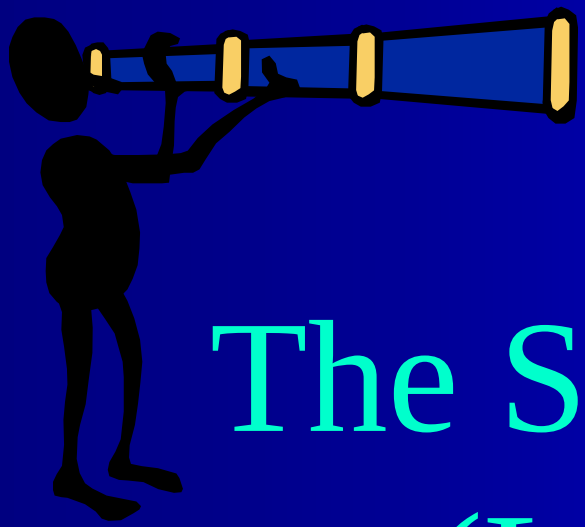

The Sequential Search (Linear Search)

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The Sequential Search Description

The Sequential (or Linear) Search examines the first element in the list and then examines each “sequential” element in the list (in the order that they appear) until a match is found. This match could be a desired word that you are searching for, or the minimum number in the list.

The Sequential Search Variations

Variations on this include: searching a **sorted** list for the first occurrence of a data value, searching a **sorted** list for all occurrences of a data value (or counting how many matches occur: inventory), or searching an **unsorted** list for the first occurrence or every occurrence of a data value.

You may indicate that a match has been found, the number of matches that have been found, or the indices where all the matches have been found.

Sequential Search Algorithm

```
Set index to 0
while index < length
   if list[index] is equal to target then
      return index
   else
      Increment the index by 1
return -1
```

Sequential Search Java

```
int Sequential_Search(int target, int[] list, int length)
{
   int index = 0;
   while (index < length)
      if (list[index] = = target)
         return index;
      else
         index++;
   return -1;
}
```

Sequential Search Java: for loop

```
int Linear_Search (int[ ] list, int searchValue, int length)
{
   for (int index = 0; index < length; index ++)
      if (list[index ] == searchValue)
         return index ;
   return -1;
}
```

Sequential Search C + +

```
int search(int target, const apvector<int> &v)
{
   int index = 0;
   while (index < v.length())
      if (v[index] = = target)
         return index;
      else
         ++index;
   return -1;
}
```

A More Efficient Sequential Search Algorithm

Set index to 0 (zero)
Set found to false
While index < length and not found do
    If list[index] is equal to target then
        set found to be true
    Else
        Increment the index by 1 (one)
If found then
    return index
Else
    Return -1 (negative one)

A Sequential Search Java

```
int Sequential_Search(int target, int[] list, int length)
{
    int index = 0;
    boolean found = false;
    while((index < length) && ! found)
        if (list[index] = = target)
          found = true;
        else
          index++;
    if (found)
        return index;
    else
        return -1
}
```

A Sequential Search C + +

```
int Sequential_Search(int target, apvector <int> &list, int length)
{
    int index = 0;
    bool found = false;
    while((index < length) && ! found)
        if (list[index] = = target)
           found = true;
        else
           ++index;
    if (found)
        return index;
    else
        return -1
}
```

The Sequential Search Java Variation #1

If the list is sorted, we can improve this code by adding the following extended if statement:

```
if (list[index] = = target)
        found = true;
else if (list[index] > target)     //target is not in list
            index = length;
else
        index++;
```

The Sequential Search C + + Variation #1

If the list is sorted, we can improve this code by adding the following extended if statement:

```
if (list[index] = = target)
      found = true;
else if (list[index] > target)    //target is not in list
          index = length;
else
      index++;
```

The Sequential Search Java Variation #2

Whether the list is sorted or not, we can return the number of occurrences of the target in the list:

```
int Occurrences_Of (int target, int [ ] list, int length)
{
        int count = 0;
        for(int index = 0; index < length; index++)
            if (list[index] = = target)
                count++;
        return count;
}
```

The Sequential Search C + + Variation #2

Whether the list is sorted or not, we can return the number of occurrences of the target in the list:

```
int Occurrences_Of (int target, const apvector <int> &list)
{
    int count = 0;
    for(int index = 0; index < list.length(); ++index)
        if (list[index] = = target)
            + + count;
    return count;
}
```

The Sequential Search Java Variation #3

Whether the list is sorted or not, we can return the indices of occurrences of the target in the list:

```
void Indices_Of (int target, int [ ] list, int length)
{
   for(int index = 0; index < length; index++)
          if (list[index] = = target)
                System.out.println(“” + target + “ located
                                          at index #  “ + index);
}
```

The Sequential Search C + + Variation #3

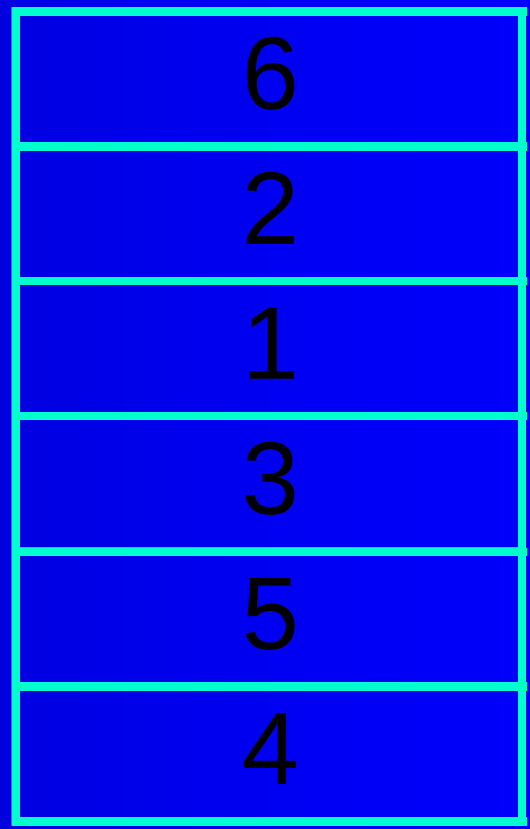
Whether the list is sorted or not, we can return the indices of occurrences of the target in the list:

void Indices_Of (int target, const apvector<int> &list)

```
{
for(int index = 0; index < list.length(); ++index)
        if (list[index] = = target)
            cout<< target << " located at index #  "
                <<index<<endl;
}
```

A Sequential Search Example

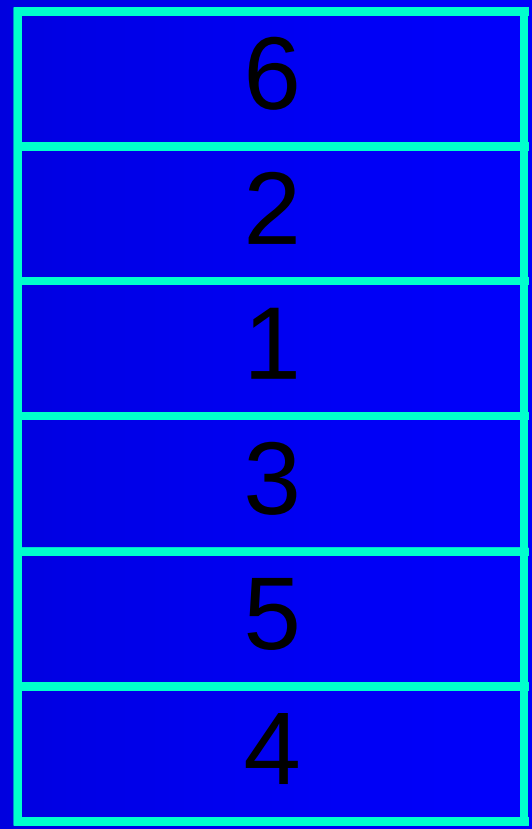
Target ?



We start by searching for the target at the first element in the List and then proceed to examine each element in the order in which they appear.

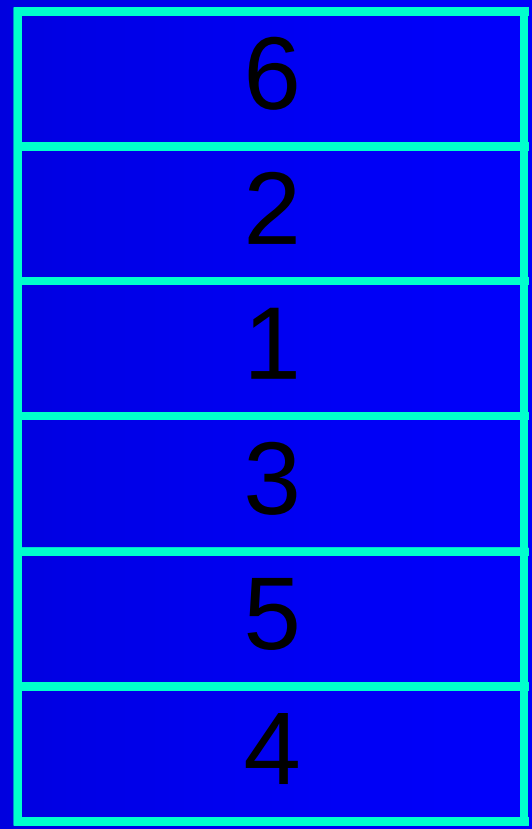
A Sequential Search Example

Target ?



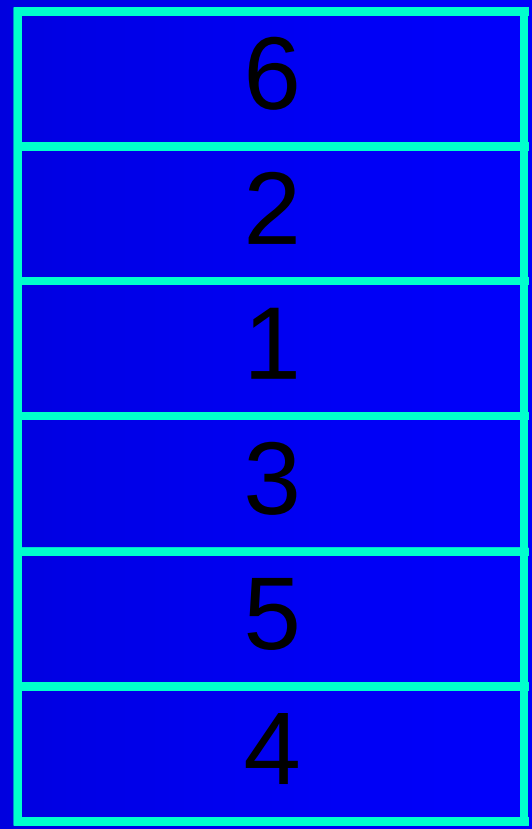
A Sequential Search Example

Target ?



A Sequential Search Example

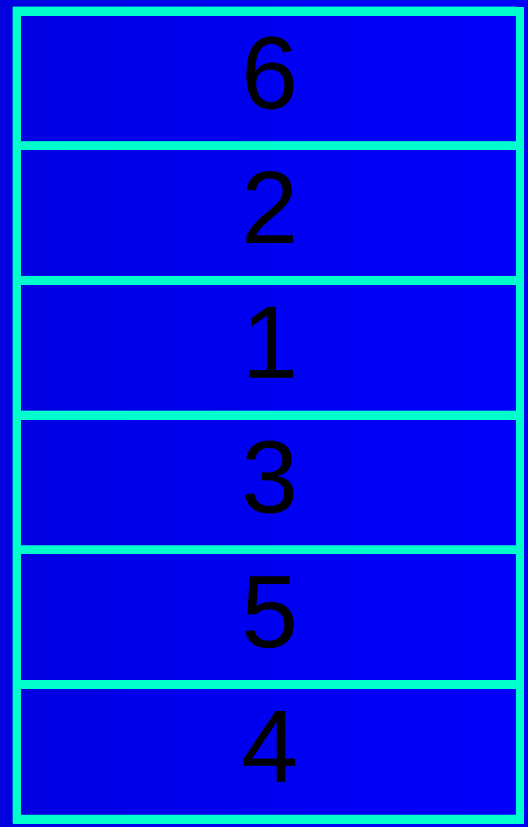
Target ?



A Sequential Search Example

Once the target data item has been found, you may return a Boolean true, or the index where it was found.

Target !



Big - O Notation

Big - O notation is used to describe the efficiency of a search or sort. The actual time necessary to complete the sort varies according to the speed of your system. Big - O notation is an approximate mathematical formula to determine how many operations are necessary to perform the search or sort. The Big - O notation for the Sequential Search is O(n), because it takes approximately n passes to find the target element.