Ch3: Insertion-Sort

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Algorithm Analysis and Design

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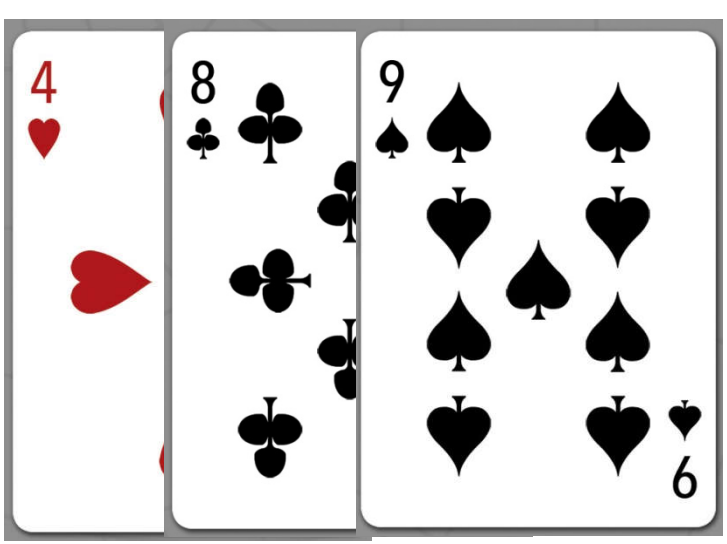
Insertion-Sort vs Cards

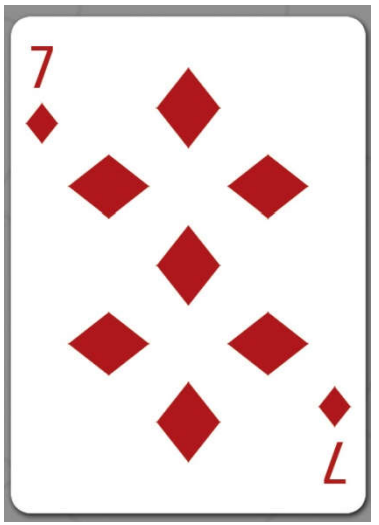
Photos are taken from : https://www.findabet.co.uk/poker-hands.php
http://www.elioimporting.com/contents/en-us/d55.html
https://www.pokerstars.com/poker/games/rules/hand-rankings/

Insertion-Sort vs Cards

Insertion-Sort vs Cards

- We have a sorted cards on the left hand side and we compare each card to the new coming one.





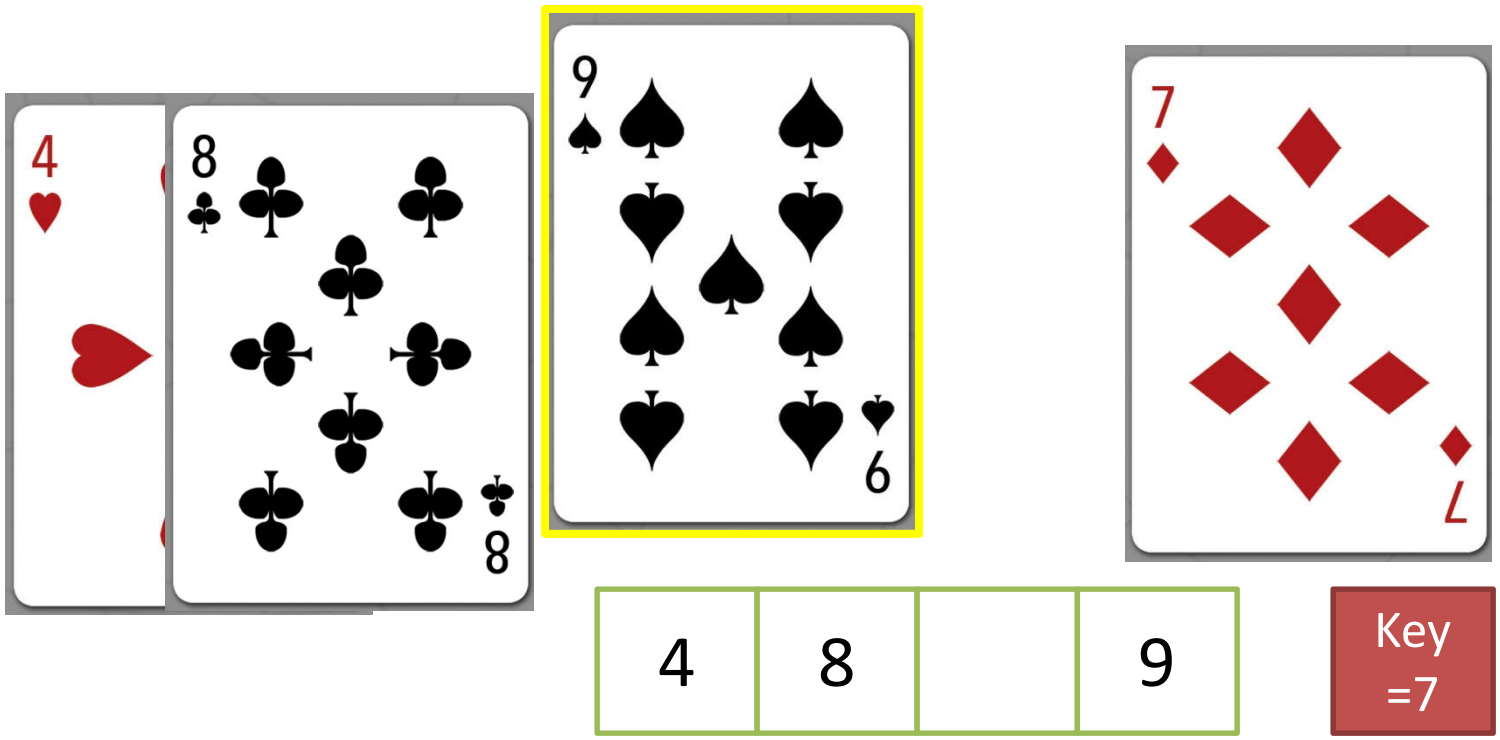
4	8	9	7

Key =7

Photos are taken from: https://www.maxplayingcards.com/en/2013/10/07/bicycle-demograffik-deck-the-multi-cultural-playing-cards/dpc_hearts/

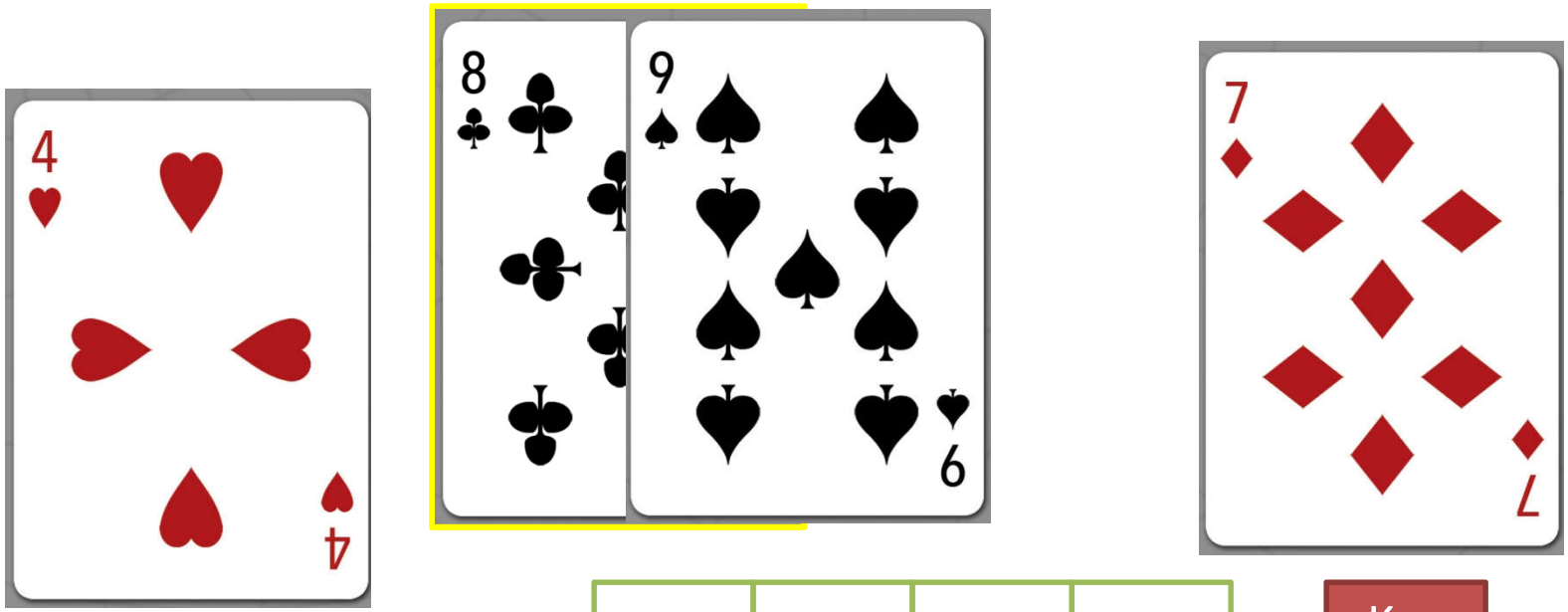
Insertion-Sort vs Cards

- If the card at position i on the left hand side is greater than the new card, then
  - we move card no. i one step to the right.



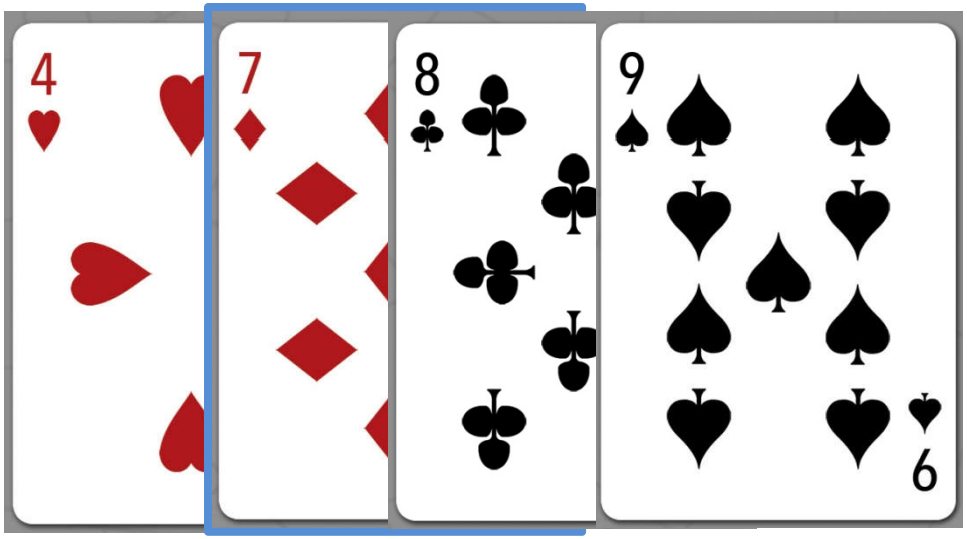
Insertion-Sort vs Cards

- Repeat the previous step until we find a card at position j that is less than the new card. We press the new card at position j+1



Insertion-Sort vs Cards

- We insert the new card.



4	7	8	9

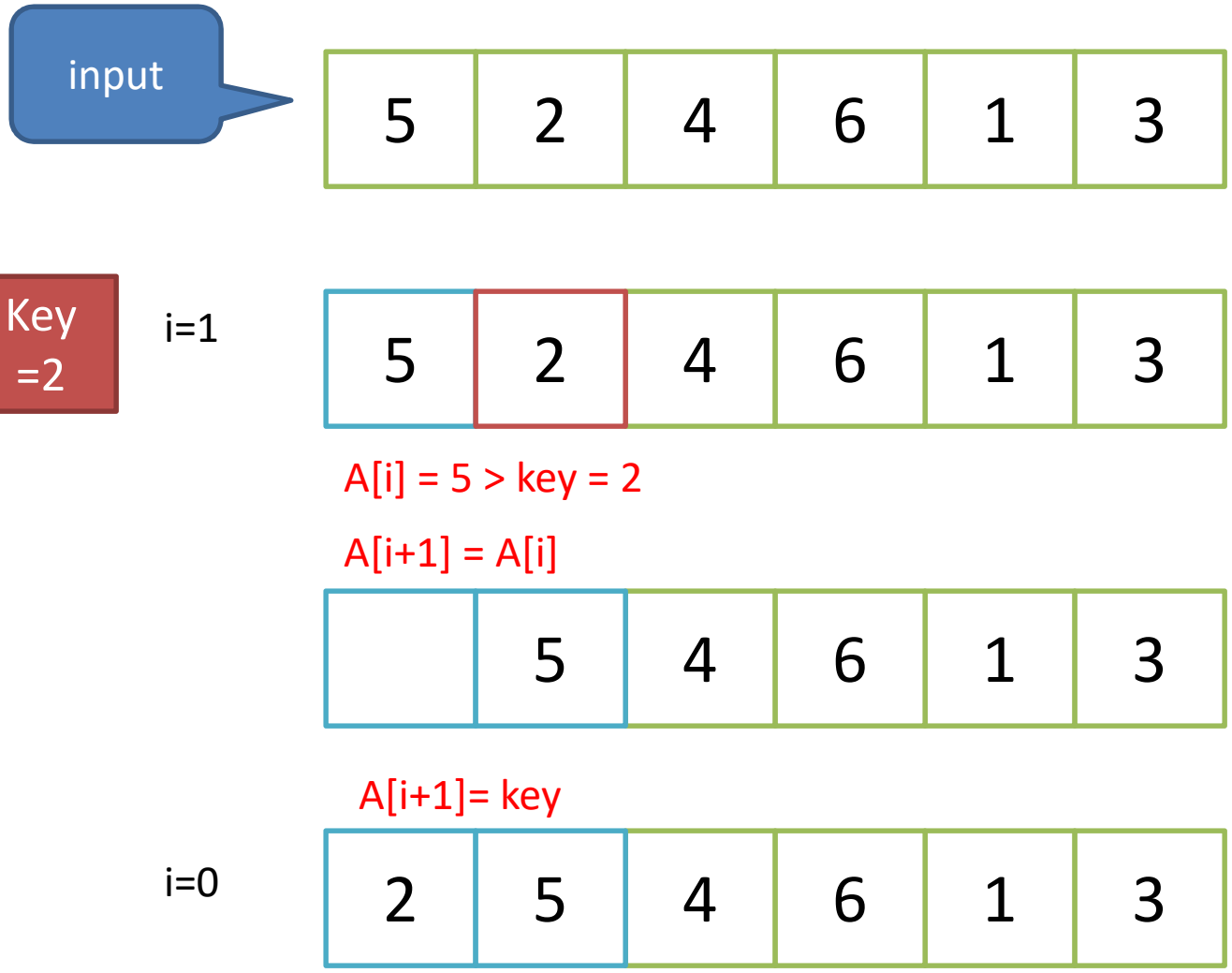
Key =7

Psudocode: Insertion-Sort

```
for j=2 to length[A]
        do key = A[ j ]

        i = j - 1
        while i > 0 and A[ i ] > key
                do A[i+1] = A[ i ]
                i = i - 1
        A[i+1]=key
```

Insertion-Sort

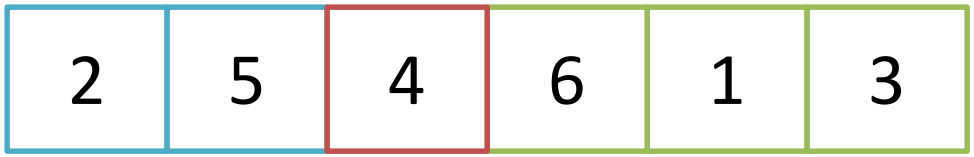


Insertion-Sort

j = 3

Key =4

i=2



A[i] = 5 > key = 4 ?

A[i+1] = A[i]

i=1

A[i] = 2 > key = 4 ? (False)

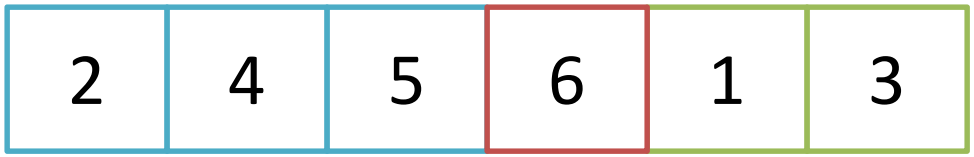
A[i+1]= key

Insertion-Sort

j = 4

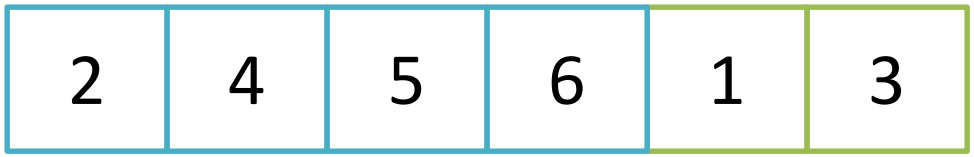
Key =6

i=3



A[i] = 5 > key = 6 ? (False)

A[i+1] = A[i]

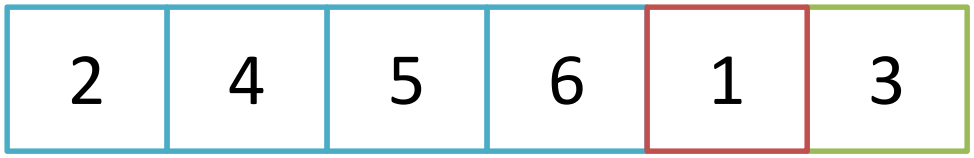


Insertion-Sort

j = 5

Key =1

i=4



A[i] = 6 > key = 1

A[i+1] = A[i]

i=3

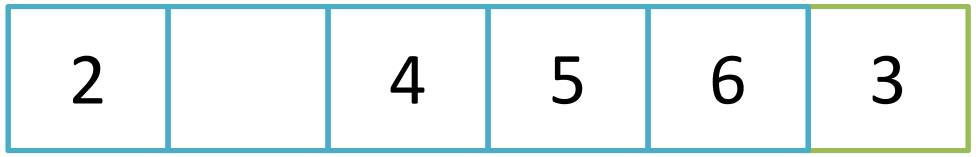
A[i] = 5 > key = 1

A[i+1] = A[i]

i=2

A[i] = 4 > key = 1

A[i+1] = A[i]

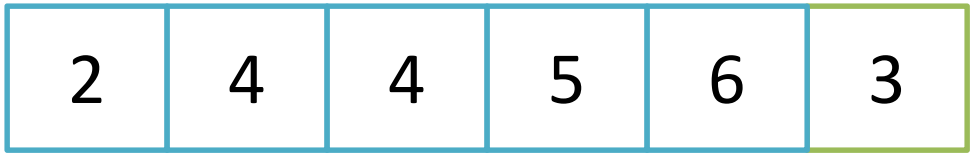


Insertion-Sort

j = 5

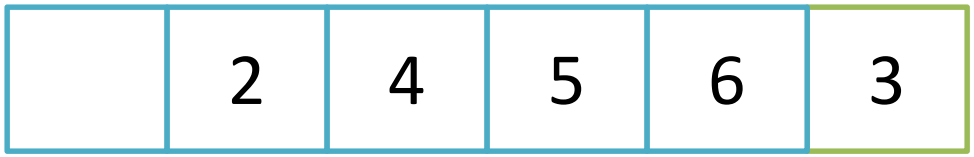
Key =1

i=1



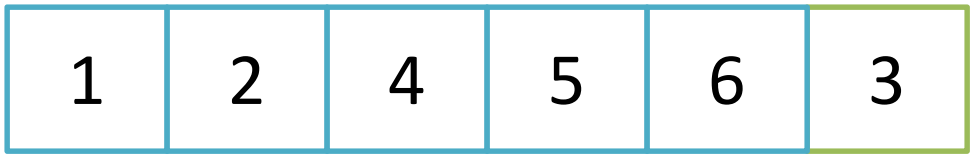
A[i] = 2 > key = 1

A[i+1] = A[i]



i=0

A[i+1] = key

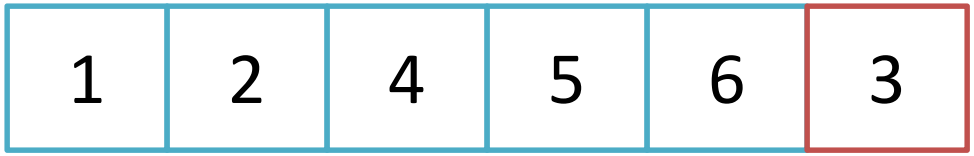


Insertion-Sort

j = 6

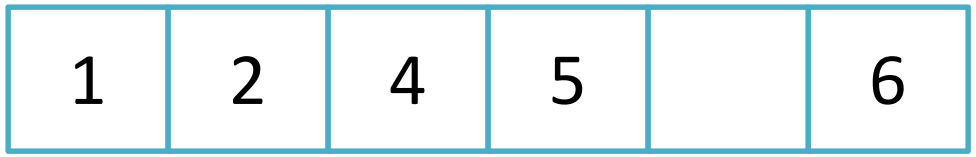
Key =3

i=5



A[i] = 6 > key = 3

A[i+1] = A[i]



i=4

A[i] = 5 > key = 3

A[i+1] = A[i]

i=3

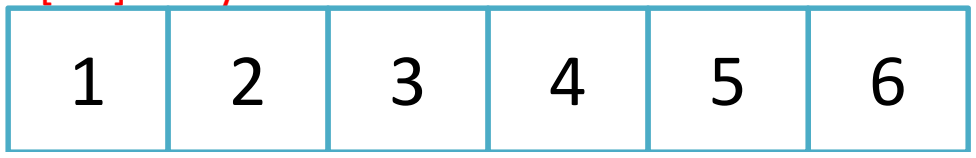
A[i] = 4 > key = 3

A[i+1] = A[i]

i=2

A[i] = 2 > key = 3 ? (False)

A[i+1] = key



Exercise insertion-sort

Input = [9,5,7,4,2]

j	key	i	Array
2			
3			
4			
5			