Console Input / Output

Reading and Writing to the Console

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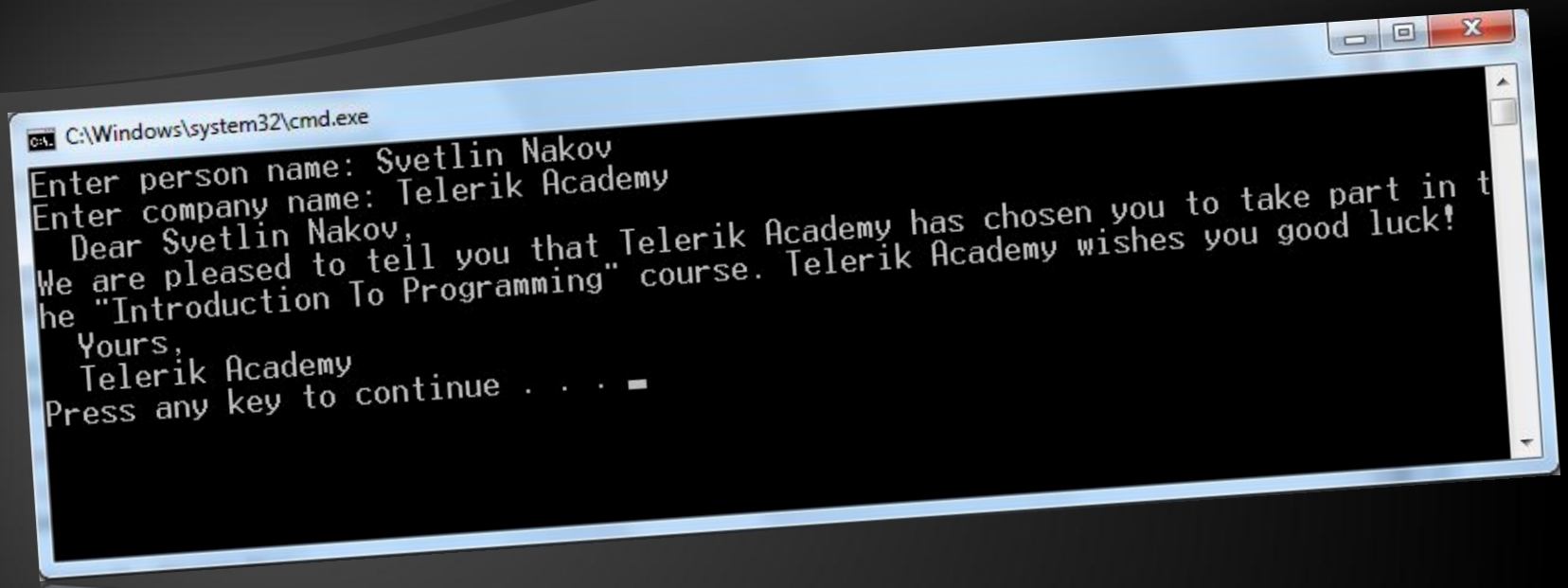


Printing to the Console

Printing Strings, Numeral Types and Expressions

Printing to the Console

- Console is used to display information in a text window
- Can display different values:
  - Strings
  - Numeral types
  - All primitive data types
- To print to the console use the class `Console` (`System.Console`)

The Console Class

- Provides methods for console input and output
  - Input
    - `Read(...)` – reads a single character
    - `ReadKey(...)` – reads a combination of keys
    - `ReadLine(...)` – reads a single line of characters
  - Output
    - `Write(...)` – prints the specified argument on the console
    - `WriteLine(...)` – prints specified data to the console and moves to the next line

Console.Write(…)

- Printing an integer variable

```
int a = 15;
...
Console.Write(a); // 15
```

- Printing more than one variable using a formatting string

```
double a = 15.5;
int b = 14;
...
Console.Write("{0} + {1} = {2}", a, b, a + b);
// 15.5 + 14 = 29.5
```

- Next print operation will start from the same line

Console.WriteLine(…)

- Printing a string variable

```
string str = "Hello C#!";
...
Console.WriteLine(str);
```

- Printing more than one variable using a formatting string

```
string name = "Marry";
int year = 1987;
...
Console.Write("{0} was born in {1}.", name, year);
// Marry was born in 1987.
```

- Next printing will start from the next line

Printing to the Console – Example

```
static void Main()
{
    string name = "Peter";
    int age = 18;
    string town = "Sofia";

    Console.Write("{0} is {1} years old from {2}.",
        name, age, town);
    // Result: Peter is 18 years old from Sofia.
    Console.Write("This is on the same line!");
    Console.WriteLine("Next sentence will be" +
        " on a new line.");

    Console.WriteLine("Bye, bye, {0} from {1}.",
        name, town);
}
```

Using Parameters – Example

```
static void Main()
{
    int a=2, b=3;
    Console.Write("{0} + {1} =", a, b);
    Console.WriteLine(" {0}", a+b);
    // 2 + 3 = 5

    Console.WriteLine("{0} * {1} = {2}",
        a, b, a*b);
    // 2 * 3 = 6

    float pi = 3.14159206;
    Console.WriteLine("{0:F2}", pi); // 3,14

    Console.WriteLine("Bye – Bye!");
}
```

Printing a Menu – Example

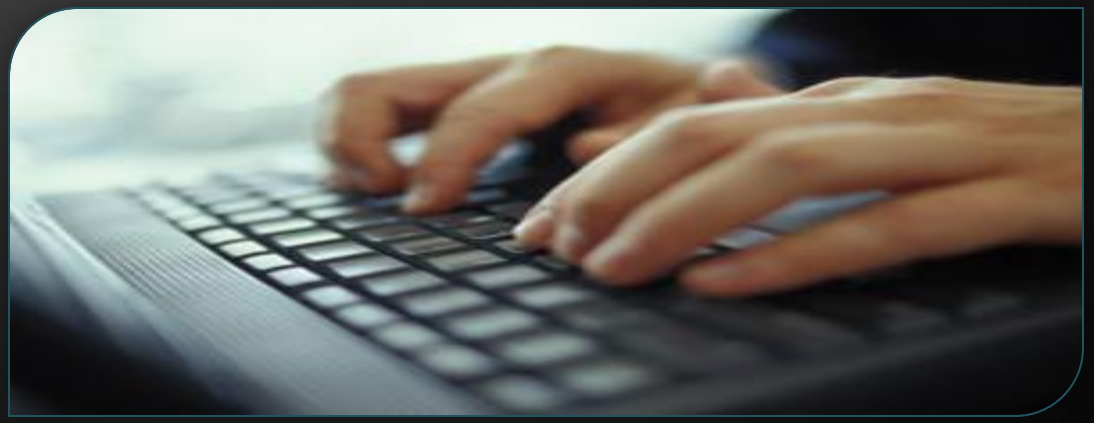
```
double colaPrice = 1.20;
string cola = "Coca Cola";
double fantaPrice = 1.20;
string fanta = "Fanta Dizzy";
double zagorkaPrice = 1.50;
string zagorka = "Zagorka";

Console.WriteLine("Menu:");
Console.WriteLine("1. {0} – {1}",
    cola, colaPrice);
Console.WriteLine("2. {0} – {1}",
    fanta, fantaPrice);
Console.WriteLine("3. {0} – {1}",
    zagorka, zagorkaPrice);
Console.WriteLine("Have a nice day!");
```

Printing to the Console

Live Demo

Reading from the Console

Reading Strings and Numeral Types



Reading from the Console

- We use the console to read information from the command line
- We can read:
  - Characters
  - Strings
  - Numeral types (after conversion)
- To read from the console we use the methods `Console.Read()` and `Console.ReadLine()`

Console.Read()

- Gets a single character from the console (after [Enter] is pressed)
  - Returns a result of type `int`
  - Returns `-1` if there aren't more symbols
- To get the actually read character we need to cast it to `char`

```
int i = Console.Read();
char ch = (char) i;  // Cast the int to char

// Gets the code of the entered symbol
Console.WriteLine("The code of '{0}' is {1}.", ch, i);
```

Reading Characters from the Console

Live Demo

Console.ReadKey()

- Waits until a combination of keys is pressed
  - Reads a single character from console or a combination of keys
- Returns a result of type `ConsoleKeyInfo`
  - `KeyChar` – holds the entered character
  - `Modifiers` – holds the state of [Ctrl], [Alt], …

```
ConsoleKeyInfo key = Console.ReadKey();
Console.WriteLine();
Console.WriteLine("Character entered: " + key.KeyChar);
Console.WriteLine("Special keys: " +  key.Modifiers);
```

Reading Keys from the Console

Live Demo

Console.ReadLine()

- Gets a line of characters
- Returns a `string` value
- Returns `null` if the end of the input is reached

```
Console.Write("Please enter your first name: ");
string firstName = Console.ReadLine();

Console.Write("Please enter your last name: ");
string lastName = Console.ReadLine();

Console.WriteLine("Hello, {0} {1}!",
    firstName, lastName);
```

Reading Strings from the Console

Live Demo

Reading Numeral Types

- Numeral types can not be read directly from the console
- To read a numeral type do the following:
  1. Read a string value
  2. Convert (parse) it to the required numeral type
- `int.Parse(string)` – parses a `string` to `int`

```
string str = Console.ReadLine()
int number = int.Parse(str);

Console.WriteLine("You entered: {0}", number);
```

Converting Strings to Numbers

- Numeral types have a method `Parse(…)` for extracting the numeral value from a string
  - `int.Parse(string)` – `string` → `int`
  - `long.Parse(string)` – `string` → `long`
  - `float.Parse(string)` – `string` → `float`
  - Causes `FormatException` in case of error

```
string s = "123";
int i = int.Parse(s); // i = 123
long l = long.Parse(s); // l = 123L

string invalid = "xxx1845";
int value = int.Parse(invalid); // FormatException
```

Reading Numbers from the Console – Example

```
static void Main()
{
    int a = int.Parse(Console.ReadLine());
    int b = int.Parse(Console.ReadLine());

    Console.WriteLine("{0} + {1} = {2}",
        a, b, a+b);
    Console.WriteLine("{0} * {1} = {2}",
        a, b, a*b);

    float f = float.Parse(Console.ReadLine());
    Console.WriteLine("{0} * {1} / {2} = {3}",
        a, b, f, a*b/f);
}
```

Converting Strings to Numbers (2)

- Converting can also be done using the methods of the Convert class
  - Convert.ToInt32(string) – string int
  - Convert.ToSingle(string)– string float
  - Convert.ToInt64(string)– string long
  - Internally uses the parse methods of the numeral types

```
string s = "123";
int i = Convert.ToInt32(s); // i = 123
long l = Convert.ToInt64(s); // l = 123L

string invalid = "xxx1845";
int value = Convert.ToInt32(invalid); // FormatException
```

Reading Numbers from the Console

Live Demo

Error Handling when Parsing

- Sometimes we want to handle the errors when parsing a number
  - Two options: use `try-catch` block or `TryParse()`
- Parsing with `TryParse()`:

```
string str = Console.ReadLine();
int number;
if (int.TryParse(str, out number))
{
    Console.WriteLine("Valid number: {0}", number);
}
else
{
    Console.WriteLine("Invalid number: {0}", str);
}
```

Parsing with TryParse()

Live Demo

Reading and Printing to the Console

Various Examples

Printing a Letter – Example

```
Console.Write("Enter person name: ");
string person = Console.ReadLine();

Console.Write("Enter company name: ");
string company = Console.ReadLine();

Console.WriteLine("  Dear {0},", person);
Console.WriteLine("We are pleased to tell you " +
    "that {1} has chosen you to take part " +
    "in the \"Introduction To Programming\" " +
    "course. {1} wishes you good luck!",
    person, company);

Console.WriteLine("  Yours,");
Console.WriteLine("  {0}", company);
```

Printing a Letter

Live Demo

Calculating Area – Example

```
Console.WriteLine("This program calculates " +
    "the area of a rectangle or a triangle");

Console.Write("Enter a and b (for rectangle) " +
    " or a and h (for triangle): ");
int a = int.Parse(Console.ReadLine());
int b = int.Parse(Console.ReadLine());

Console.Write("Enter 1 for a rectangle or 2 " +
    "for a triangle: ");

int choice = int.Parse(Console.ReadLine());
double area = (double) (a*b) / choice;
Console.WriteLine("The area of your figure " +
    " is {0}", area);
```

Calculating Area

Live Demo

Summary

- We have discussed the basic input and output methods of the class `Console`
  - `Write(...)` and `WriteLine(...)`
    - Used to write values to the console
  - `Read(...)` and `ReadLine(...)`
    - Used to read values from the console
- Parsing numbers to strings
  - `int.Parse(...)`, `double.Parse(...)`, …

Exercises

1. Write a program that reads 3 integer numbers from the console and prints their sum.
2. Write a program that reads the radius `r` of a circle and prints its perimeter and area.
3. A company has name, address, phone number, fax number, web site and manager. The manager has first name, last name, age and a phone number. Write a program that reads the information about a company and its manager and prints them on the console.

Exercises (2)

4. Write a program that reads two positive integer numbers and prints how many numbers `p` exist between them such that the reminder of the division by `5` is `0` (inclusive). Example: `p(17,25) = 2`.
5. Write a program that gets two numbers from the console and prints the greater of them. Don't use `if` statements.
6. Write a program that reads the coefficients `a`, `b` and `c` of a quadratic equation $ax^2+bx+c=0$ and solves it (prints its real roots).

Exercises (3)

7. Write a program that gets a number n and after that gets more n numbers and calculates and prints their sum.
8. Write a program that reads an integer number n from the console and prints all the numbers in the interval [1..n], each on a single line.
9. Write a program to print the first 100 members of the sequence of Fibonacci: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, …
10. Write a program to calculate the sum (with accuracy of 0.001): 1 + 1/2 - 1/3 + 1/4 - 1/5 + …