key

$5, \overleftarrow{2}, 4, 6, 1, 3$

$\overleftarrow{2}, 5, 4, 6, 1, 3$

$2, 5, \overleftarrow{4}, 6, 1, 3$

$2, \overleftarrow{4}, 5, 6, 1, 3$

$2, 4, 5, \overleftarrow{6}, 1, 3$

$2, 4, 5, 6, \overleftarrow{1}, 3$

$2, 4, 5, \overleftarrow{1}, 6, 3$

$2, 4, \overleftarrow{1}, 5, 6, 3$

$2, \overleftarrow{1}, 4, 5, 6, 3$

$\overleftarrow{1}, 2, 4, 5, 6, 3$

$1, 2, 4, 5, 6, \overleftarrow{3}$

$1, 2, 4, 5, \overleftarrow{3}, 6$

$1, 2, 4, \overleftarrow{3}, 5, 6$

$1, 2, \overleftarrow{3}, 4, 5, 6$

In the key outside of array.

How to calculate running time?

- Each “line” of pseudocode requires a constant time. (In **RAM** model)

```
for j ← 2 to length[A]
  do begin
    key ← A[j];
      i ← j − 1;
    while i > 0 and A[i] > key
      do begin
        A[i + 1] ← A[i];
        i ← i − 1;
      end-while;
      A[i + 1] ← key;
  end-for.
```

This loop runs n-1 times and each time runs at most 4+3(j-1) lines.

This loop runs at most j-1 times and each time runs at most 3 lines.

$$T(n) \le \sum_{j=2}^{n} (4 + 3(j-1))$$

$$= \cancel{n-1} + 3\frac{(n-1)(n+2)}{2}$$

4(n-1)