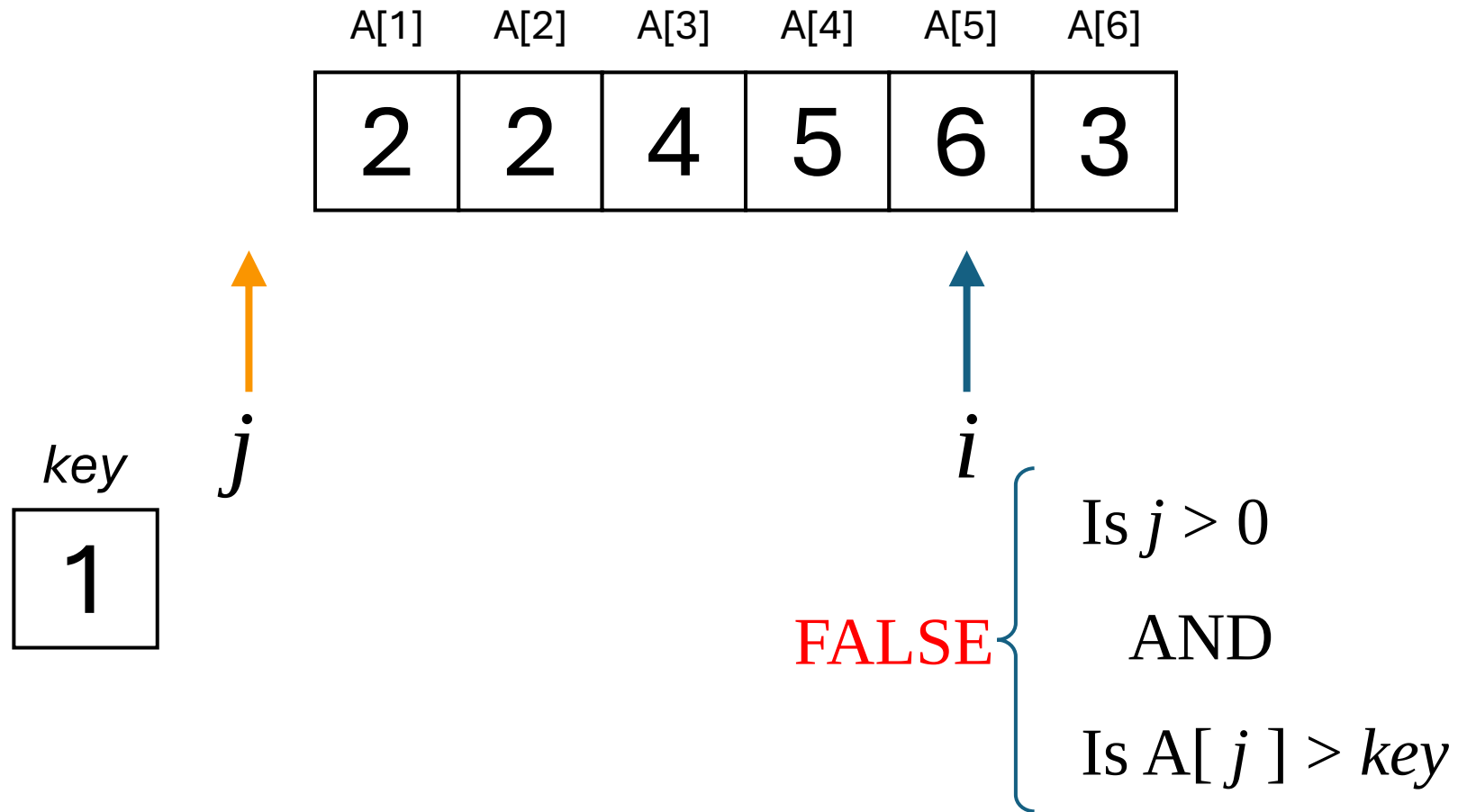
$$i = 5 \quad j = 1 \quad key = 1$$

## STEP 6



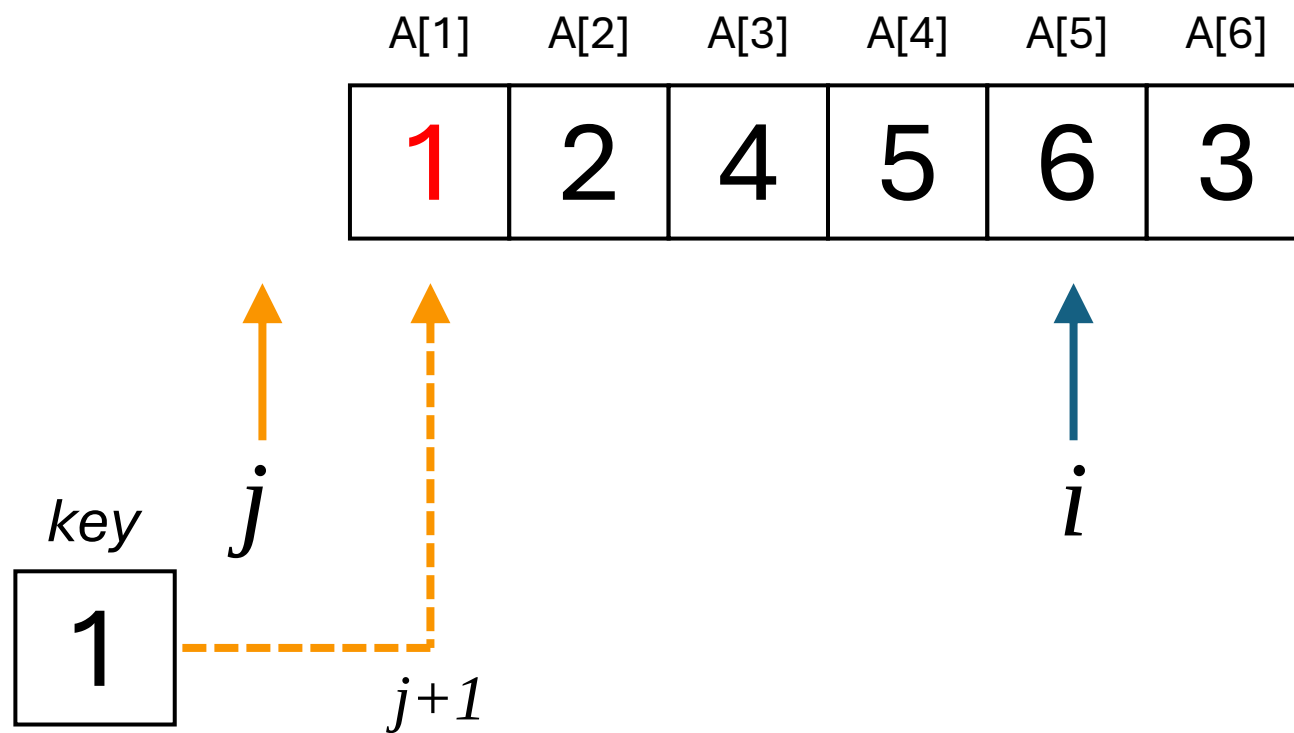
$$i = 5 \quad j = 0 \quad key = 1$$

## STEP 6



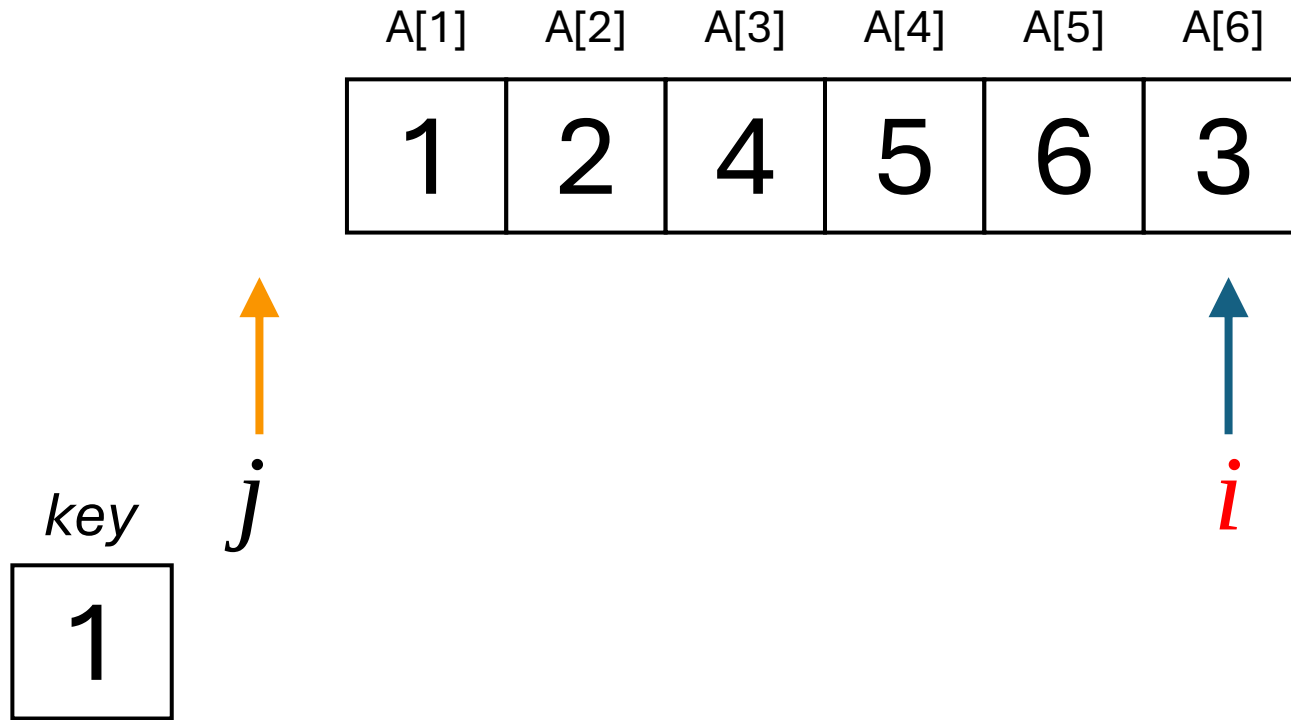
$$i = 5 \quad j = 0 \quad key = 1$$

## STEP 7



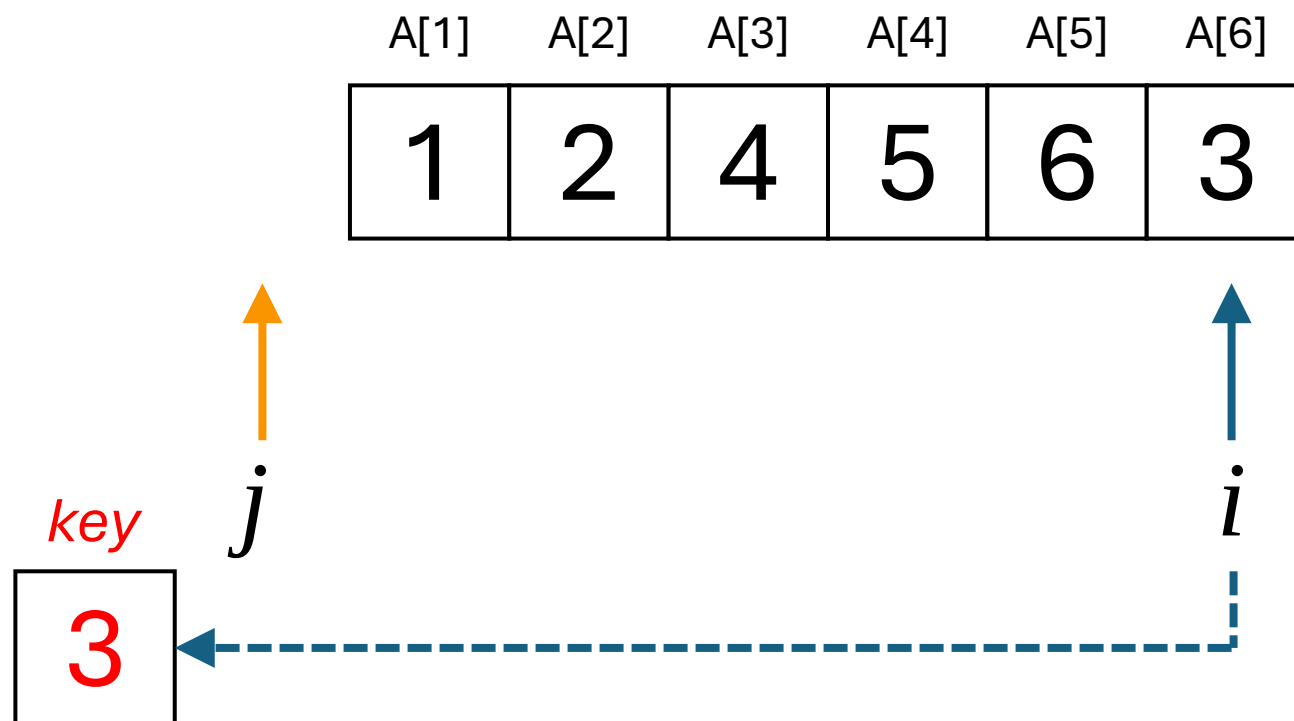
$$i = 5 \quad j = 0 \quad key = 1$$

## STEP 1



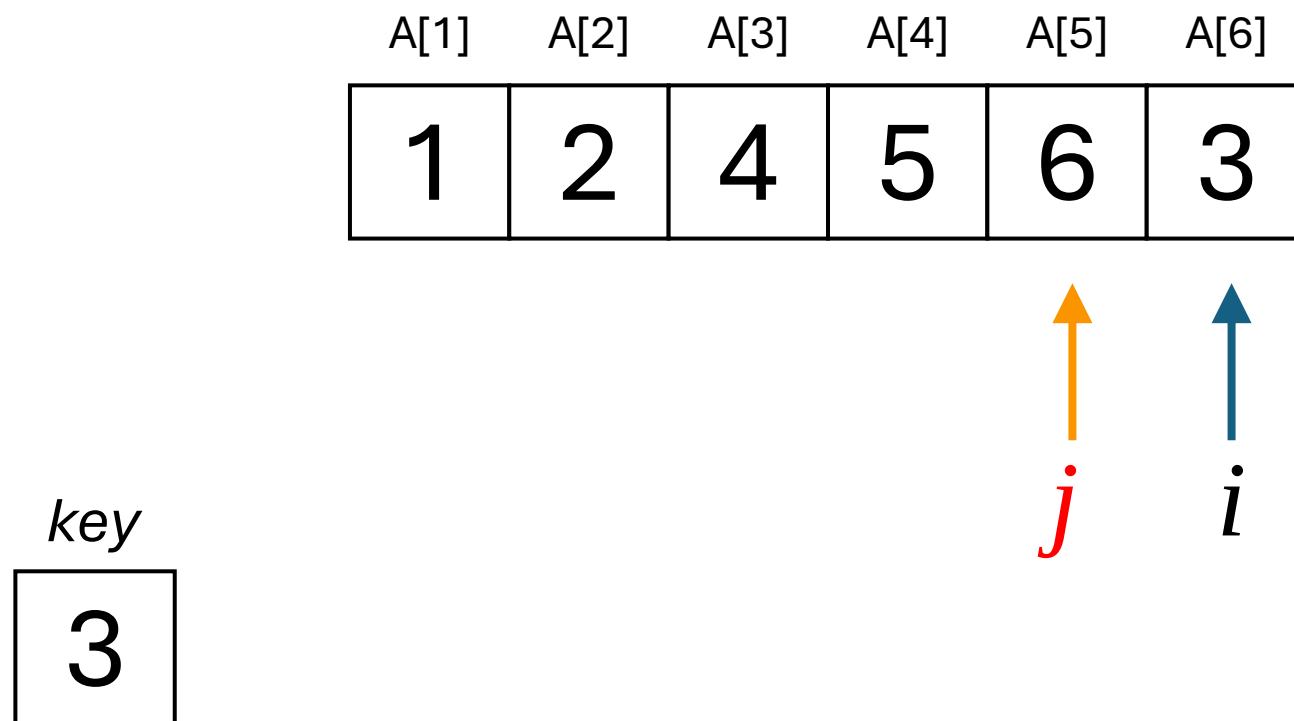
$$i = 6 \quad j = 0 \quad key = 1$$

## STEP 2



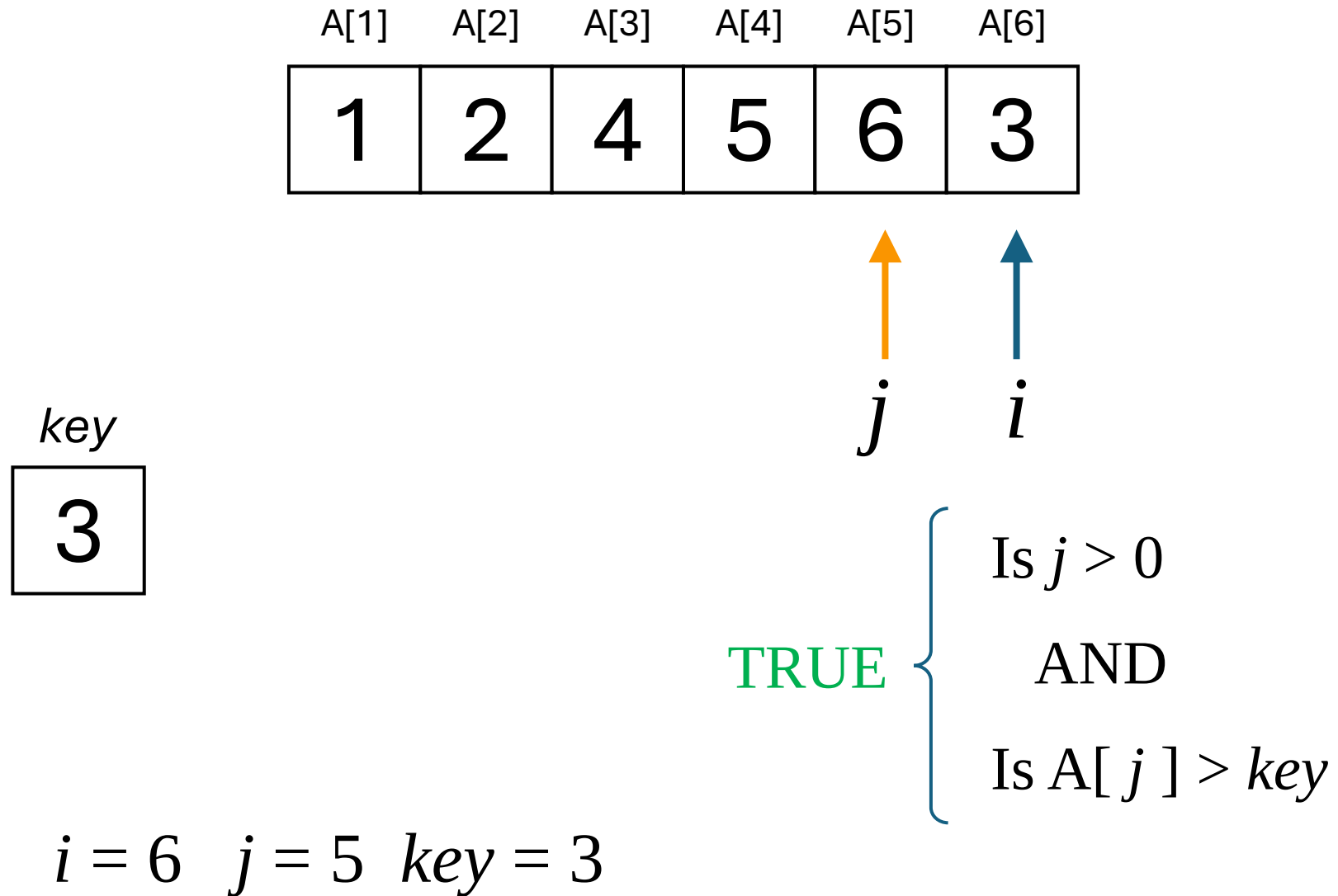
$$i = 6 \quad j = 0 \quad \text{key} = 3$$

## STEP 3

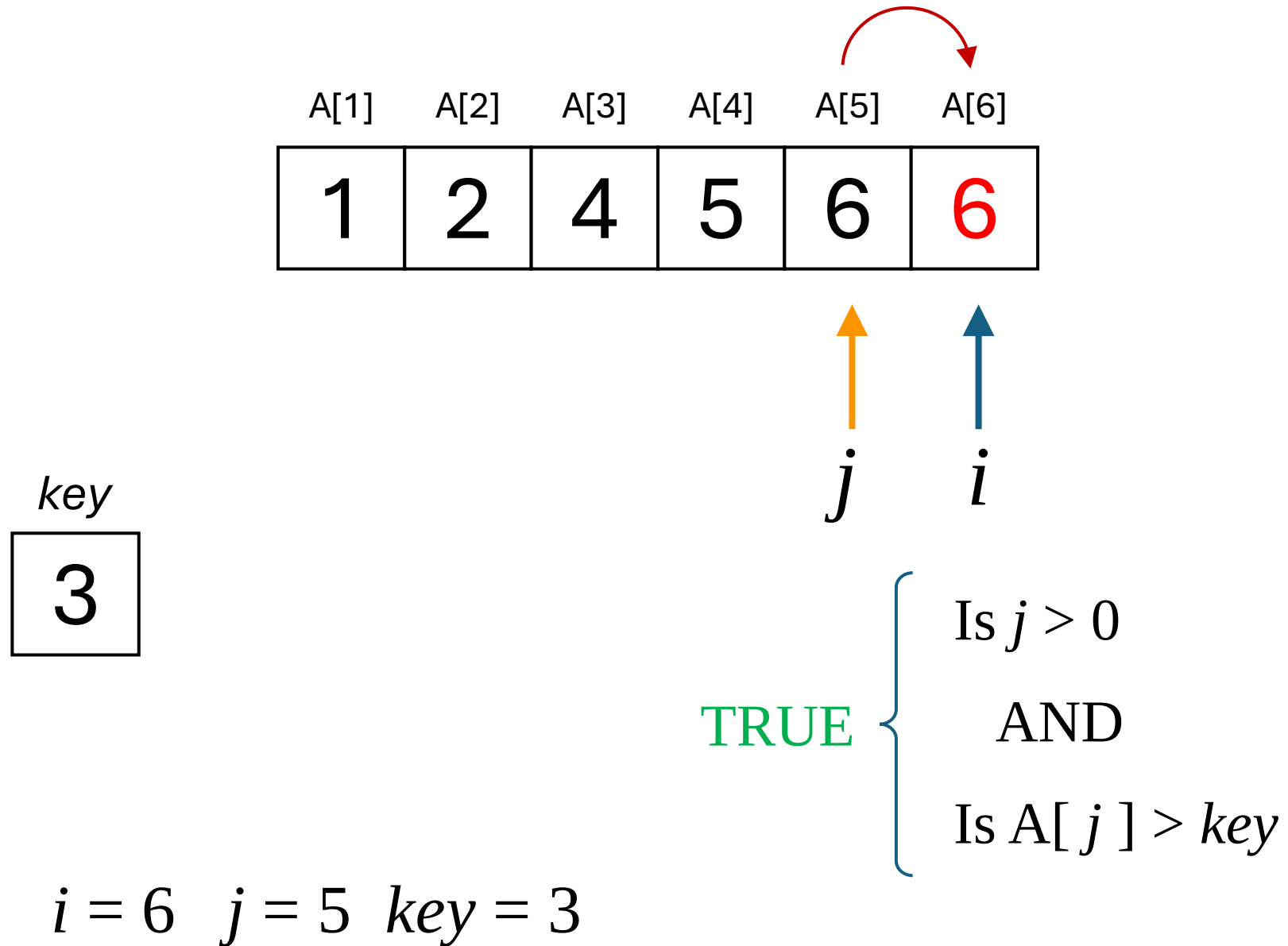


$$i = 6 \quad j = 5 \quad key = 3$$

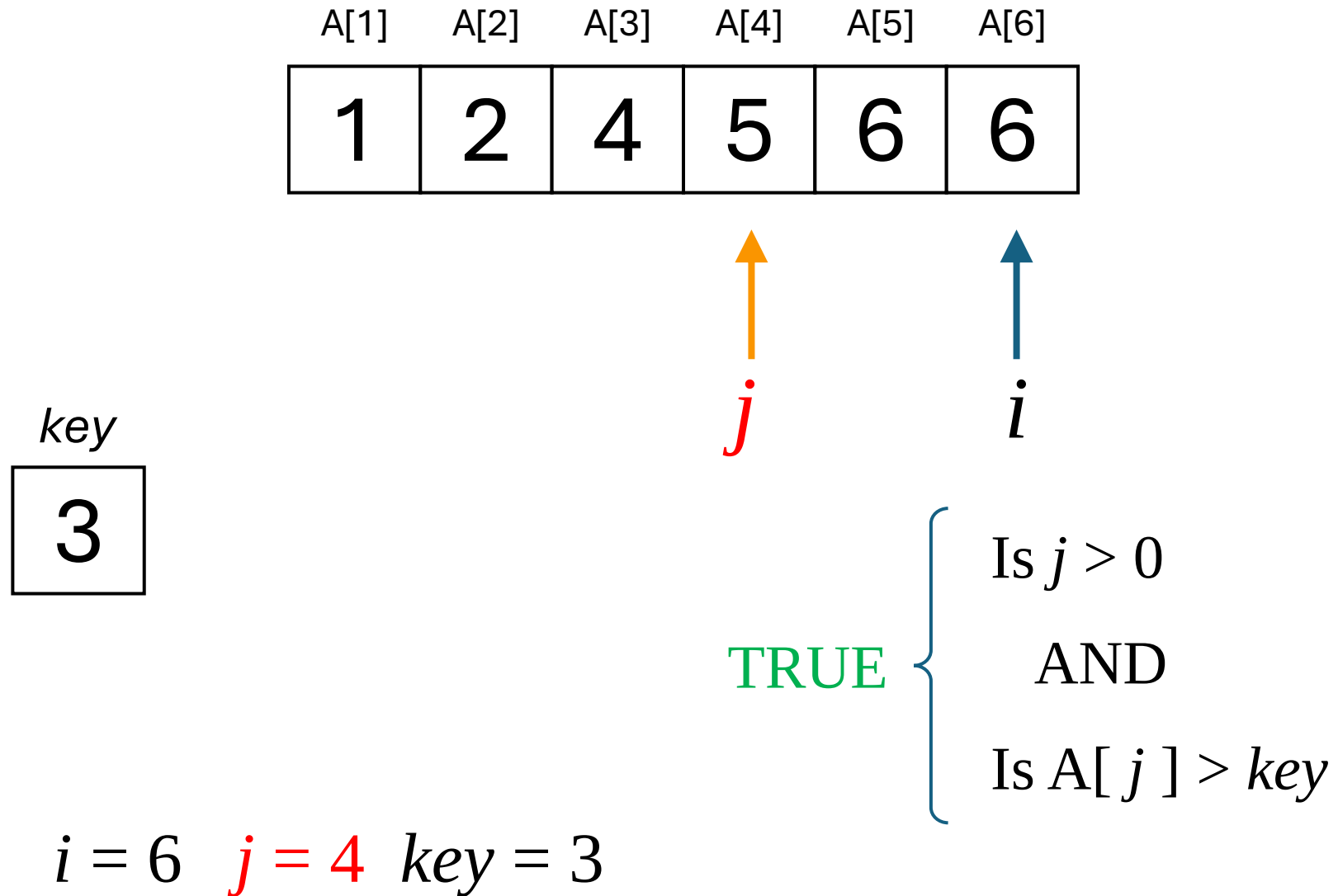
## STEP 4



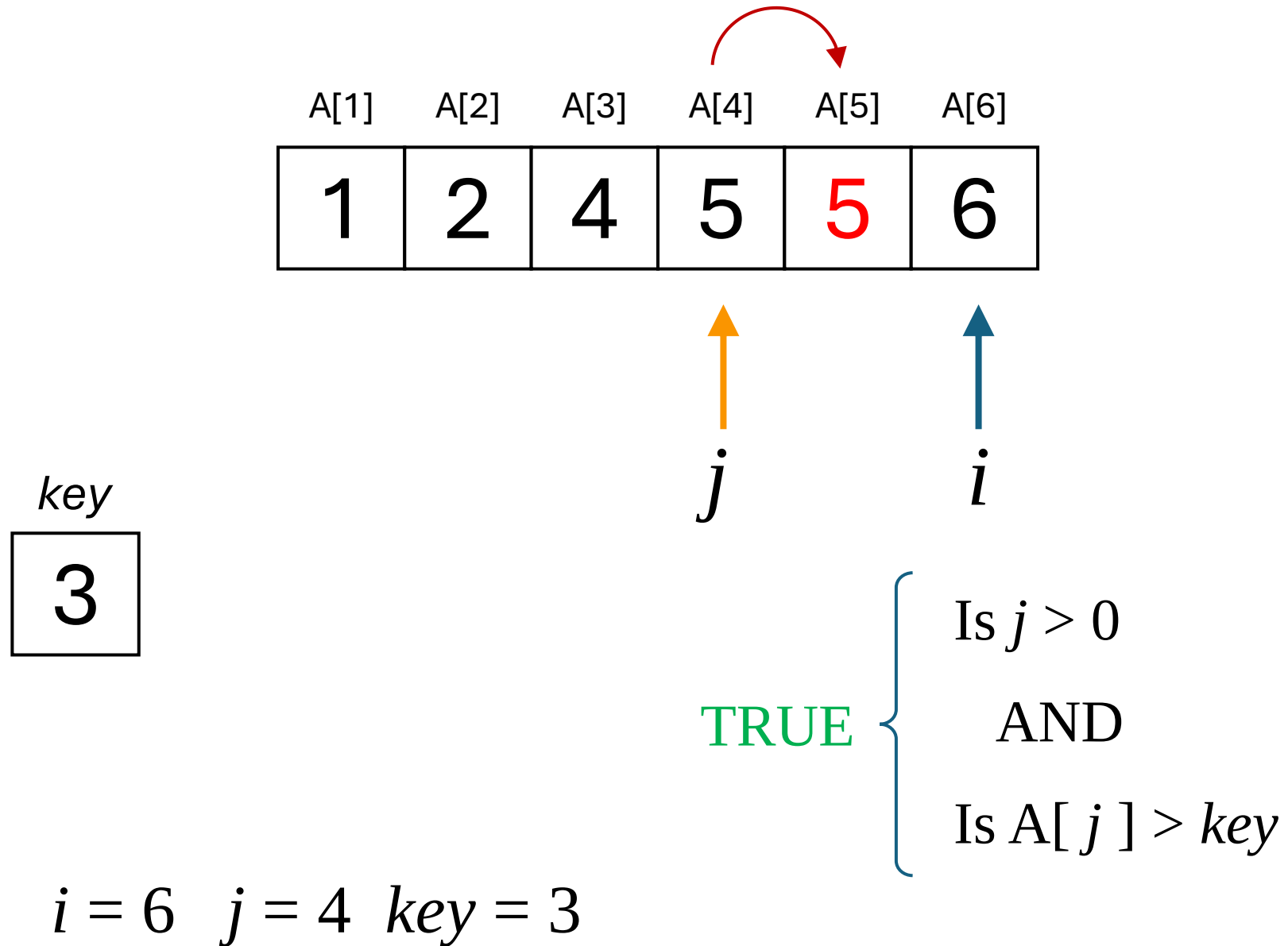
## STEP 5



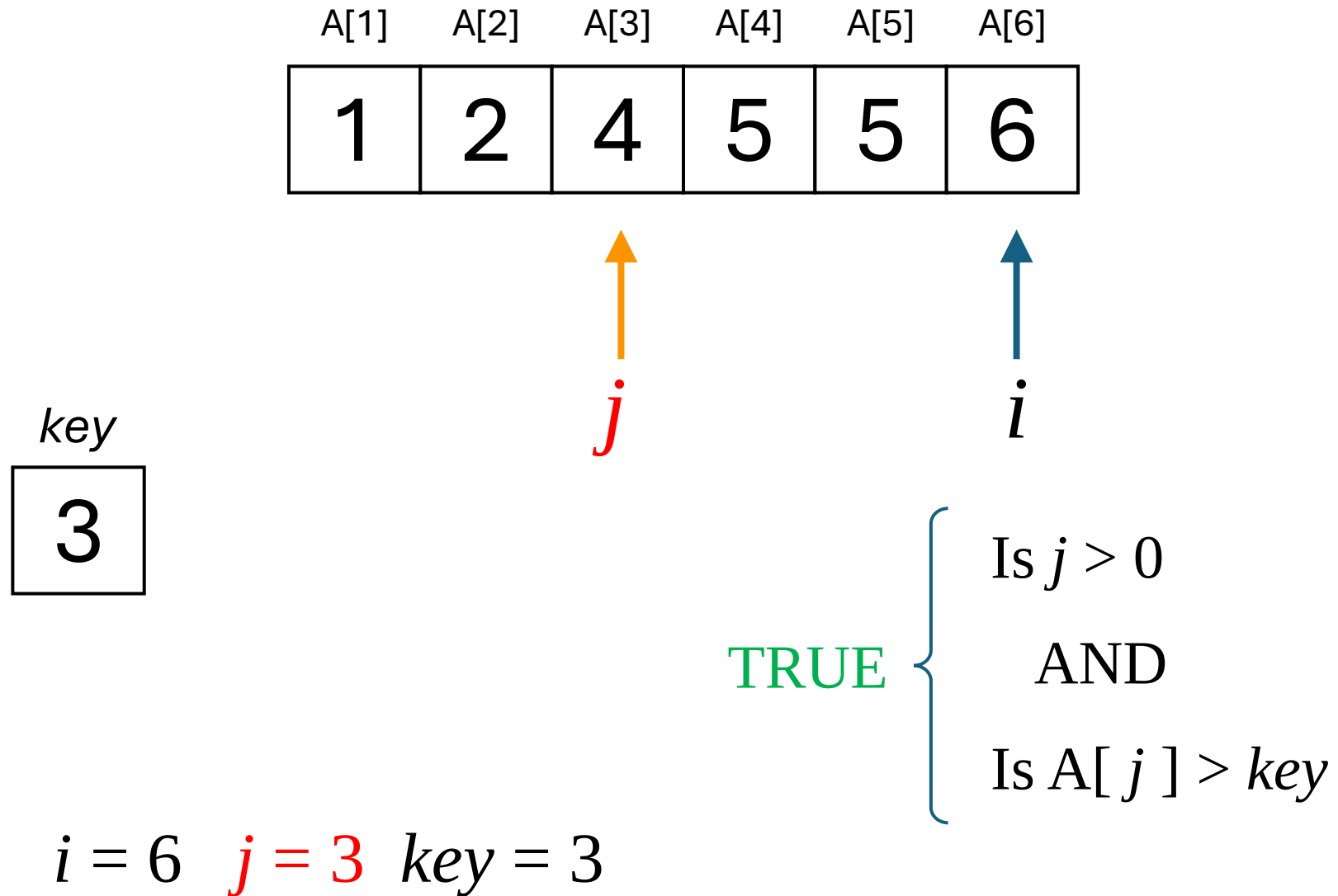
## STEP 6



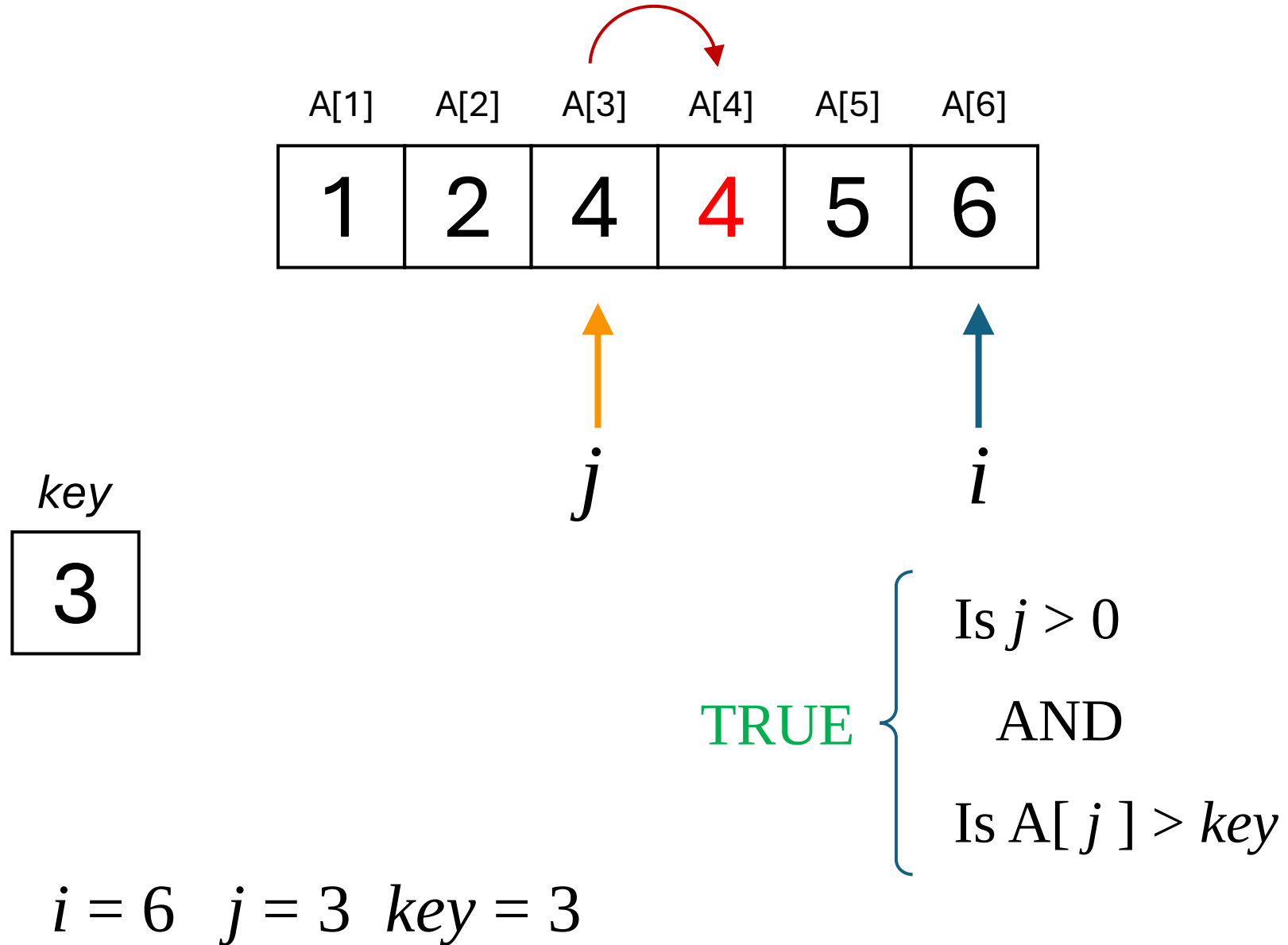
## STEP 5



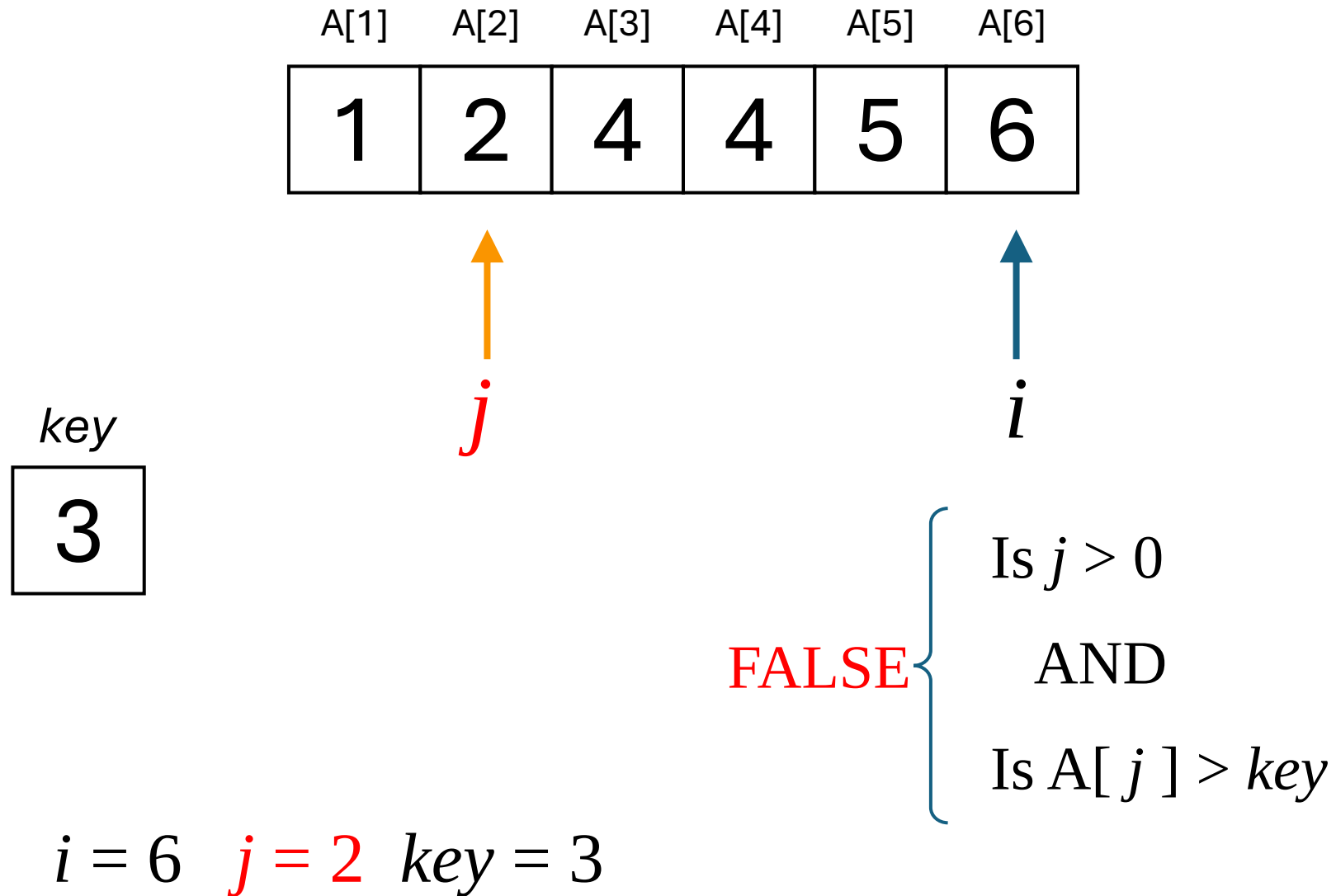
## STEP 6



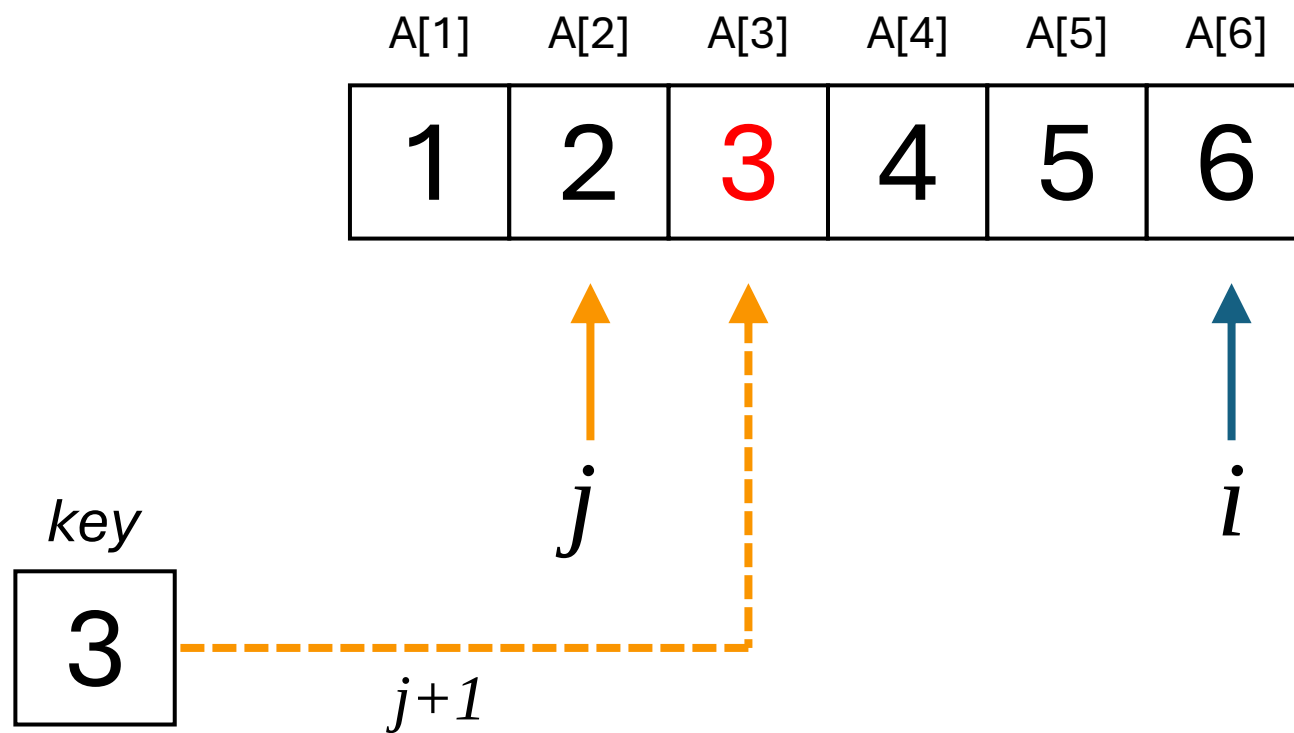
## STEP 5



## 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    |