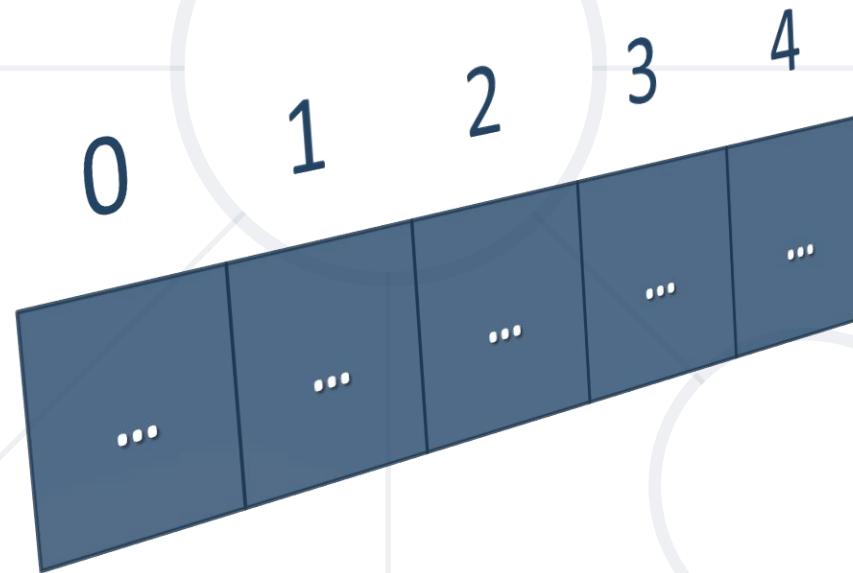


# Arrays

Fixed-Size Sequences of Elements



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Have a Question?



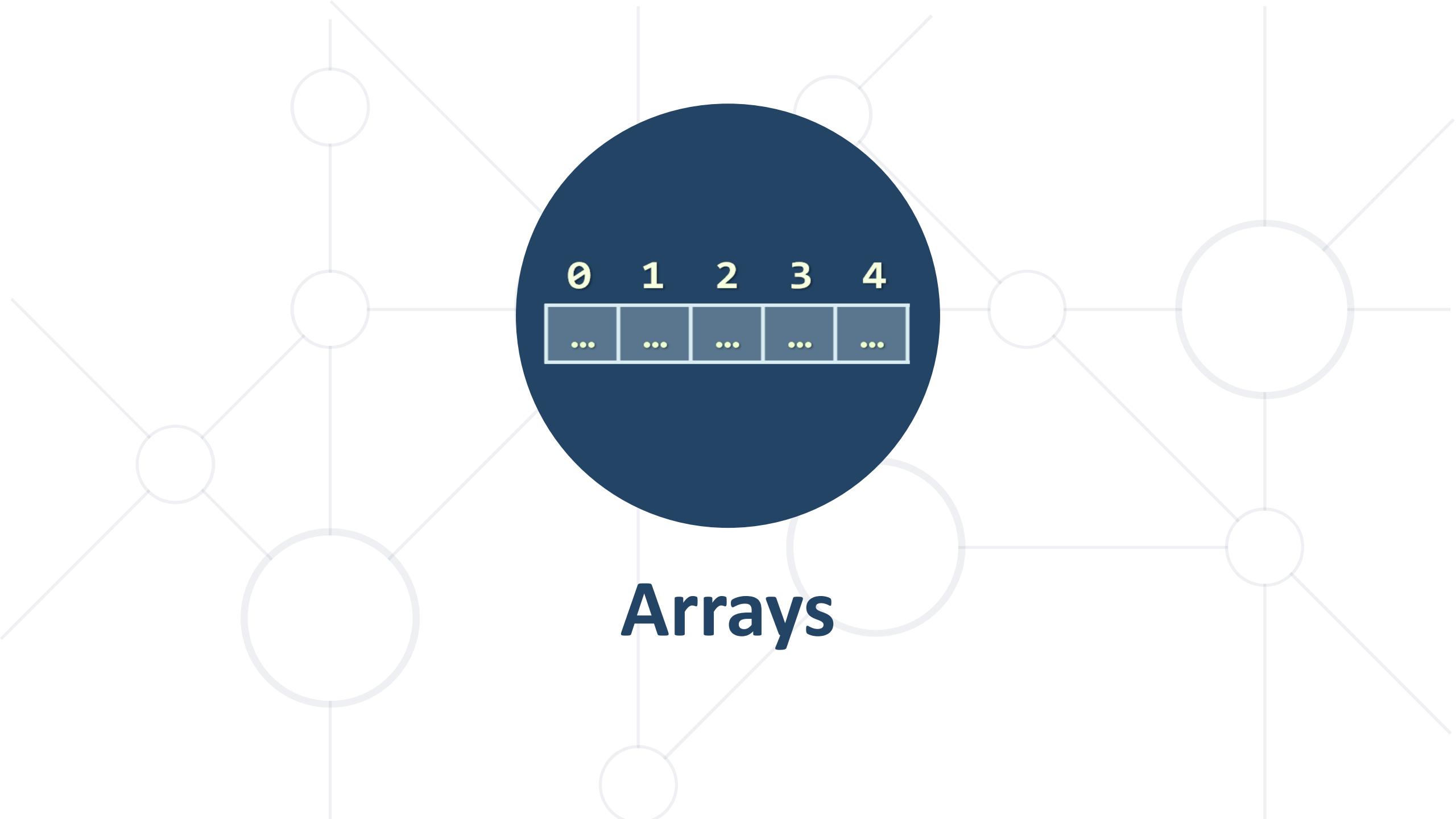
**sli.do**

**#fund-csharp**

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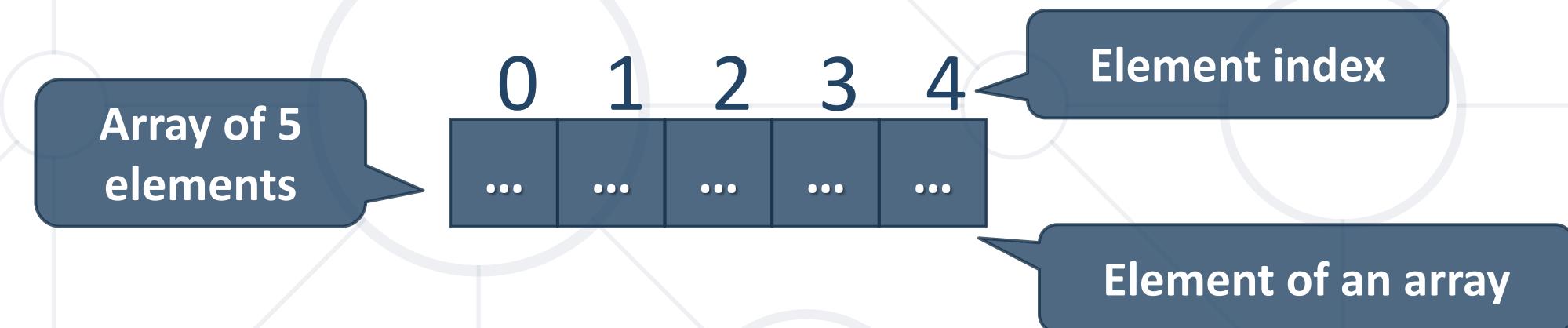
**0 1 2 3 4**

...	...	...	...	...
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**Arrays**

# What Are Arrays?

- In programming, an **array** is a **sequence of elements**



- Elements are numbered from **0** to **Length-1**
- Elements are of the **same type** (e.g., integers)
- Arrays have **fixed size (Array.Length)** and cannot be resized

# Creating Arrays

- Use the **new** keyword
  - It is used to create the **array** and initialize the array elements to their default values
  - Allocating an **array** of 10 **integers**

```
int[] numbers = new int[10];
```

All elements are initially == 0
  - An array that stores **string** elements can be declared in the same way

```
string[] names = new string[10];
```

All elements are initially == null



# Working with Arrays

- **Assigning values** to the array elements
  - The **Length** holds the number of array elements

```
for (int i = 0; i < numbers.Length; i++)  
    numbers[i] = 1;
```

- **Accessing** array elements by index
  - The **[]** operator accesses elements by index

```
numbers[5] = numbers[2] + numbers[7];  
numbers[10] = 1; // IndexOutOfRangeException
```

# Days of Week – Example

- The days of week can be stored in array of strings

```
string[] days = {  
    "Monday",  
    "Tuesday",  
    "Wednesday",  
    "Thursday",  
    "Friday",  
    "Saturday",  
    "Sunday"  
};
```



Operator	Notation in C#
days[0]	Monday
days[1]	Tuesday
days[2]	Wednesday
days[3]	Thursday
days[4]	Friday
days[5]	Saturday
days[6]	Sunday

# Problem: Day of Week

- Enter a day number [1...7] and print the day name (in English) or "Invalid day!"

Name	Value	Type
days	{string[7]}	string[]
[0]	"Monday"	string
[1]	"Tuesday"	string
[2]	"Wednesday"	string
[3]	"Thursday"	string
[4]	"Friday"	string
[5]	"Saturday"	string
[6]	"Sunday"	string

Check your solution here: <https://judge.softuni.org/Contests/Practice/Index/1202#0>

# Solution: Day of Week

```
string[] days = { "Monday", "Tuesday", "Wednesday",
"Thursday", "Friday", "Saturday", "Sunday" };

int day = int.Parse(Console.ReadLine());

if (day >= 1 && day <= 7)
    Console.WriteLine(days[day - 1]);
else
    Console.WriteLine("Invalid day!");
```

The first day in our array is on index 0, not 1.



# Reading Arrays

Using a For Loop or `string.Split()`

# Reading Arrays from the Console

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

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

- Next, create an array of given size **n** and read its **elements**

```
int[] arr = new int[n];
for (int i = 0; i < n; i++) {
    arr[i] = int.Parse(Console.ReadLine());
}
```

# Reading Array Values from a Single Line

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

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

```
string values = Console.ReadLine();
string[] items = values.Split();
int[] arr = new int[items.Length];
```

```
for (int i = 0; i < items.Length; i++)
    arr[i] = int.Parse(items[i]);
```

**Split()** splits  
by space  
into **string[]**

# Shorter: Reading Array from a Single Line

- Read an array of integers

```
var inputLine = Console.ReadLine();
string[] items = inputLine.Split(", ");
int[] arr = items.Select(int.Parse).ToArray();
```

uses System.Linq;

```
int[] arr = Console.ReadLine().Split(", ")
    .Select(int.Parse).ToArray();
```

Or shorter

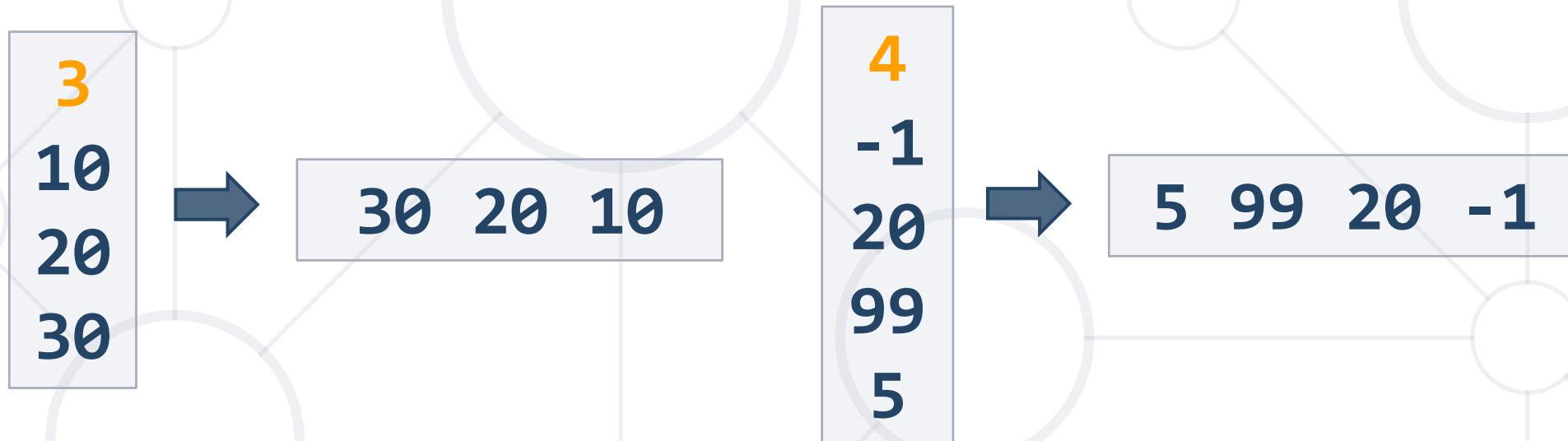
# Printing Arrays On the Console

- To print all array elements, a **for** loop can be used
  - Separate elements with white space or a new line

```
string[] arr = {"one", "two"};
// == new string [2] {"one", "two"};
// Process all array elements
for (int index = 0; index < arr.Length; index++) {
    // Print each element on a separate line
    Console.WriteLine("arr[{0}] = {1}", index, arr[index]);
}
```

# Problem: Print Numbers in Reverse Order

- Read an array of integers (**n** lines of integers), **reverse** it and print its elements on a single line, space-separated:



Check your solution here: <https://judge.softuni.org/Contests/Practice/Index/1202#1>

# Solution: Print Numbers in Reverse Order

```
// Read the array (n Lines of integers)  
  
var n = int.Parse(Console.ReadLine());  
  
var arr = new int[n];  
  
for (int i = 0; i < n; i++)  
    arr[i] = int.Parse(Console.ReadLine());  
  
// Print the elements from the Last to the first  
  
for (int i = n-1; i >= 0; i--)  
    Console.Write(arr[i] + " ");  
  
Console.WriteLine();
```

Check your solution here: <https://judge.softuni.org/Contests/Practice/Index/1202#1>

# Problem: Rounding Numbers

- Read an array of real numbers (space separated), round them in "away from 0" style and print the output as in the examples:

```
0.9 1.5 2.4 2.5 3.14
```

```
0.9 => 1  
1.5 => 2  
2.4 => 2  
2.5 => 3  
3.14 => 3
```



```
-5.01 -1.599 -2.5 -1.50 0
```

```
-5.01 => -5  
-1.599 => -2  
-2.5 => -3  
-1.50 => -2  
0 => 0
```



# Solution: Rounding Numbers

- **Rounding** turns each value to the nearest integer

```
double[] nums = Console.ReadLine().Split().Select(double.Parse).ToArray();

int[] roundedNums = new int[nums.Length];
for (int i = 0; i < nums.Length; i++) {
    roundedNums[i] = (int)Math
        .Round(nums[i], MidpointRounding.AwayFromZero);
}
// TODO: Print each number
```

2.5 => 3

# Printing Arrays with for / string.Join(...)

- Use **for** loop

```
int[] arr = { 10, 20, 30, 40, 50};  
for (int i = 0; i < arr.Length; i++)  
    Console.WriteLine(arr[i]);
```

- Use **string.Join(separator, array)**

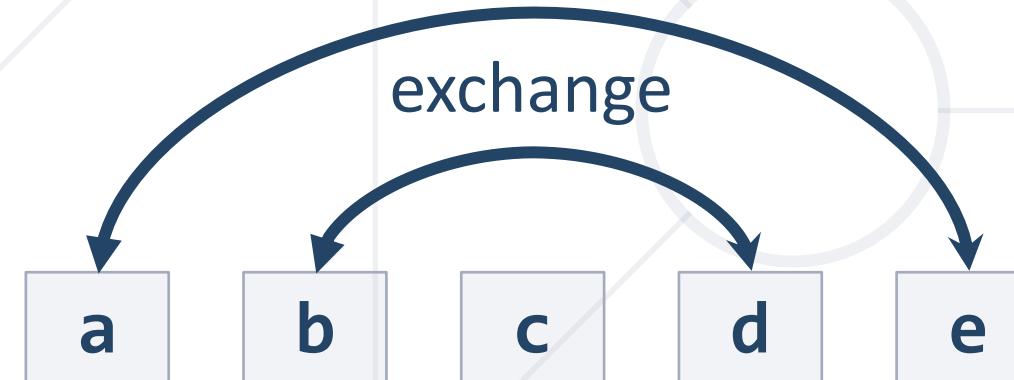
```
int[] arr = { 1, 2, 3 };  
Console.WriteLine(string.Join(", ", arr)); // 1, 2, 3  
  
string[] strings = { "one", "two" };  
Console.WriteLine(string.Join(" - ", strings)); // one - two
```

# Problem: Reverse Array of Strings

- Read an array of strings (space separated values), reverse it and print its elements:



- Reversing array elements:



Check your solution here: <https://judge.softuni.org/Contests/Practice/Index/1202#2>

# Solution: Reverse Array of Strings

```
var items = Console.ReadLine().Split(' ').ToArray();
for (int i = 0; i < items.Length / 2; i++)
{
    var oldElement = items[i];
    items[i] = items[items.Length - 1 - i];
    items[items.Length - 1 - i] = oldElement;
}
Console.WriteLine(string.Join(" ", items));
```

Check your solution here: <https://judge.softuni.org/Contests/Practice/Index/1202#2>



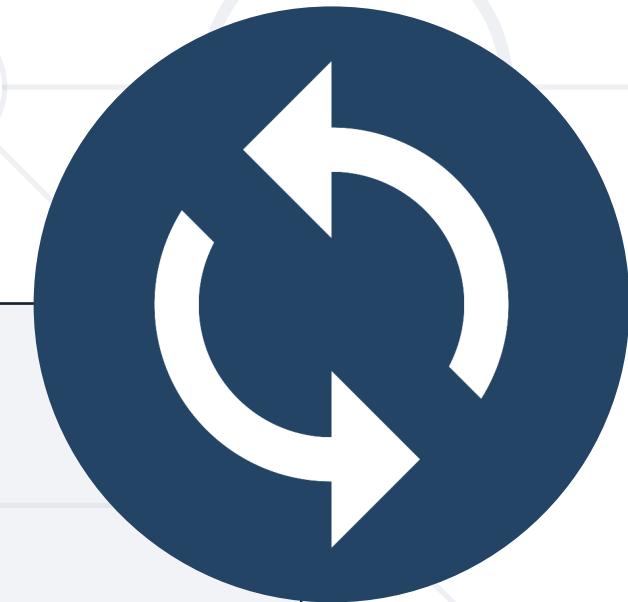
# Foreach Loop

Iterate Through Collections

# Foreach Loop

- **Iterates** through all elements in a collection
- Cannot access the current index
- **Read-only**

```
foreach (var item in collection)
{
    // Process the value here
}
```



# Print an Array with Foreach

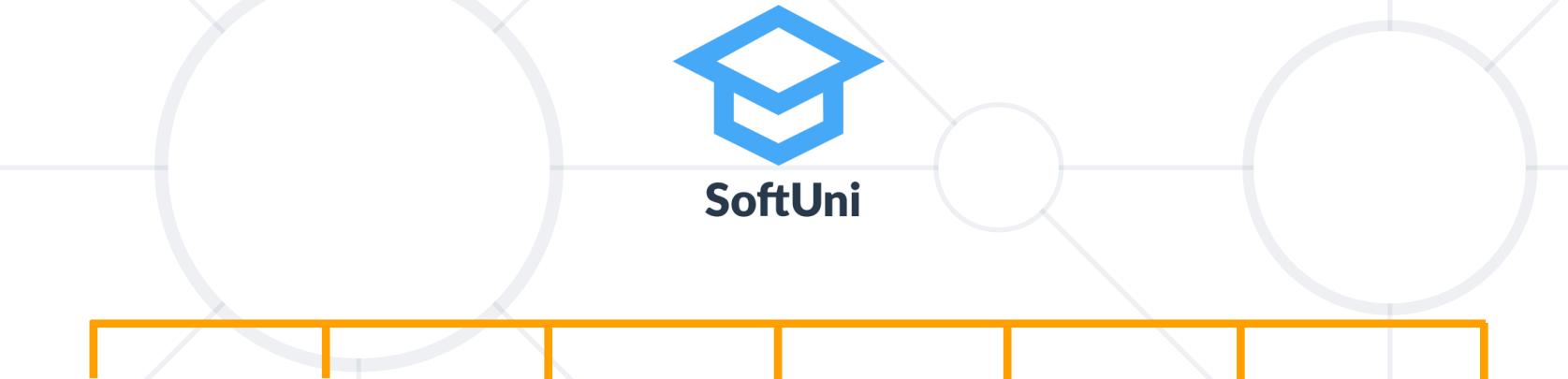
```
int[] numbers = { 1, 2, 3, 4, 5 };
foreach (int number in numbers)
{
    Console.WriteLine($"{number} ");
}
```



- Arrays hold a **sequence** of elements
  - Elements are numbered from **0** to **length-1**
- Creating (allocating) an array
- Accessing array elements by **index**
- Printing array elements



# Questions?



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