

Data types

- Objectives: 1. Explain the need for a range of different data types including Boolean, integer, decimal, date/time, character, string*
- 2. Explain the purpose of data types within code, justify the selection of data structures for given situations*

Most programming languages have built in data types that are used when declaring variables. Some common data types, and the ones you need to know for the exam, are as follows:

| | |
|----------------|-----------------------------------------------------------------|
| byte | 0 .. 255 |
| sbyte | -128 .. 127 |
| short | -32,768 .. 32,767 |
| ushort | 0 .. 65,535 |
| int | -2,147,483,648 .. 2,147,483,647 |
| uint | 0 .. 4,294,967,295 |
| long | -9,223,372,036,854,775,808 .. 9,223,372,036,854,775,807 |
| ulong | 0 .. 18,446,744,073,709,551,615 |
| float | -3.402823e38 .. 3.402823e38 |
| double | -1.79769313486232e308 .. 1.79769313486232e308 |
| decimal | -79228162514264337593543950335 .. 79228162514264337593543950335 |
| char | A Unicode character. |
| string | A string of Unicode characters. |
| bool | True or False. |

Examples of declaration

```
string str = "Hello World!"; // Here we can see an example of declaration of string variable
char symb = 'A';           // Here we can see an example of declaration of char variable
int number = 100;         // Here we can see an example of declaration of integer variable
float = height = 1.68;    // Here we can see an example of declaration of float variable
bool hasDegree = true;  // Here we can see an example of declaration of boolean variable
```

! Notice that we can assign value to a variable in declaration stage

Every data type has its own size

| Data type | Size |
|-----------|--------------------------|
| Byte | Unsigned 8-bit integer |
| Short | Signed 16-bit integer |
| Int | Signed 32-bit integer |
| Float | Signed 16-bit decimal |
| Double | Signed 32-bit decimal |
| Long | Signed 64-bit decimal |
| Char | Unicode 16-bit character |

! We need to remember that it's better to use least memory-expensive type for each variable

Situation 1

We have to declare a **data type** for a variables:

- *numberOfstudentsInGroup*
- *numberOfstudentsInSchool*
- *numberOfstudentsInKazakhstan*

Which one data type we should use for each of them? Try to explain your choice.

What is the difference between integer and float?

- `float` stores floating-point values, that is, values that have potential decimal places
- `int` only stores integral values, that is, whole numbers

So while both are 32 bits wide, their use (and representation) is quite different. You cannot store 3.141 in an integer, but you can in a `float`.

Situation 2

We have to declare a **data type** for a variables:

- *ageOfstudent*
- *averageAgeOfstudent*
- *maxAgeOfstudent*

Which one data type we should use for each of them? Try to explain your choice.

What is the difference between char and string?

`char` is one character. `String` is zero or more characters.

`char` is a primitive type. `String` is a class.

```
char c = 'a';  
String s = "Hi!";
```

Situation 3

We have to declare a **data type** for a variables:

- *genderOfstudent*
- *nameOfstudent*
- *maxAgeOfstudent*

Which one data type we should use for each of them? Try to explain your choice.

DateTime data type

- The DateTime is a value type. It represents an instant in time, typically expressed as a date and time of day.

```
DateTime today;  
  
today = DateTime.Now;  
  
System.Console.WriteLine(today);  
System.Console.WriteLine(today.ToShortDateString());  
System.Console.WriteLine(today.ToShortTimeString());
```

Exercise 1

Using the correct datatype declare variables for a person's:

- Name
- Age
- Gender
- Height(metres)
- Date of Birth
- license (Do they have a driver license)

Exercise 2

- Which of the following declarations correct, which are wrong and why?

```
name = Pete;
```

```
age = "34";
```

```
height = twenty;
```

```
hasChildren = true;
```

Exercise 3

Write assignment statements for the following variables using yourself as an example:

- Name
- Age
- Gender

Exercise 4

- Which of the following declarations correct, which are wrong and why?

1. `char hasElectricWindows;`

2. `string colour;`

3. `int wheelNum;`

4. `string carSpeed;`

Exercise 5

Give two reasons why is it important to get the correct datatypes:

- 1 _____
- 2 _____

Exercise 6

- Write code that asks the user to insert the date of birth. Calculate the age of a student.



Exercise 7

Create a form for a student that will have: name, surname, age, height, group, gender.

The image shows a screenshot of a Windows application window titled "Form1". Inside the window, there is a form titled "STUDENT INFO" in red text. The form consists of several rows, each with a label on the left and a corresponding input field on the right. The fields are: Student ID (text box), Name (text box), Surname (text box), Sex (radio buttons for Female and Male), Date of Birth (calendar control showing 09 Ekim 2013 Çarşamba), Phone Number (text box), E-mail (text box), Class (dropdown menu), Year of Join (dropdown menu), Advisor (dropdown menu), Attendance Status (dropdown menu), Division (dropdown menu), and Sub Division (dropdown menu). The form is styled with a light gray background and a blue border.

| STUDENT INFO | |
|-------------------|---------------------------------------------------------|
| Student ID | <input type="text"/> |
| Name | <input type="text"/> |
| Surname | <input type="text"/> |
| Sex | <input type="radio"/> Female <input type="radio"/> Male |
| Date of Birth | 09 Ekim 2013 Çarşamba |
| Phone Number | <input type="text"/> |
| E-mail | <input type="text"/> |
| Class | <input type="text"/> |
| Year of Join | <input type="text"/> |
| Advisor | <input type="text"/> |
| Attendance Status | <input type="text"/> |
| Division | <input type="text"/> |
| Sub Division | <input type="text"/> |