Data Types in C++*

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Abstract

An introduction to data types within the C++ programming language.

1 General Discussion

Our interactions (inputs and outputs) of a program are treated in many languages as a stream of bytes. These bytes represent data that can be interpreted as representing values that we understand. Additionally, within a program we process this data in various ways such as adding them up or sorting them. This data comes in different forms. Examples include: yourname which is a string of characters; your age which is usually an integer; or the amount of money in your pocket which is usually a value measured in dollars and cents (something with a fractional part). A major part of understanding how to design and code programs in centered in understanding the types of data that we want to manipulate and how to manipulate that data.

"A **type** defines a set of values and a set of operations that can be applied on those values. The set of values for each type is known as the domain for that type."[1] The four major families of data include:

- Nothing
- Integer
- Floating-point
- Complex

The C++ programming language identifies five data types as standard data types:

- Void
- Boolean
- Character
- Integer
- Floating-point

The standard data types and the complex data types within C++ have a series of attributes, which include:

- C++ Reserved or Key Word
- Domain – the allowed values
- Signage – do they allow negative numbers or only positive numbers

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[1] Behrouz A. Forouzan and Richard F. Gilberg, Computer Science A Structured Approach using C++ Second Edition (United States of America: Thompson – Brooks/Cole, 2004) 33.

- Meaning – i.e. What do they represent
- Rules of Definition – What special characters indicate the data type
- Size – in terms of the number of bytes of storage used in the memory
- Operations Allowed – i.e. Which operators can I use on the data type

Placing some of the above into a summary table, we get:

Family	Data Type	Reserved Word	Represents	Standard Type
Nothing	Null or nothing	void	No data	Yes
Integer	Boolean	bool	Logical true and false	Yes
Integer	Character	char	Single characters	Yes
Integer	Integer	int	Whole numbers	Yes
Floating Point	Floating Point	float	Fractional numbers	Yes
Complex	String	string	A sequence (sting them along) of characters	No
Complex	Array	N/A	A collection of elements of the same data type	No
Complex	Pointer	N/A	A value that points to a location (an address) within the data area	No

Table 1

The five standard data types usually exist in most programming languages and act or behave similarly from language to language. Most courses of study for a programming course or language will explain the standard data types first. After they are learned, the complex data types are introduced.

The Boolean, character and integer data types are identified as belonging to the Integer Family. These data types are all represented by integer numbers and thus act or behave similarly.

2 Definitions

Definition 1: data type
Defines a set of values and a set of operations that can be applied on those values.

Definition 2: data type families
1) Nothing 2) Integer 3) Floating-Point 4) Complex

Definition 3: domain
The set of allowed values for a data type.

Definition 4: integer
A data type representing whole numbers.

Definition 5: floating point
A data type representing numbers with fractional parts.