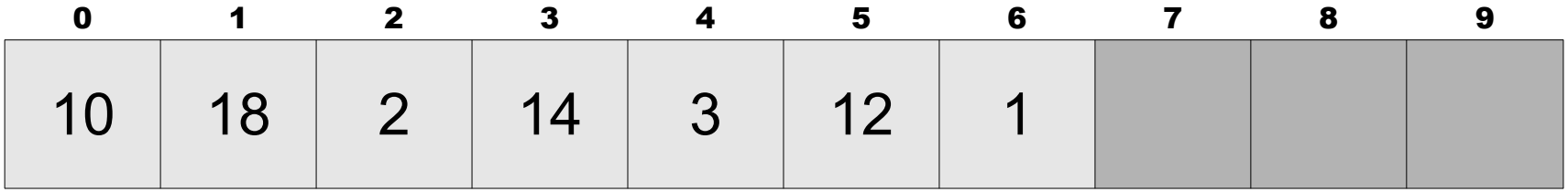
Selection Sort

(select the smallest element)



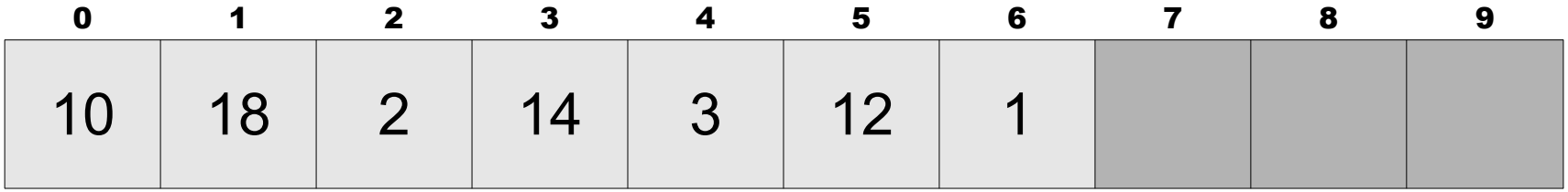
Slides by **Sean Szumlanski**

for **CS106B**, Programming Abstractions

Summer 2024

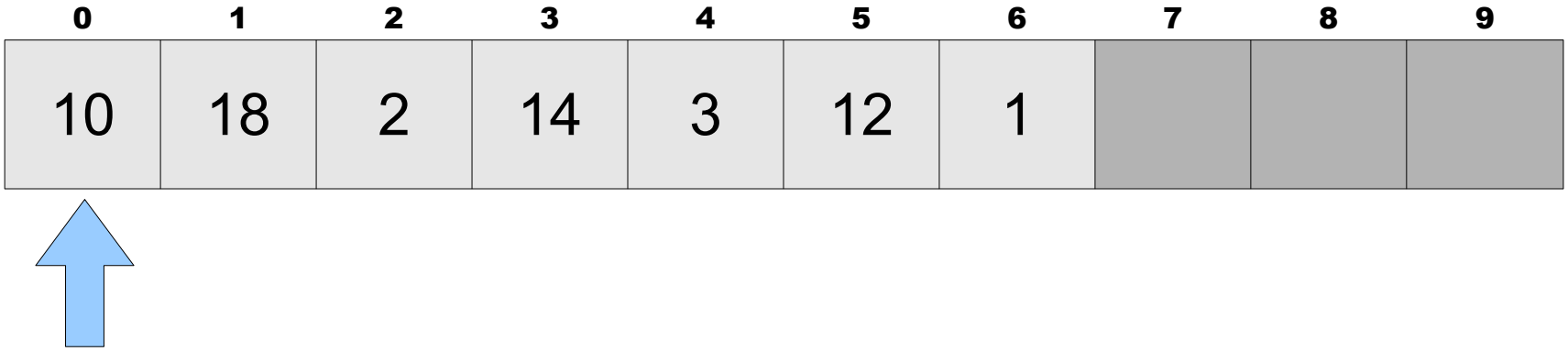
Selection Sort

(select the smallest element)



Selection Sort

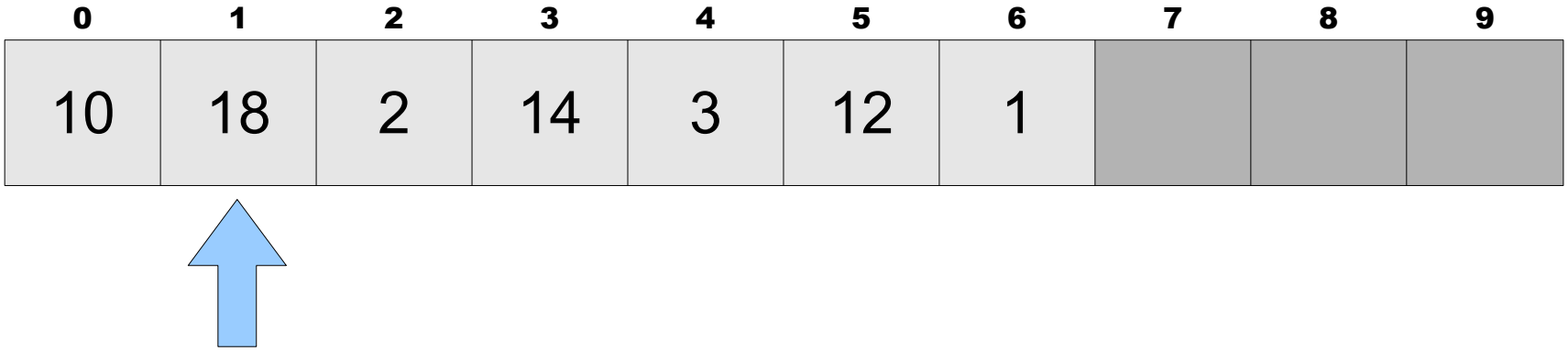
(select the smallest element)



Smallest element seen (so far): 10 (at index 0)

Selection Sort

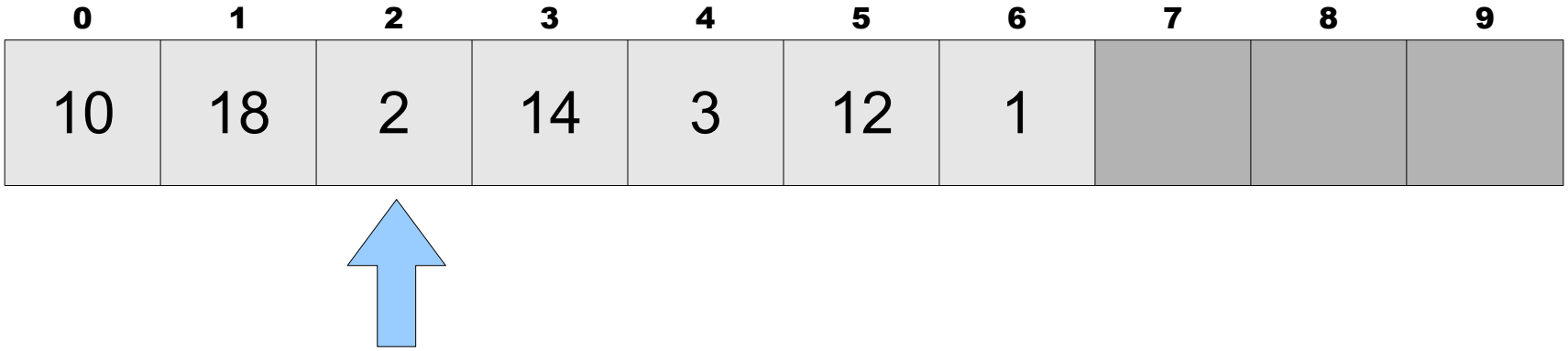
(select the smallest element)



Smallest element seen (so far): 10 (at index 0)

Selection Sort

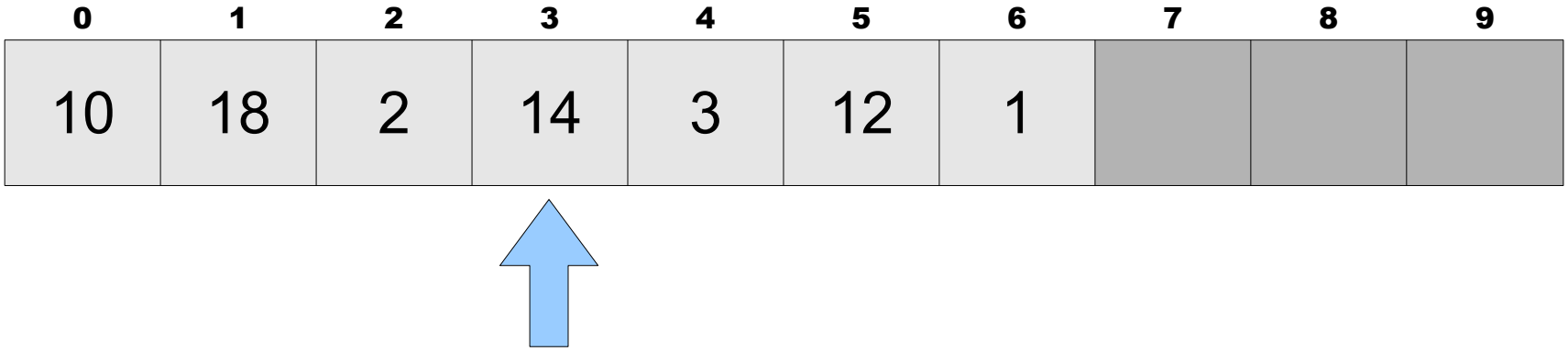
(select the smallest element)



Smallest element seen (so far): 2 (at index 2)

Selection Sort

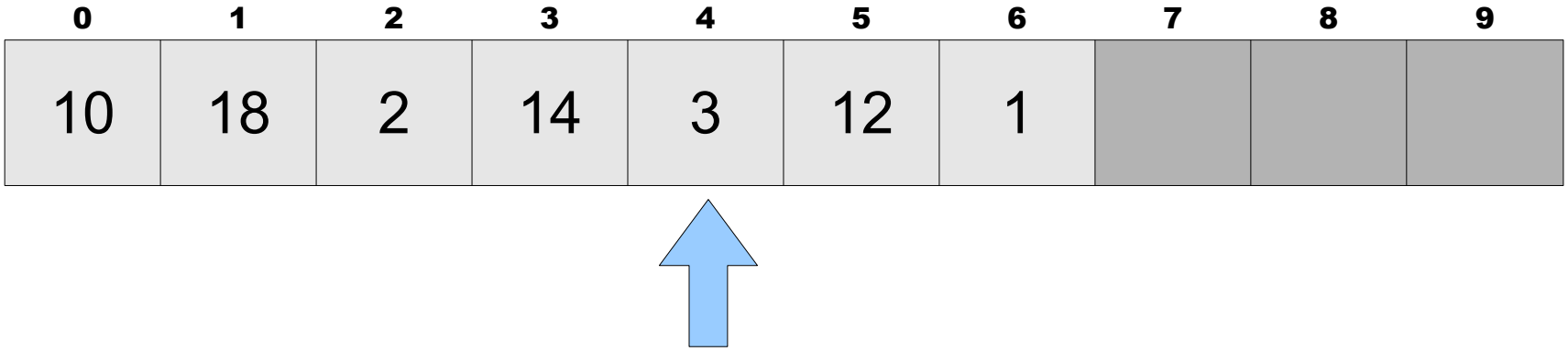
(select the smallest element)



Smallest element seen (so far): 2 (at index 2)

Selection Sort

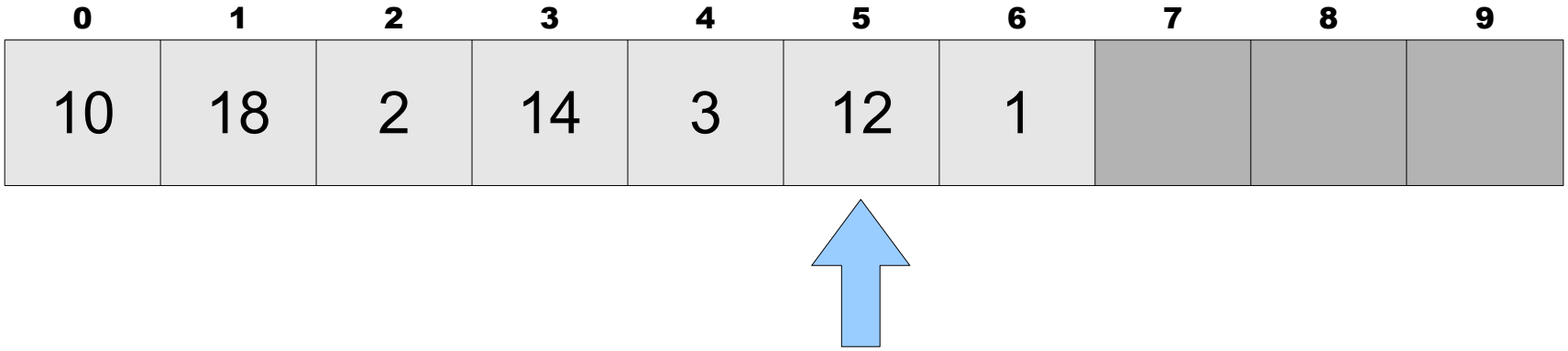
(select the smallest element)



Smallest element seen (so far): 2 (at index 2)

Selection Sort

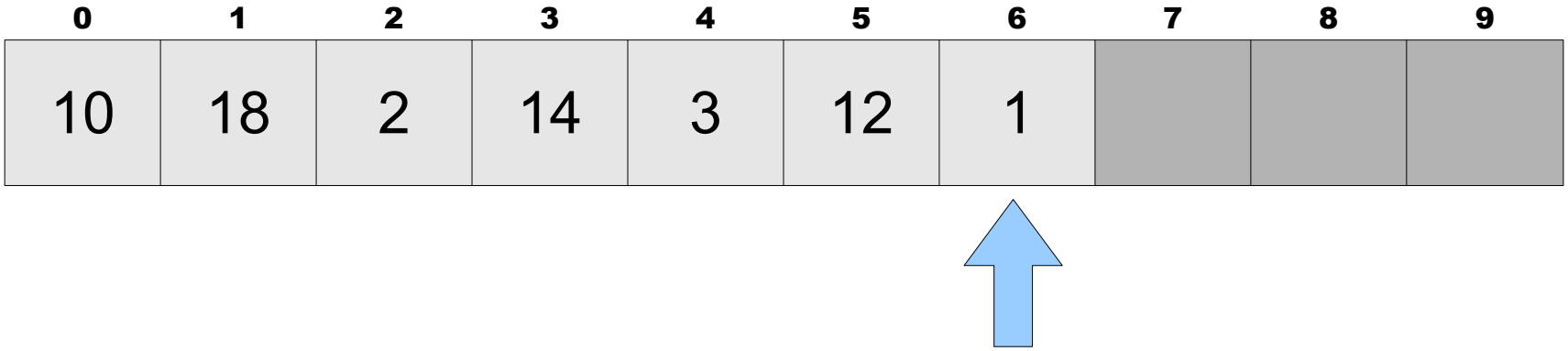
(select the smallest element)



Smallest element seen (so far): 2 (at index 2)

Selection Sort

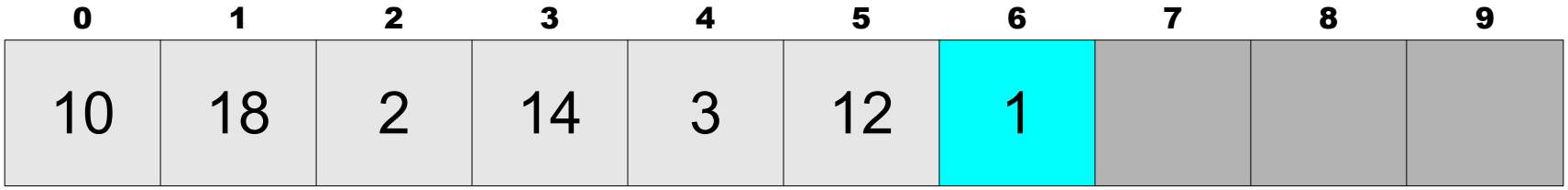
(select the smallest element)



Smallest element seen (so far): 1 (at index 6)

Selection Sort

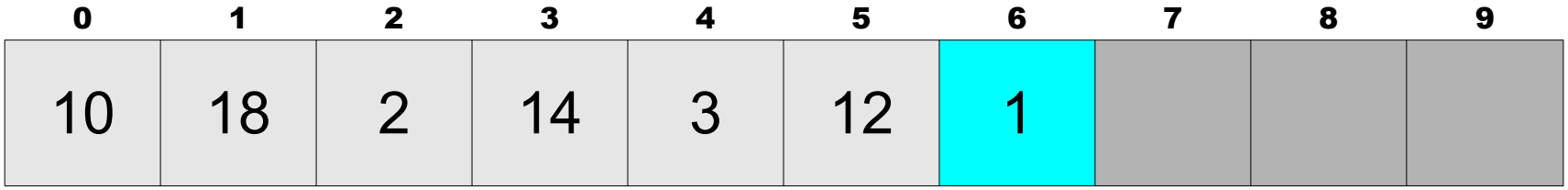
(select the smallest element)



We've found the **smallest element** in the vector.

Selection Sort

(select the smallest element)

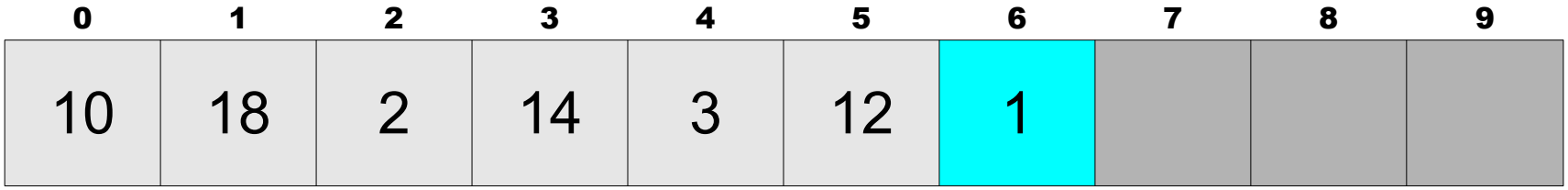


We've found the **smallest element** in the vector.

Notice everything is **unsorted** so far.

Selection Sort

(select the smallest element)



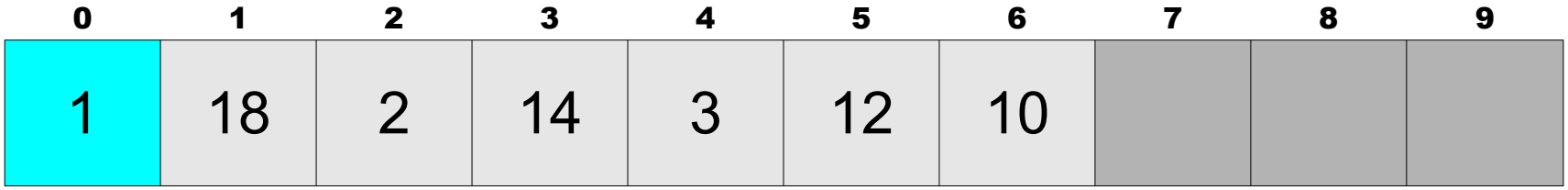
We've found the **smallest element** in the vector.

Notice everything is **unsorted** so far.

Swap that smallest element into the **leftmost position** of the **unsorted** portion of the vector.

Selection Sort

(select the smallest element)



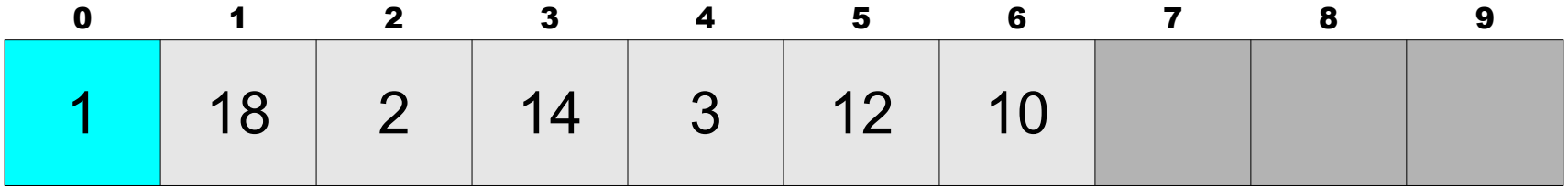
We've found the **smallest element** in the vector.

Notice everything is **unsorted** so far.

Swap that smallest element into the **leftmost position** of the **unsorted** portion of the vector.

Selection Sort

(select the smallest element)



We've found the **smallest element** in the vector.

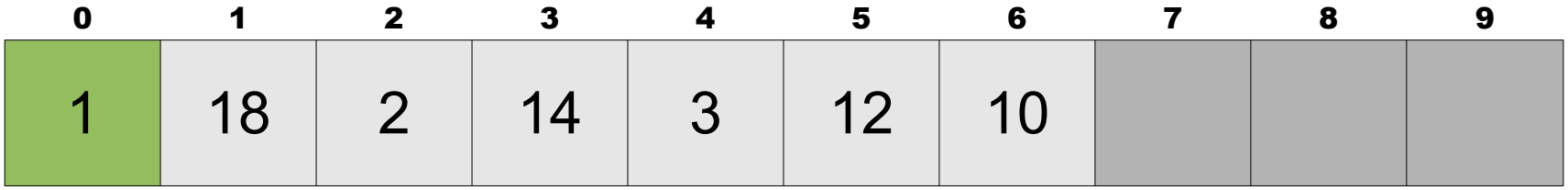
Notice everything is **unsorted** so far.

Swap that smallest element into the **leftmost position** of the **unsorted** portion of the vector.

Mark that position as part of a **sorted portion** of the vector.

Selection Sort

(select the smallest element)



We've found the **smallest element** in the vector.

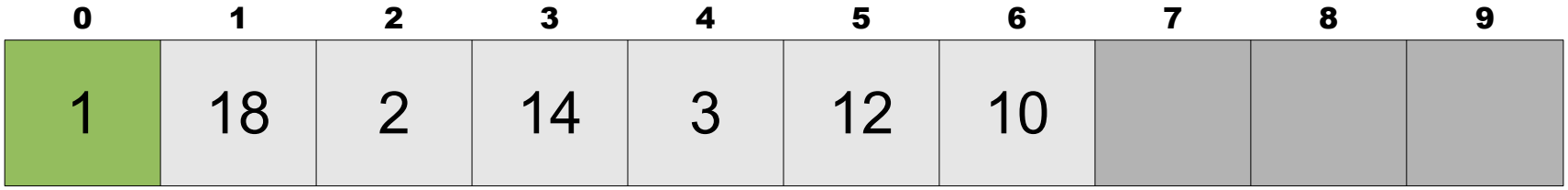
Notice everything is **unsorted** so far.

Swap that smallest element into the **leftmost position** of the **unsorted** portion of the vector.

Mark that position as part of a **sorted portion** of the vector.

Selection Sort

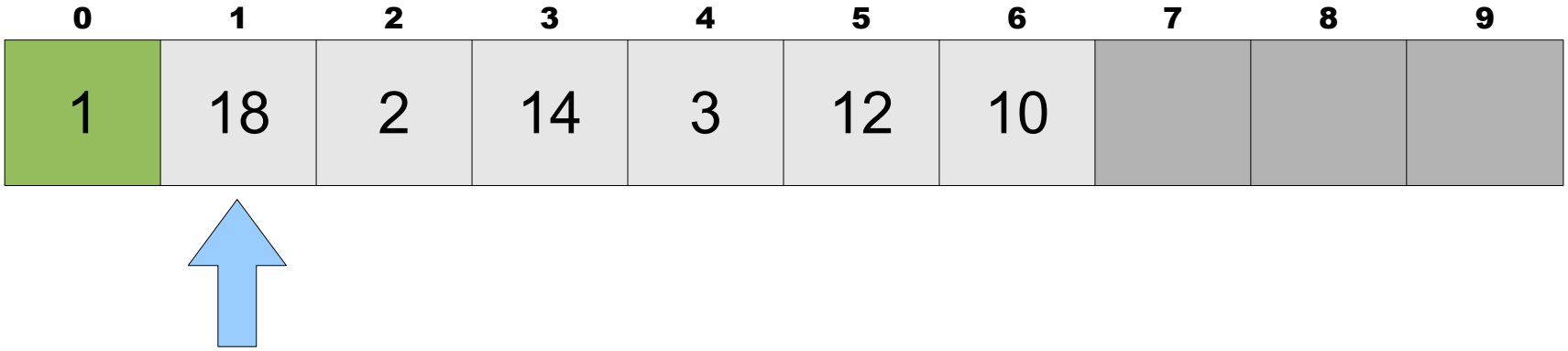
(select the smallest element)



Now repeat the process for the remaining **unsorted portion** of the vector.

Selection Sort

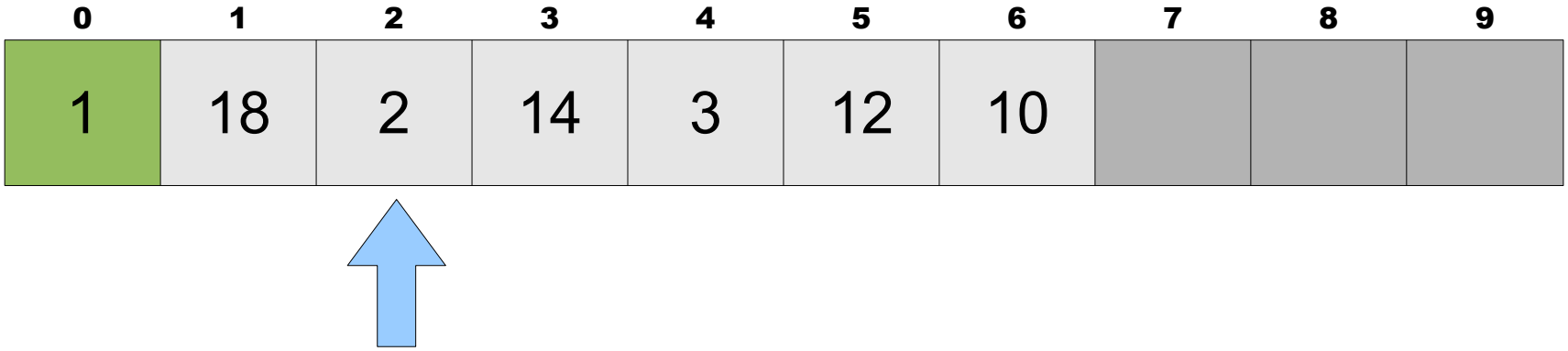
(select the smallest element)



Smallest element seen (so far): 18 (at index 1)

Selection Sort

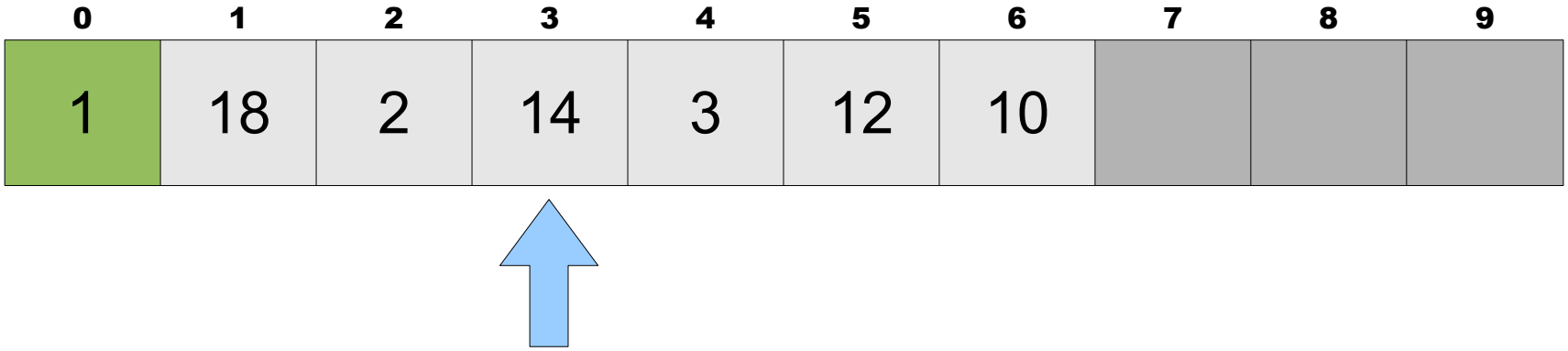
(select the smallest element)



Smallest element seen (so far): 2 (at index 2)

Selection Sort

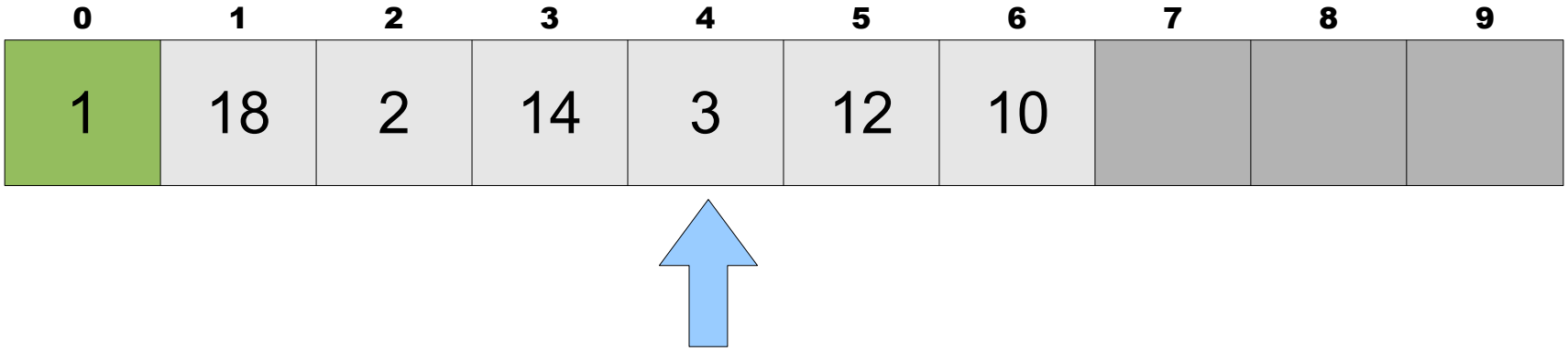
(select the smallest element)



Smallest element seen (so far): 2 (at index 2)

Selection Sort

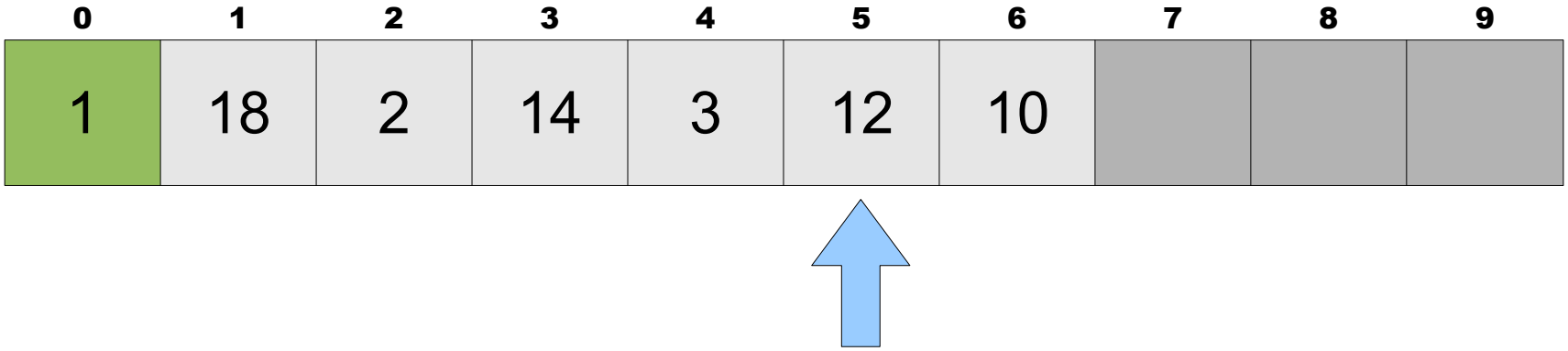
(select the smallest element)



Smallest element seen (so far): 2 (at index 2)

Selection Sort

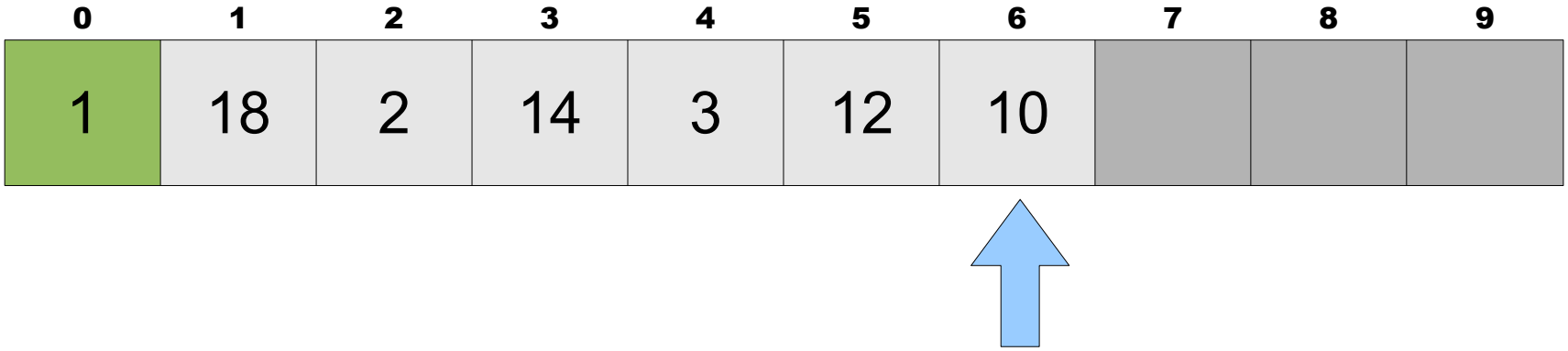
(select the smallest element)



Smallest element seen (so far): 2 (at index 2)

Selection Sort

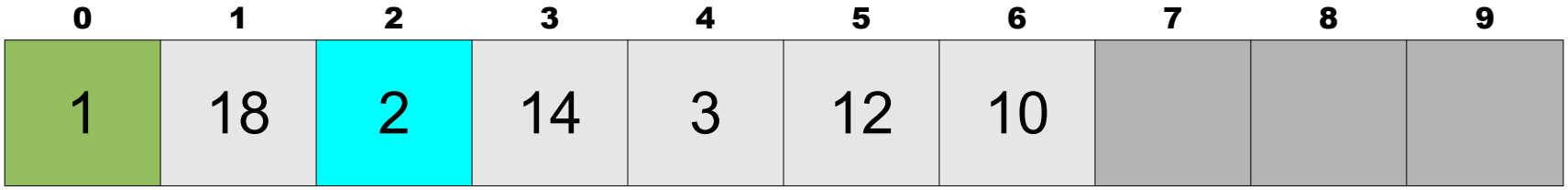
(select the smallest element)



Smallest element seen (so far): 2 (at index 2)

Selection Sort

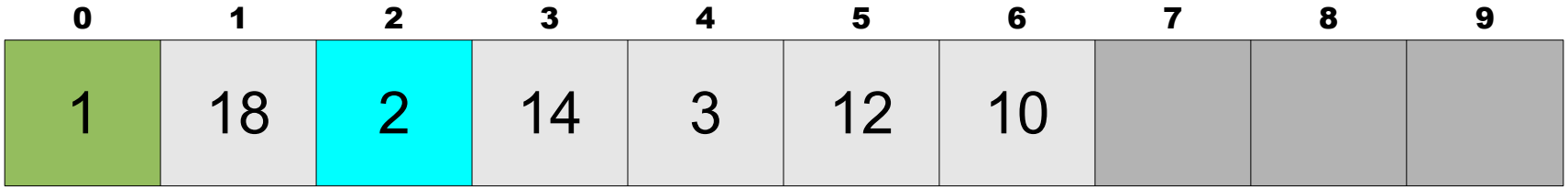
(select the smallest element)



We have the **smallest element** from the **unsorted** part of the vector.

Selection Sort

(select the smallest element)

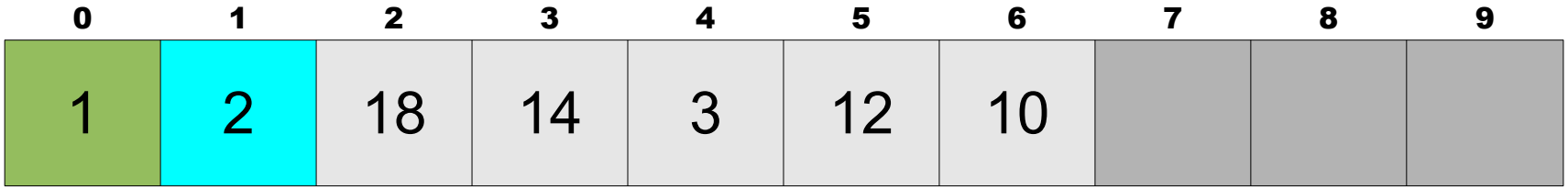


We have the **smallest element** from the **unsorted** part of the vector.

Swap it into the **leftmost position** of the **unsorted portion** of the vector.

Selection Sort

(select the smallest element)



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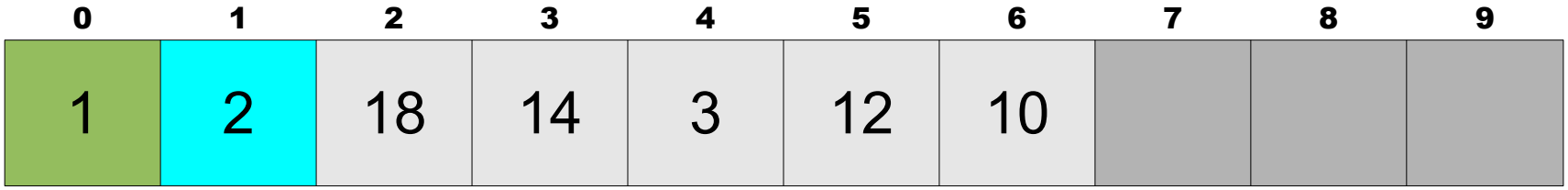

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Swap it into the **leftmost position** of the **unsorted portion** of the vector.

Mark that position as part of a **sorted portion** of the vector.

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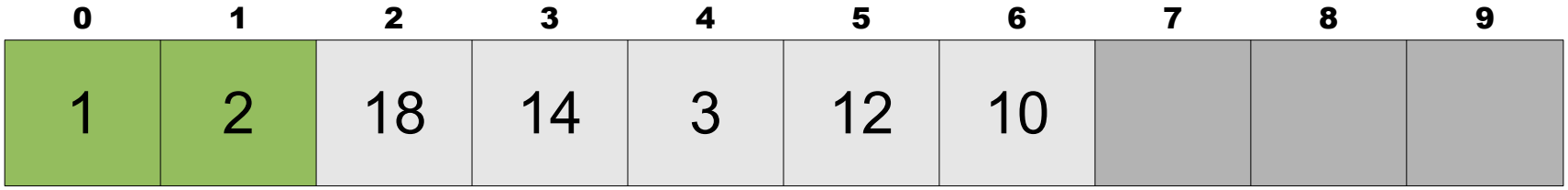
(select the smallest element)



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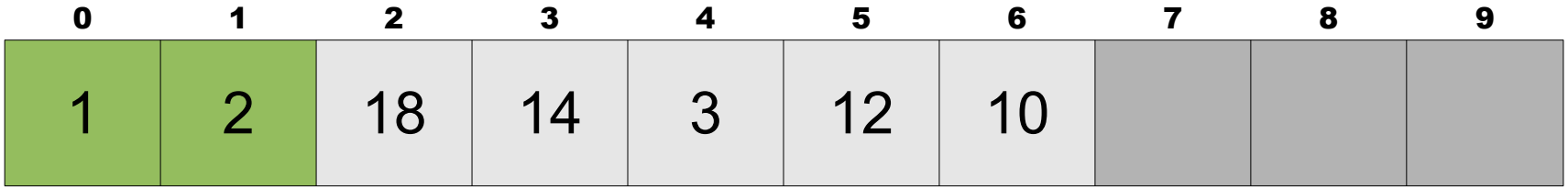
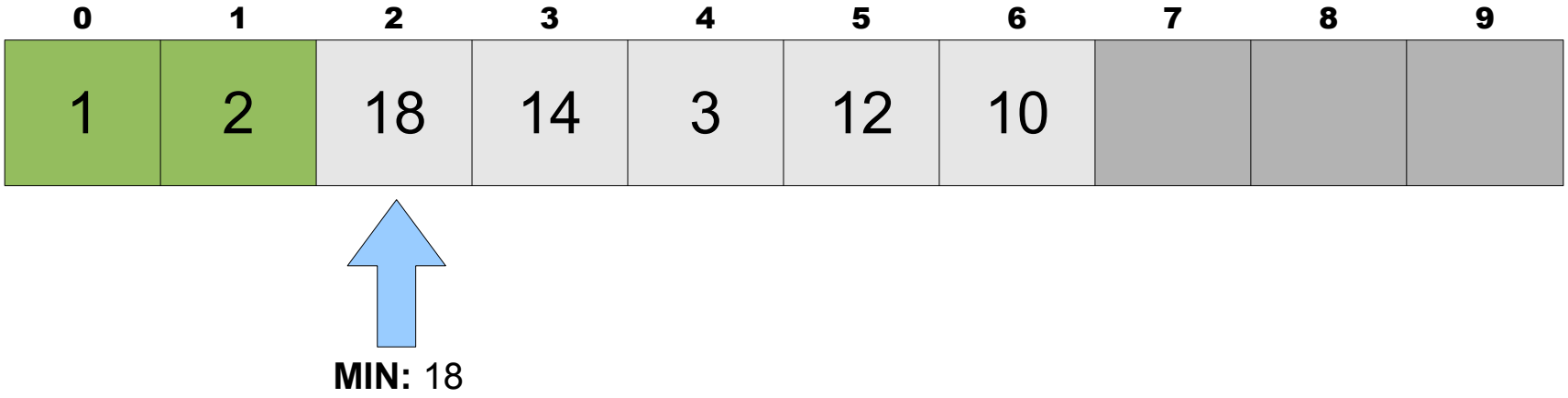


See if you can follow along...

Selection Sort

(select the smallest element)



See if you can follow along...

Selection Sort

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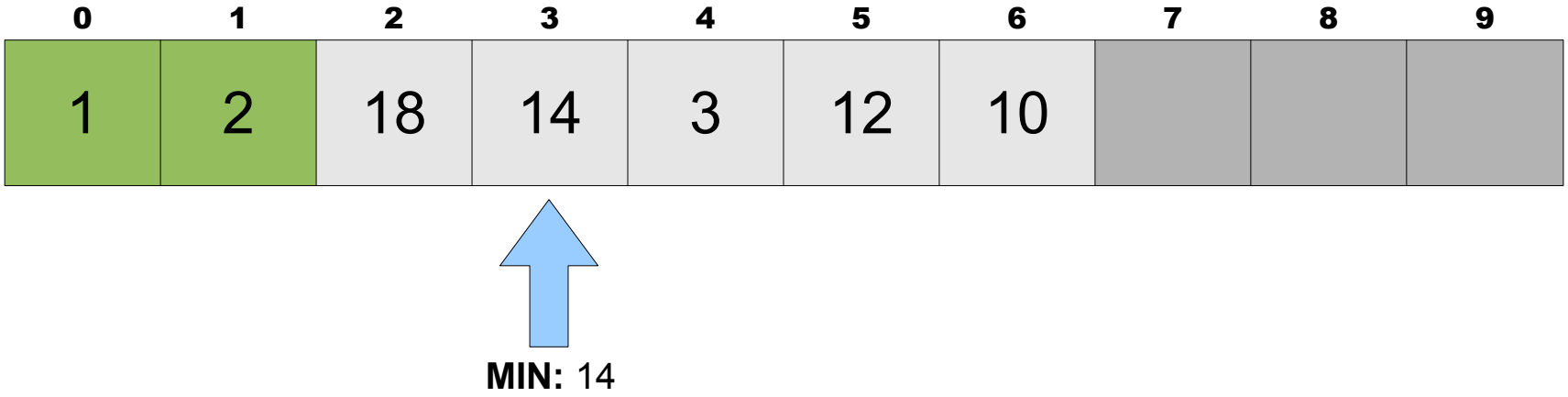
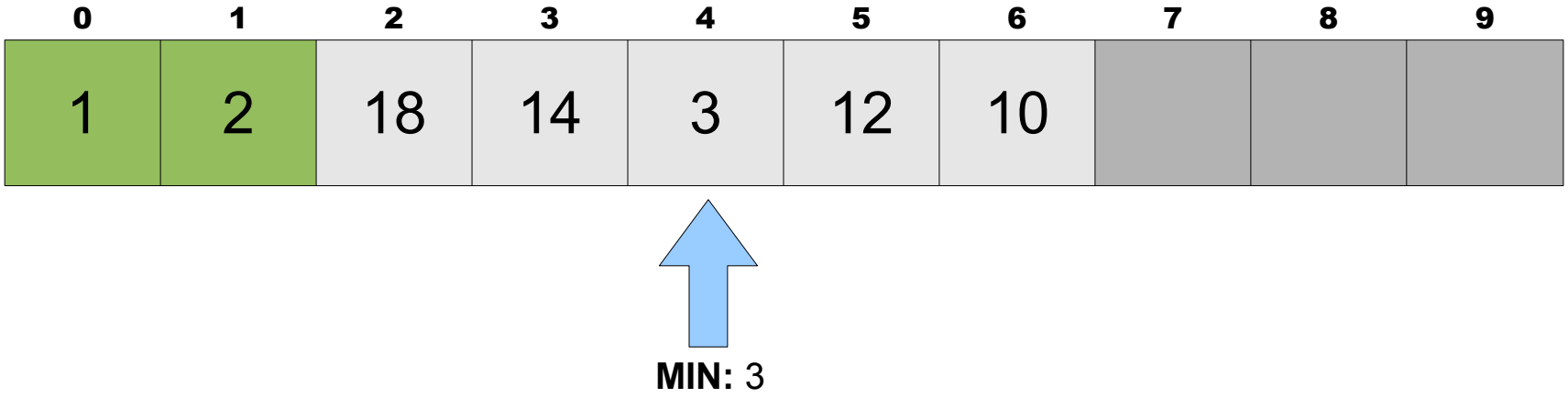


MIN: 14

See if you can follow along...

Selection Sort

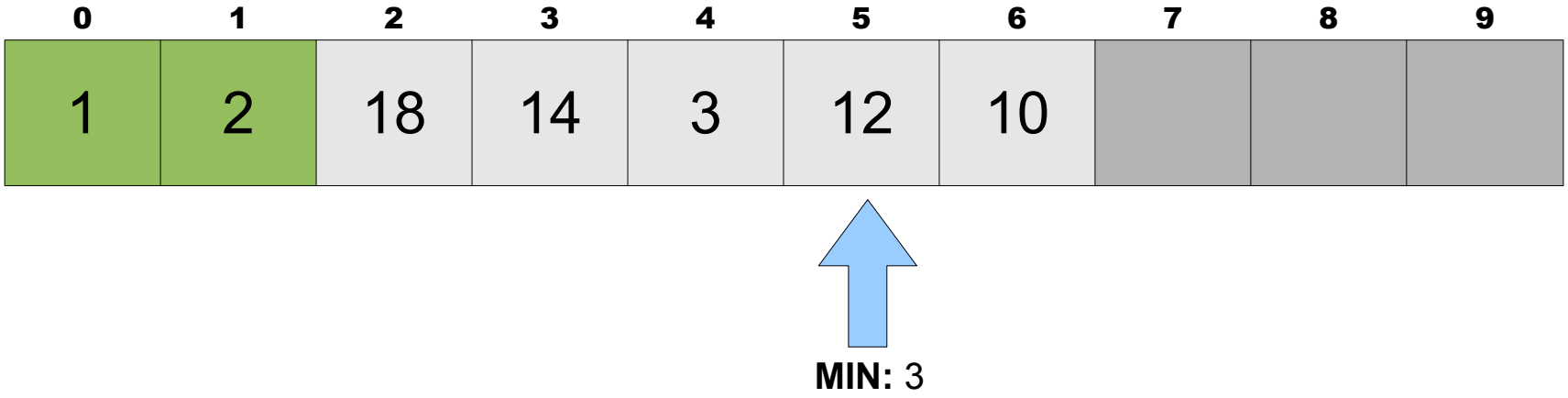
(select the smallest element)



See if you can follow along...

Selection Sort

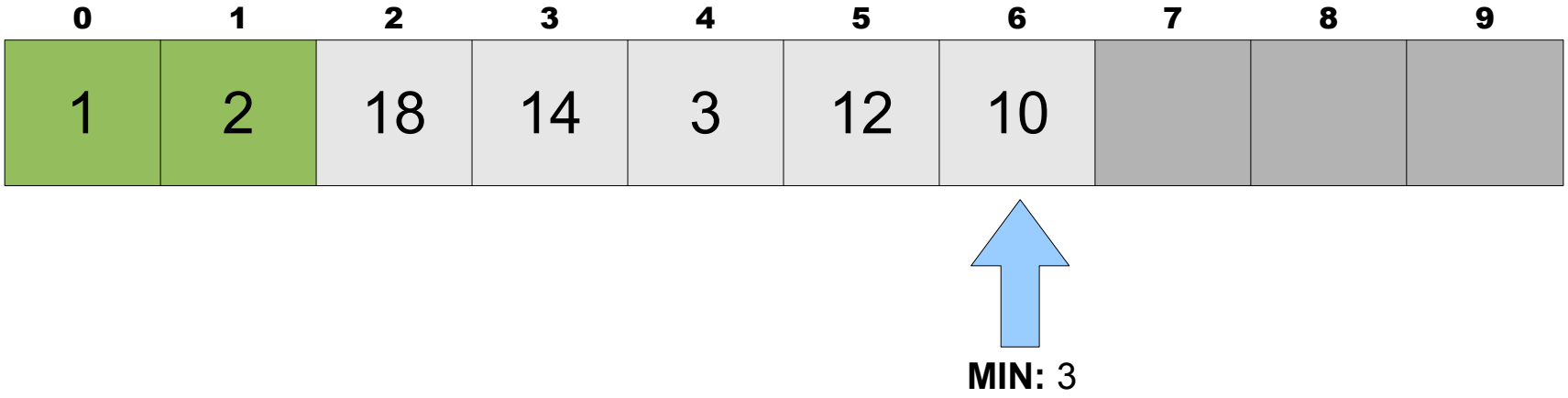
(select the smallest element)



See if you can follow along...

Selection Sort

(select the smallest element)



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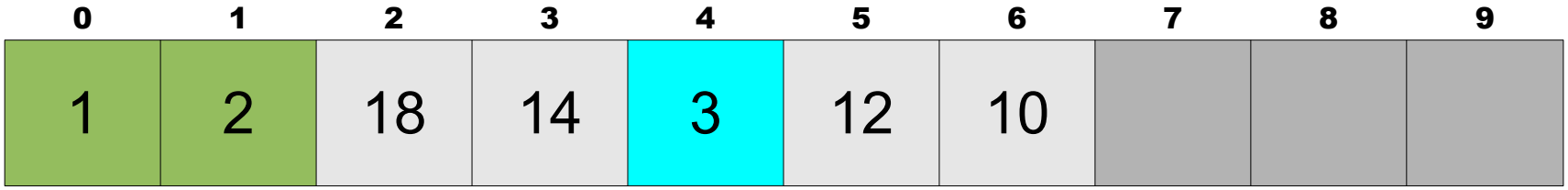

See if you can follow along...

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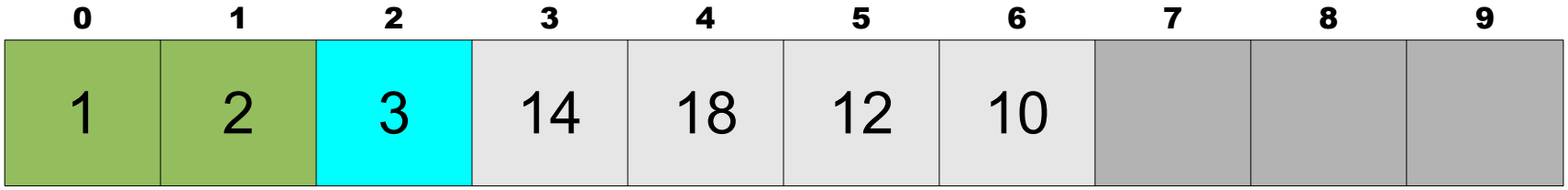
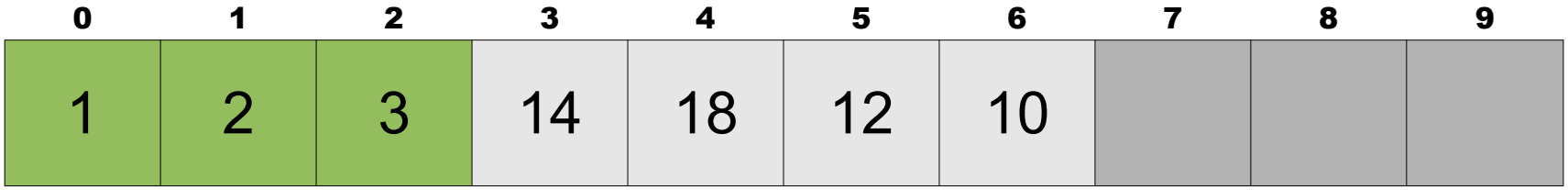


See if you can follow along...

Selection Sort

(select the smallest element)



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Selection Sort

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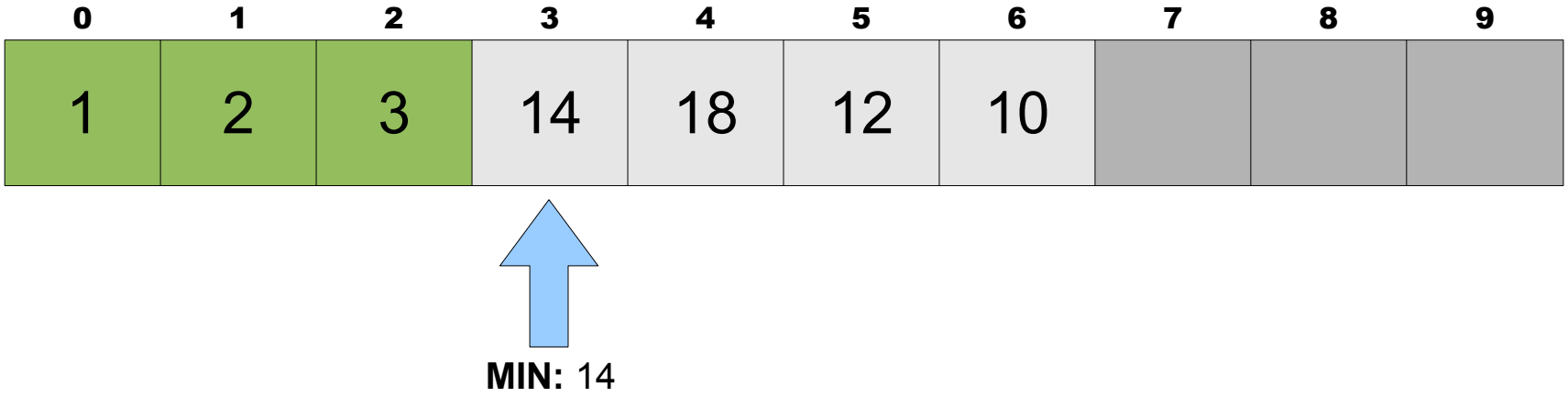

MIN: 14

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Selection Sort

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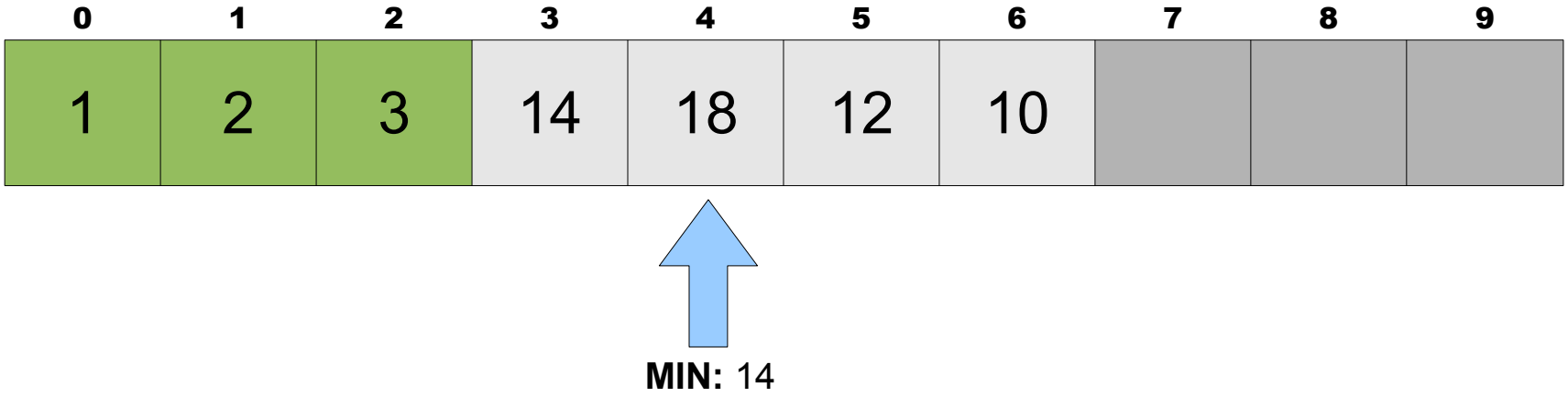
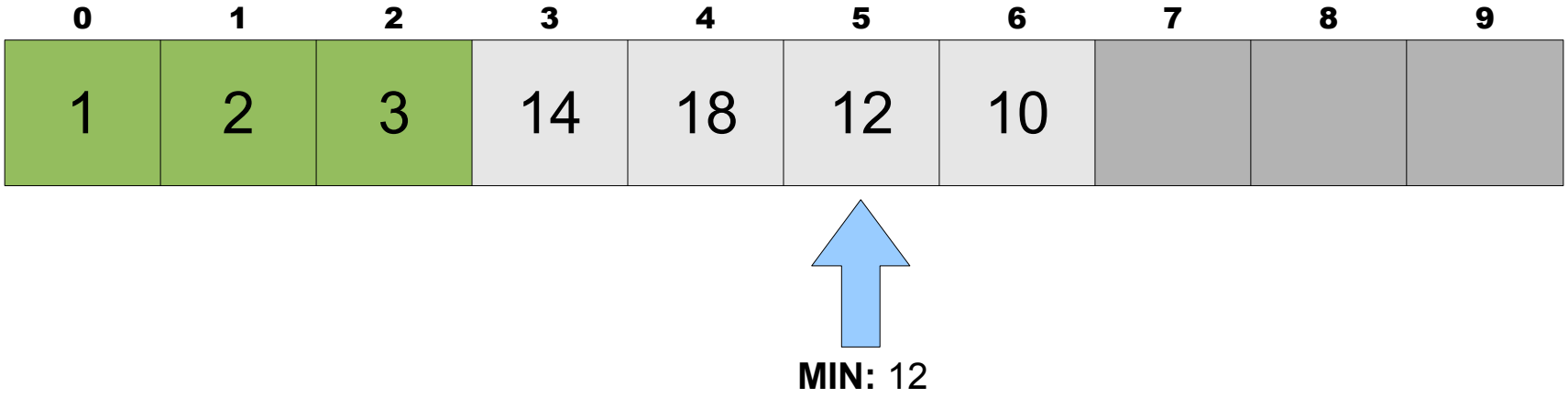


MIN: 14

See if you can follow along...

Selection Sort

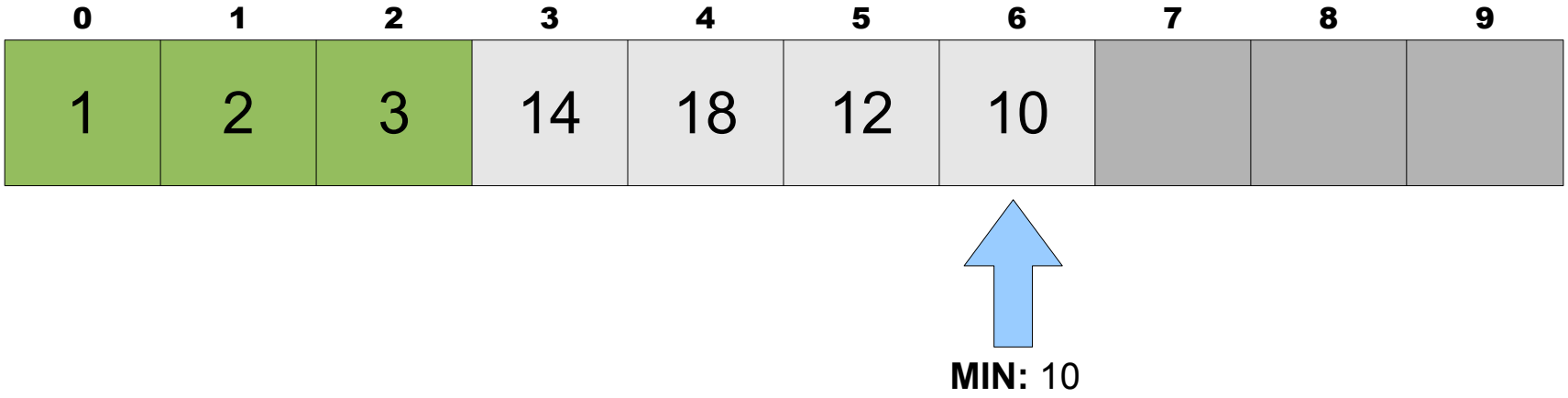
(select the smallest element)



See if you can follow along...

Selection Sort

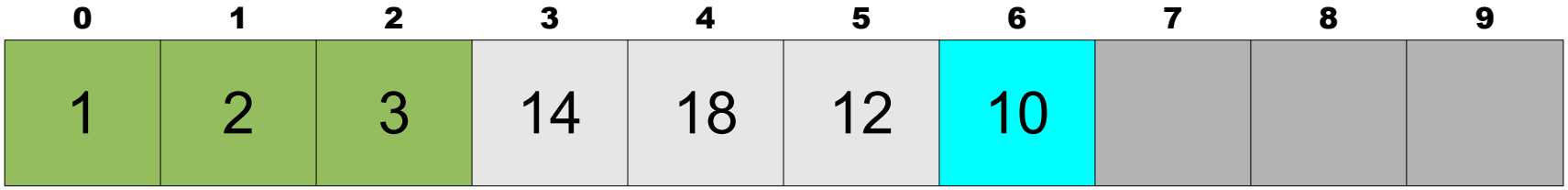
(select the smallest element)



See if you can follow along...

Selection Sort

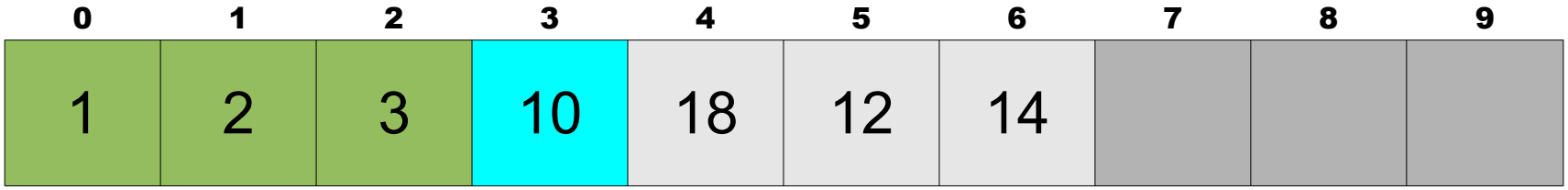
(select the smallest element)



See if you can follow along...

Selection Sort

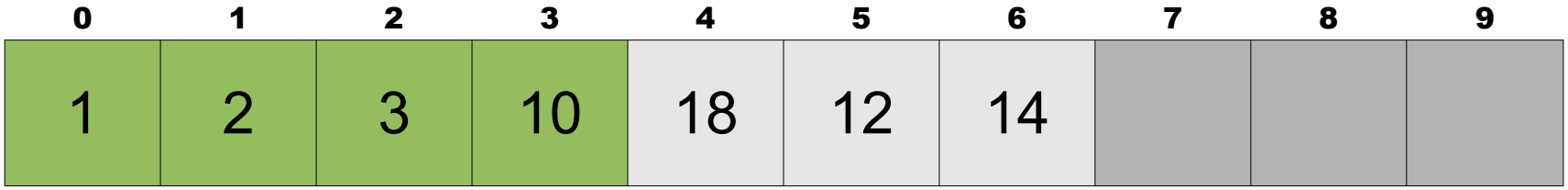
(select the smallest element)



See if you can follow along...

Selection Sort

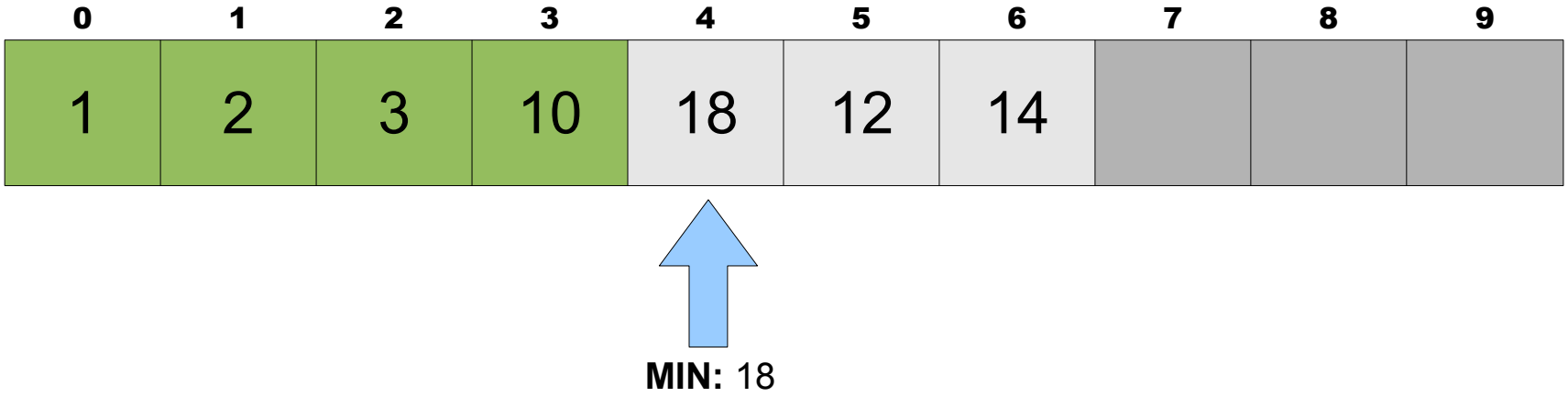
(select the smallest element)



See if you can follow along...

Selection Sort

(select the smallest element)

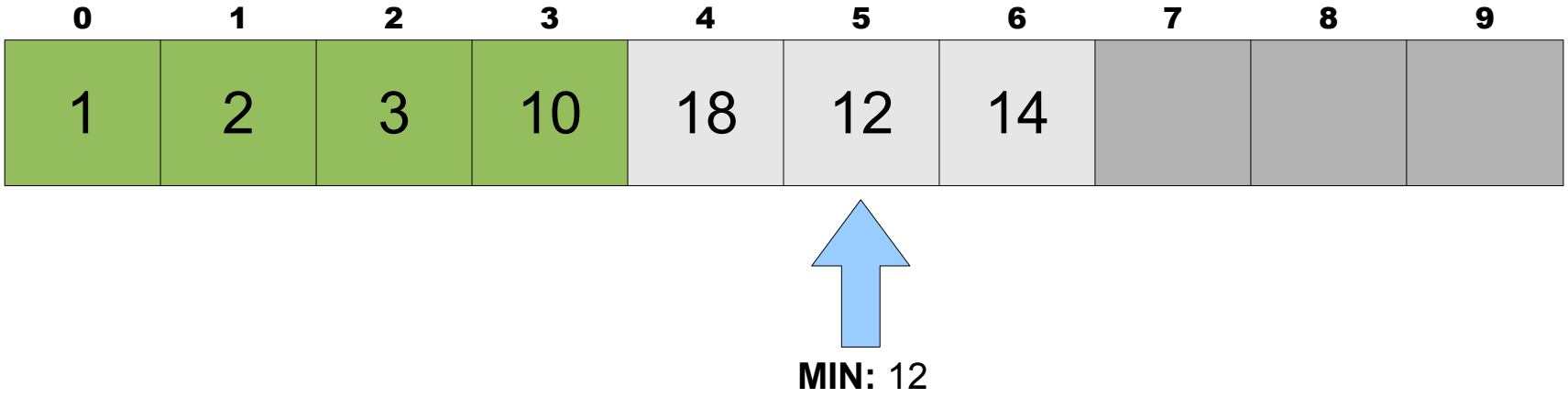


MIN: 18

See if you can follow along...

Selection Sort

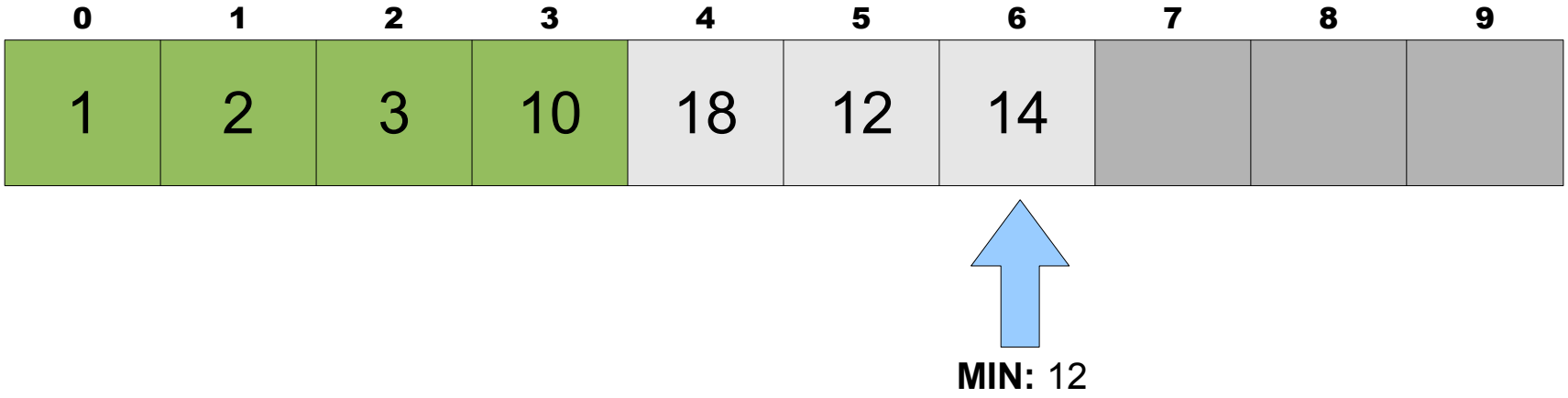
(select the smallest element)



See if you can follow along...

Selection Sort

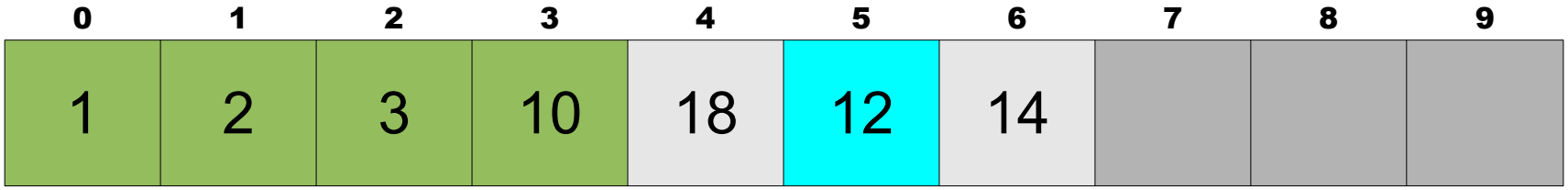
(select the smallest element)



See if you can follow along...

Selection Sort

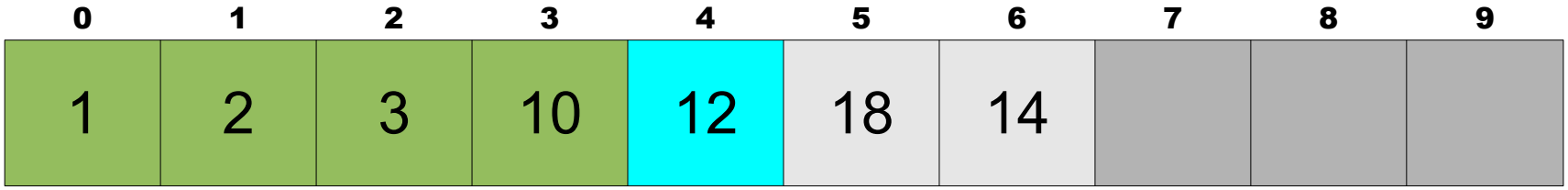
(select the smallest element)



See if you can follow along...

Selection Sort

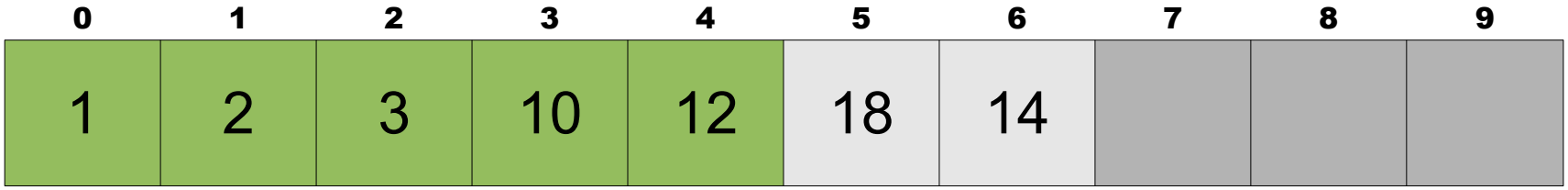
(select the smallest element)



See if you can follow along...

Selection Sort

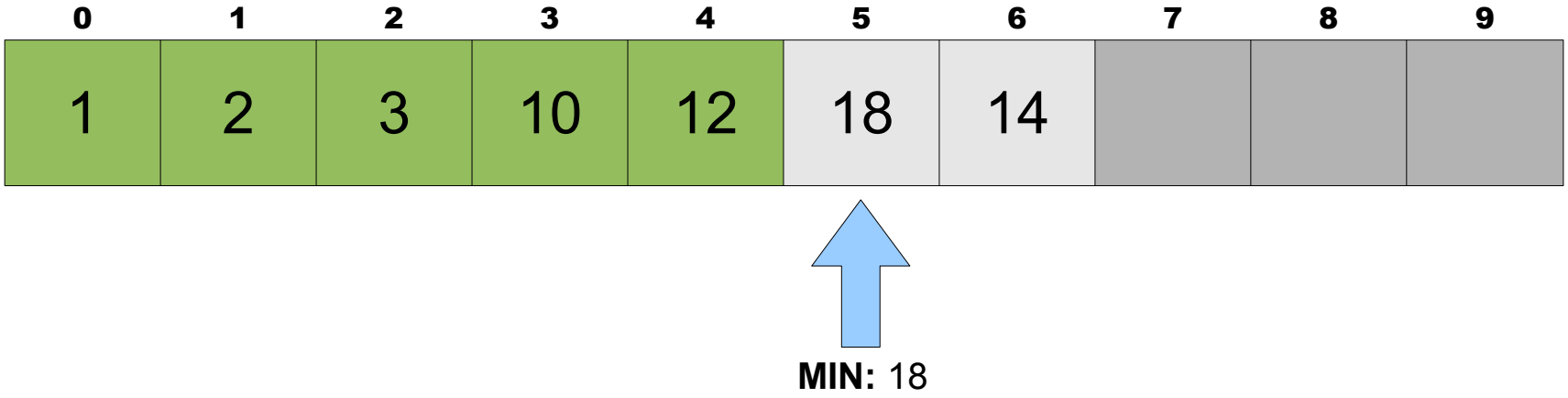
(select the smallest element)



See if you can follow along...

Selection Sort

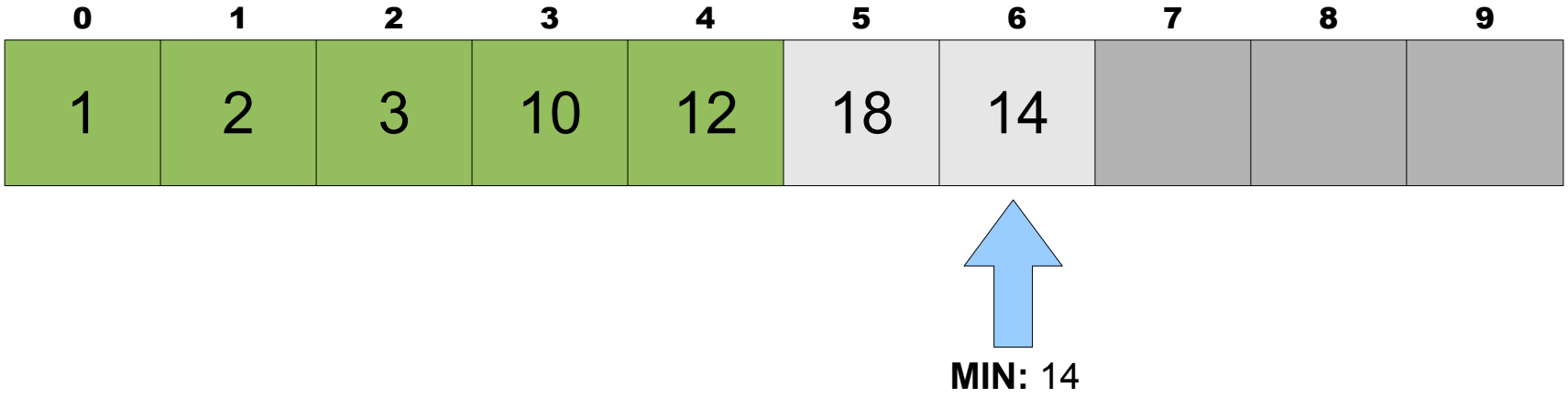
(select the smallest element)



See if you can follow along...

Selection Sort

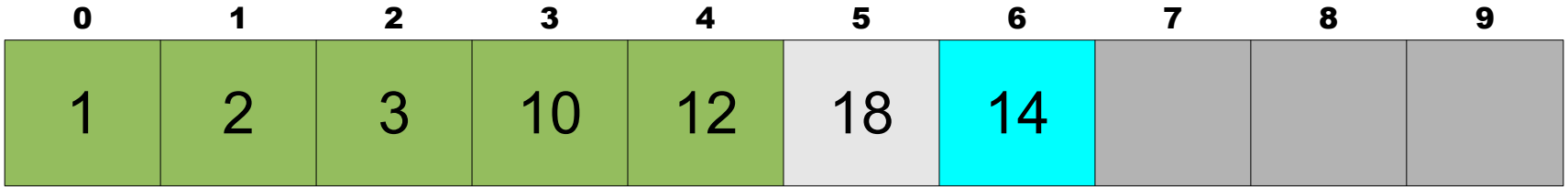
(select the smallest element)



See if you can follow along...

Selection Sort

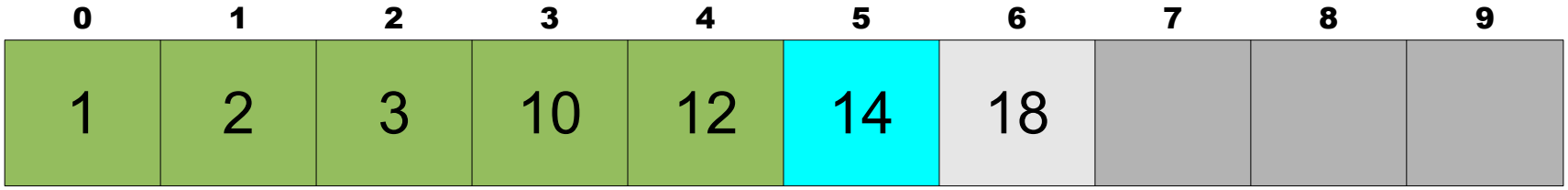
(select the smallest element)



See if you can follow along...

Selection Sort

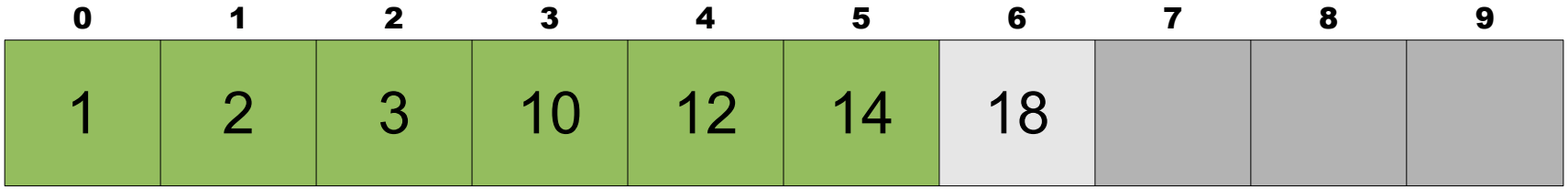
(select the smallest element)



See if you can follow along...

Selection Sort

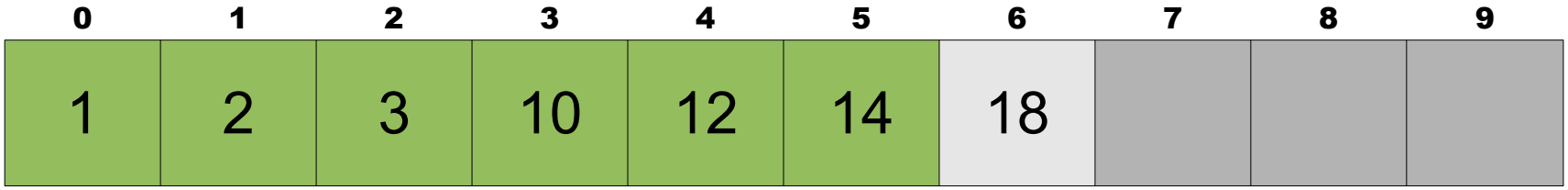
(select the smallest element)



See if you can follow along...

Selection Sort

(select the smallest element)

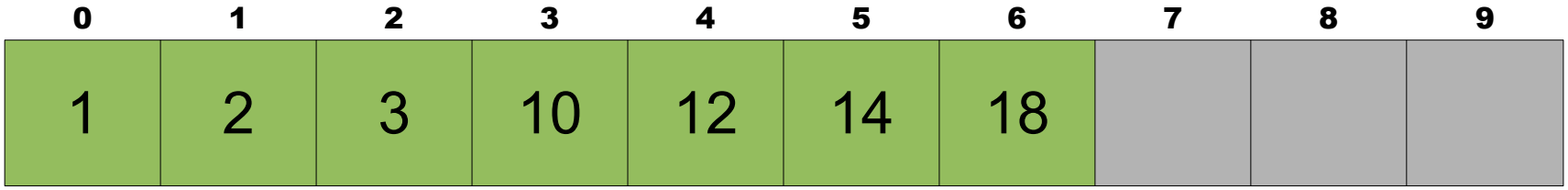


When there's **one element** left to be sorted,

we're **FINISHED!**

Selection Sort

(select the smallest element)

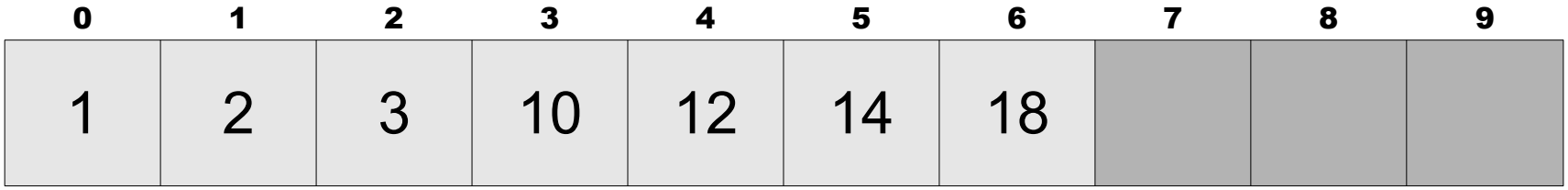


When there's **one element** left to be sorted,

we're **FINISHED!**

Selection Sort

(select the smallest element)



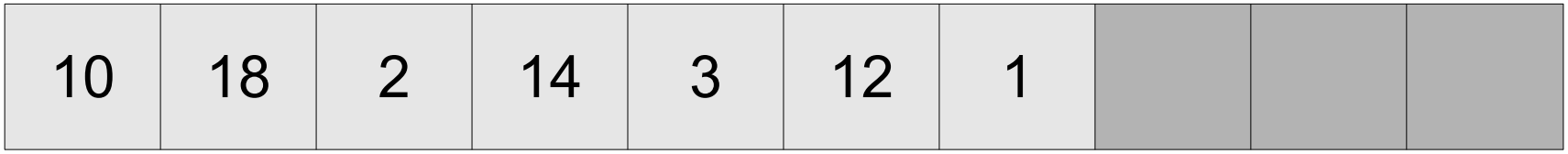
1. What's the **worst-case** Big-Oh runtime?

2. What's the **best-case** Big-Oh runtime?

3. Show the vector after **each pass** of Selection Sort.

Selection Sort

(let's code it up)




```
void selectionSort(Vector<int>& v)
{
   for (int i = 0; i < v.size() - 1; i++)
   {
      int minIndex = i;

      for (int j = i + 1; j < v.size(); j++)
      {
         if (v[j] < v[minIndex])
         {
            minIndex = j;
         }

      swap(v, i, minIndex);
   }
}
```