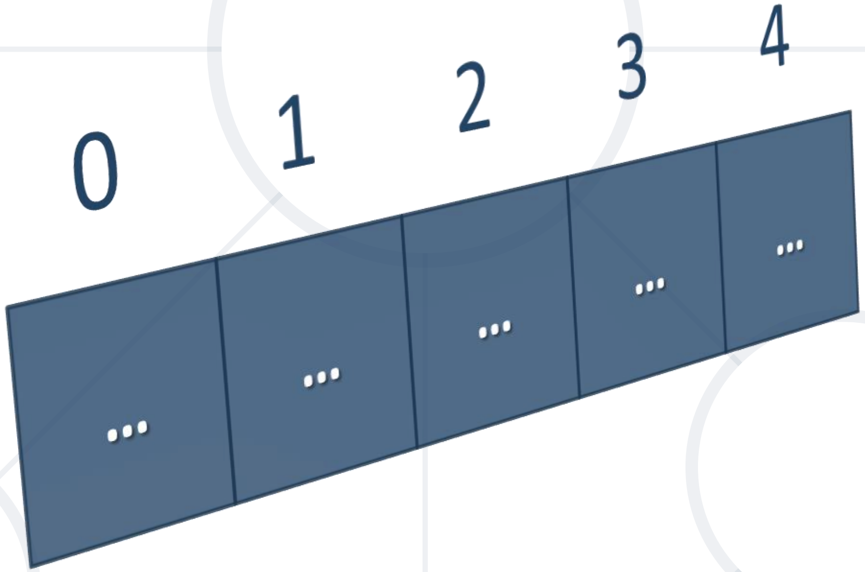
Lists

Processing Variable-Length Sequences of Elements



SoftUni Team

Technical Trainers

Software University

SoftUni

Software University

https://softuni.bg

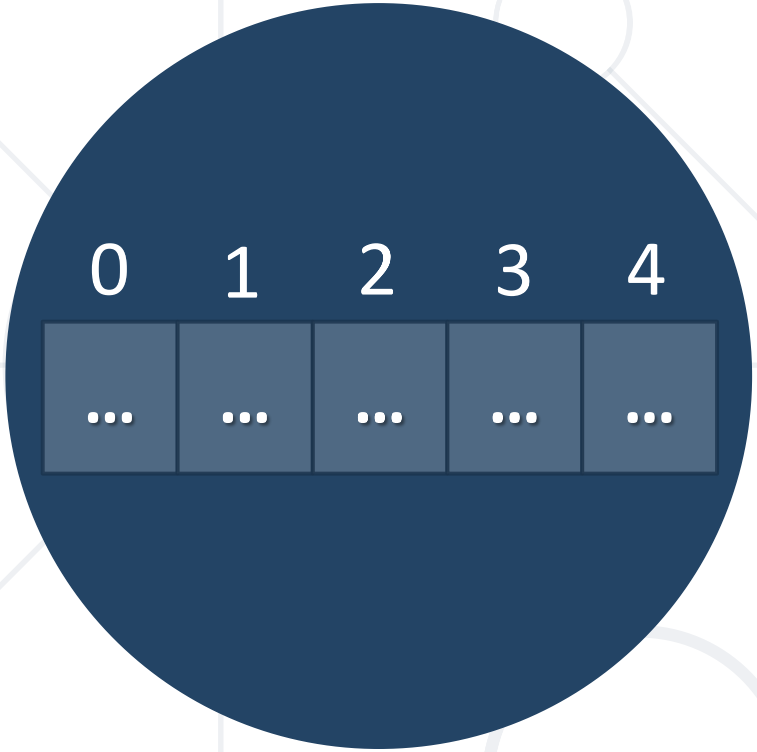
Have a Question?

sli.do

#prgm-for-qa

Table of Contents

1. Lists
2. Reading Lists from the Console
3. Sorting Lists and Arrays



Lists

List<T> – Overview

- List<T> holds a list of elements of the same type

```
List<string> names = new List<string>();
// Create an empty list of strings

names.Add("Peter");

names.Add("Maria");

// Add elements

foreach (var name in names)

   Console.WriteLine(name);

Console.WriteLine(string.Join(", ", names));

// Print elements
```

Creating Lists

- Use the **new** keyword
  - Create an empty list of integers

```
List<int> numbers = new List<int>();
```

  - Using a target-type **new** expression

```
List<string> names = new() {"Peter", "Ana", "Maria"};
```

List<T> – Basic Methods

- Provides operations to **add** / **insert** / **remove** / **find** elements
  - `Add(element)` – adds an element to the `List<T>`
  - `Count` – number of elements in the `List<T>`
  - `Remove(element)` – removes an element (returns `true` / `false`)
  - `Insert(index, element)` – inserts an element to a given index
  - `Contains(element)` – determines whether an element is in the list
  - `Sort()` – sorts the array/list in ascending order

Add() – Appends an Element

- We create an empty list and start adding elements
- The count increases each time we add an element

10

20

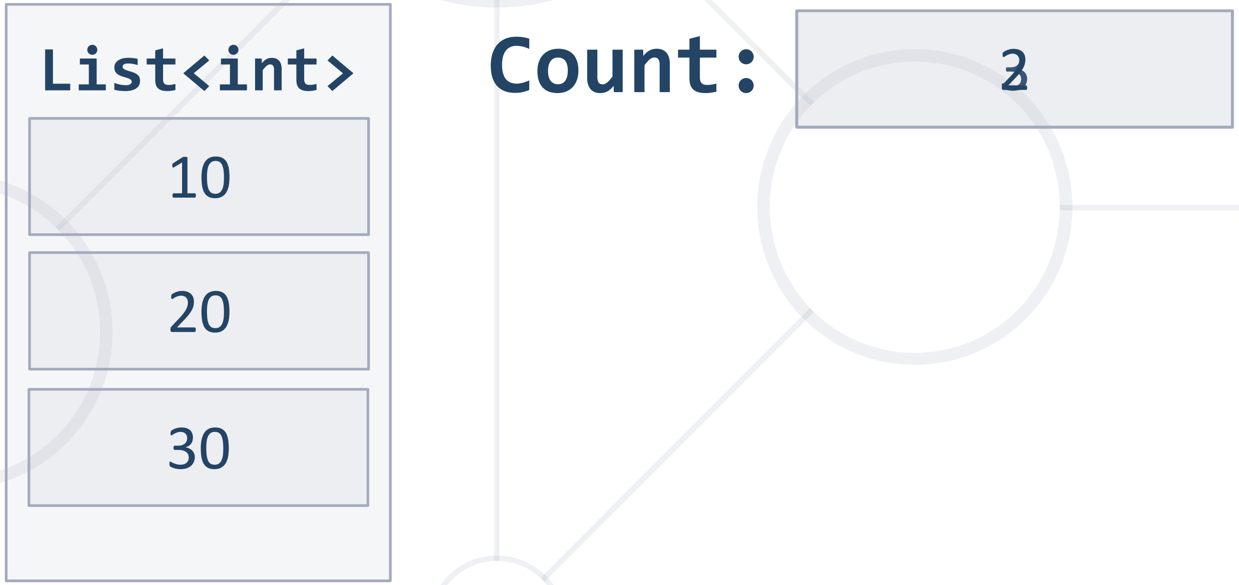
30

`List<int>`

Count: 3

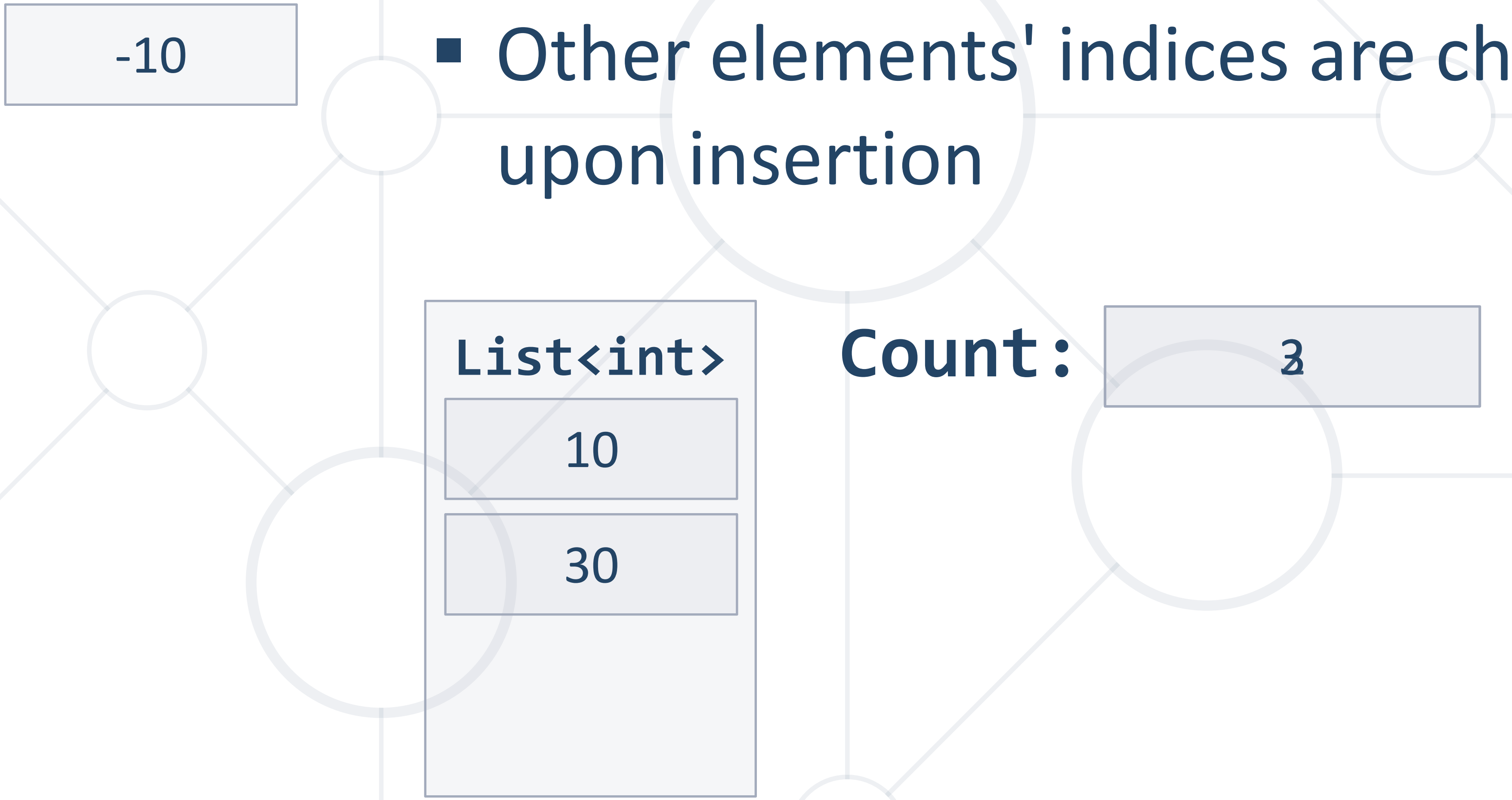
Remove() – Deletes an Element

- We remove an element from the List
- The count decreases each time we remove an element



Insert() – Inserts an Element at Position

- We insert an element at index 1
- Other elements' indices are changed upon insertion


-10

`List<int>`

10

30

Count: 3 2

List<T> – Basic Methods Example

```
List<int> nums = new List<int>
                      { 10, 20, 30, 40, 50, 60 };

nums.Remove(30);

nums.Add(100);

nums.Insert(0, -100);

Console.WriteLine(string.Join(", ", nums));

Console.WriteLine($"Count: {nums.Count}");
```

```
-100, 10, 20, 40, 50, 60, 100
Count: 7
```

Reading Lists from the Console

Using for Loop or String.Split()

Reading Lists from the Console

- First, read from the console the list's **length**

```
int n = int.Parse(Console.ReadLine());
```

- Next, create a list of a given size **n** and read its **elements**

```
List<int> list = new List<int>();
for (int i = 0; i < n; i++)
{
   int number = int.Parse(Console.ReadLine());
   list.Add(number));
}
```

Reading List Values from a Single Line

- Lists can be read from a **single line** of **space separated values**

```
2 8 30 25 40 72 -2 44 56
```

```
string values = Console.ReadLine();
List<string> items = values.Split(' ').ToList();
List<int> nums = new List<int>();
for (int i = 0; i < items.Count; i++)
  nums.Add(int.Parse(items[i]));
```

Convert a collection into List

```
List<int> items = Console.ReadLine()
  .Split(' ').Select(int.Parse).ToList();
```

Read a List of integers

Printing Lists On the Console

- Printing a list using a **for** loop

```
List<string> list = new List<string>() {
  "one", "two", "three", "four", "five", "six"};
for (int index = 0; index < list.Count; index++)
  Console.WriteLine(“list[{0}] = {1}", index, list[index]);
```

- Printing a list using a **string.Join(…)**

```
List<string> list = new List<string>() {
  "one", "two", "three", "four", "five", "six"};
Console.WriteLine(string.Join("; ", list));
```

Sorting Lists and Arrays

Sorting Lists

- Sorting a list == reorder its elements incrementally: **Sort()**
  - Items must be **comparable,** e.g., numbers, strings, dates, …

```
List<string> names = new List<string>()
 {"Peter", "Michael", "George", "Victor", "John" };
names.Sort();

Console.WriteLine(string.Join(", ", names));
// George, John, Michael, Peter, Victor
names.Sort();
names.Reverse();
Console.WriteLine(string.Join(", ", names));
// Victor, Peter, Michael, John, George
```

Sort in natural (ascending) order

Reverse the sorted result

Problem: List of Products

- Read a number n and n lines of products. Print a numbered list of all the products ordered by name.
- Examples:

```
4
Potatoes
Tomatoes
Onions
Apples
```

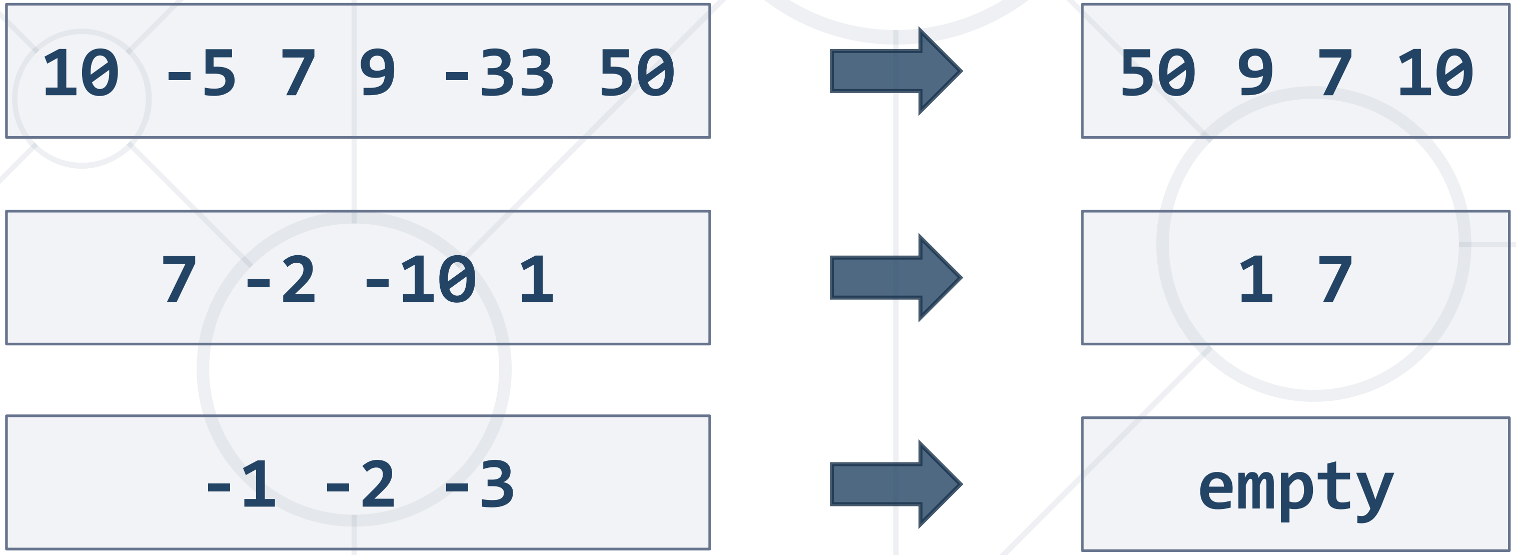
```
1.Apples
2.Onions
3.Potatoes
4.Tomatoes
```

Solution: List of Products

```
int n = int.Parse(Console.ReadLine());
List<string> products = new List<string>();
for (int i = 0; i < n; i++)
{
  string currentProduct = Console.ReadLine();
  products.Add(currentProduct);
}
products.Sort();
for (int i = 0; i < products.Count; i++)
  Console.WriteLine($"{i + 1}.{products[i]}");
```

Problem: Remove Negatives and Reverse

- Read a list of integers, remove all negative numbers from it.
  - Print the remaining elements in reversed order
  - In case of no elements left in the list, print "empty"



10 -5 7 9 -33 50 → 50 9 7 10

7 -2 -10 1 → 1 7

-1 -2 -3 → empty

Solution: Remove Negatives and Reverse

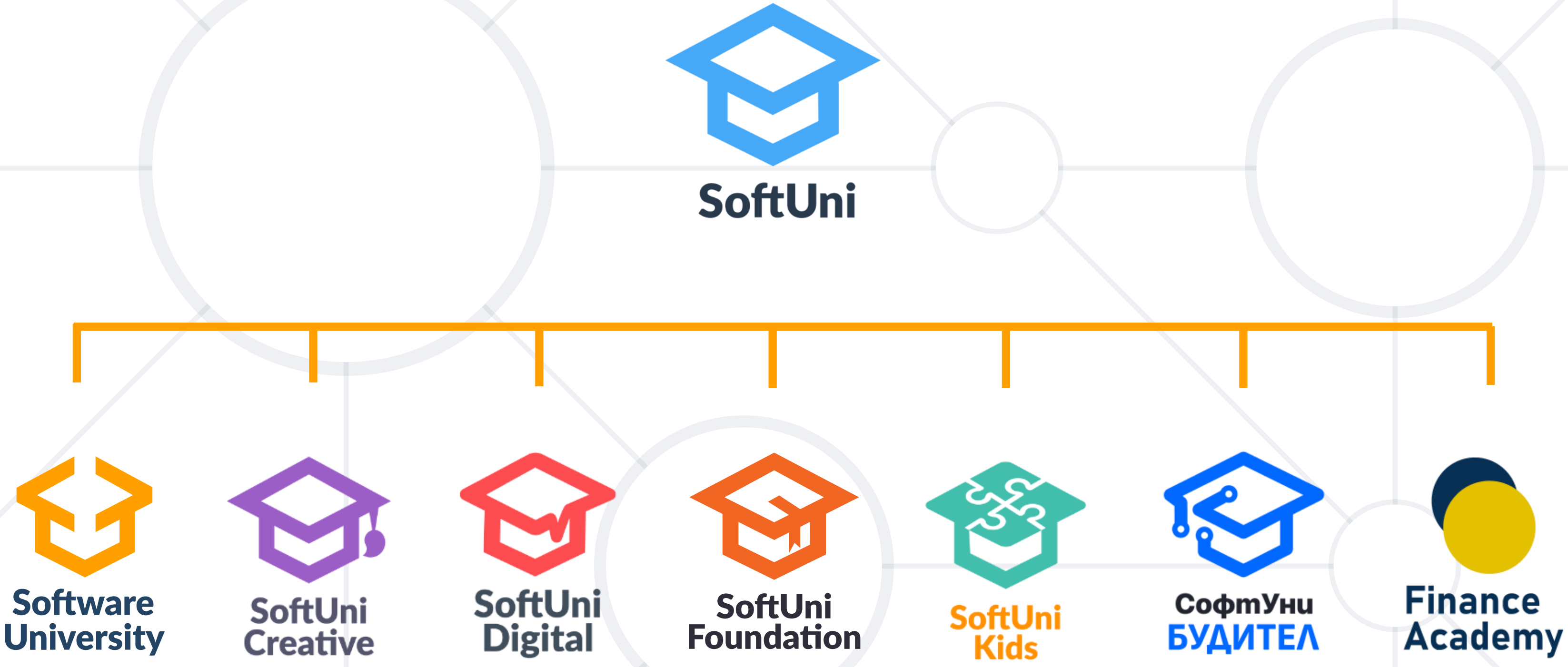
```
List<int> nums = // TODO: Read the List from the console.
for (int i = 0; i < nums.Count; i++)
  if (nums[i] < 0) { nums.RemoveAt(i--); }

nums.Reverse();
if (nums.Count == 0)
 Console.WriteLine("empty");
else
 Console.WriteLine(string.Join(" ", nums));
```

Summary

- Lists hold a sequence of elements
- Can add / remove / insert elements at runtime
- Creating (allocating) a list: new List<T>()
- Accessing list elements by index
- Printing list elements: string.Join(…)

Questions?



SoftUni

Software University

SoftUni Creative

SoftUni Digital

SoftUni Foundation

SoftUni Kids

СофтУни БУДИТЕЛ

Finance Academy

SoftUni Diamond Partners

SmartIT

createX

VIVACOM

INDEAVR
Serving the high achievers

Coca-Cola HBC
Bulgaria

Postbank
Решения за твоето утре

AMBITIONED

SOFTWARE
GROUP

SUPER
HOSTING
.BG

DRAFT
KINGS

PHAR
VISION

Trainings @ Software University (SoftUni)

- Software University – High-Quality Education, Profession and Job for Software Developers
  - softuni.bg, about.softuni.bg
- Software University Foundation
  - softuni.foundation
- Software University @ Facebook
  - facebook.com/SoftwareUniversity

License