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.