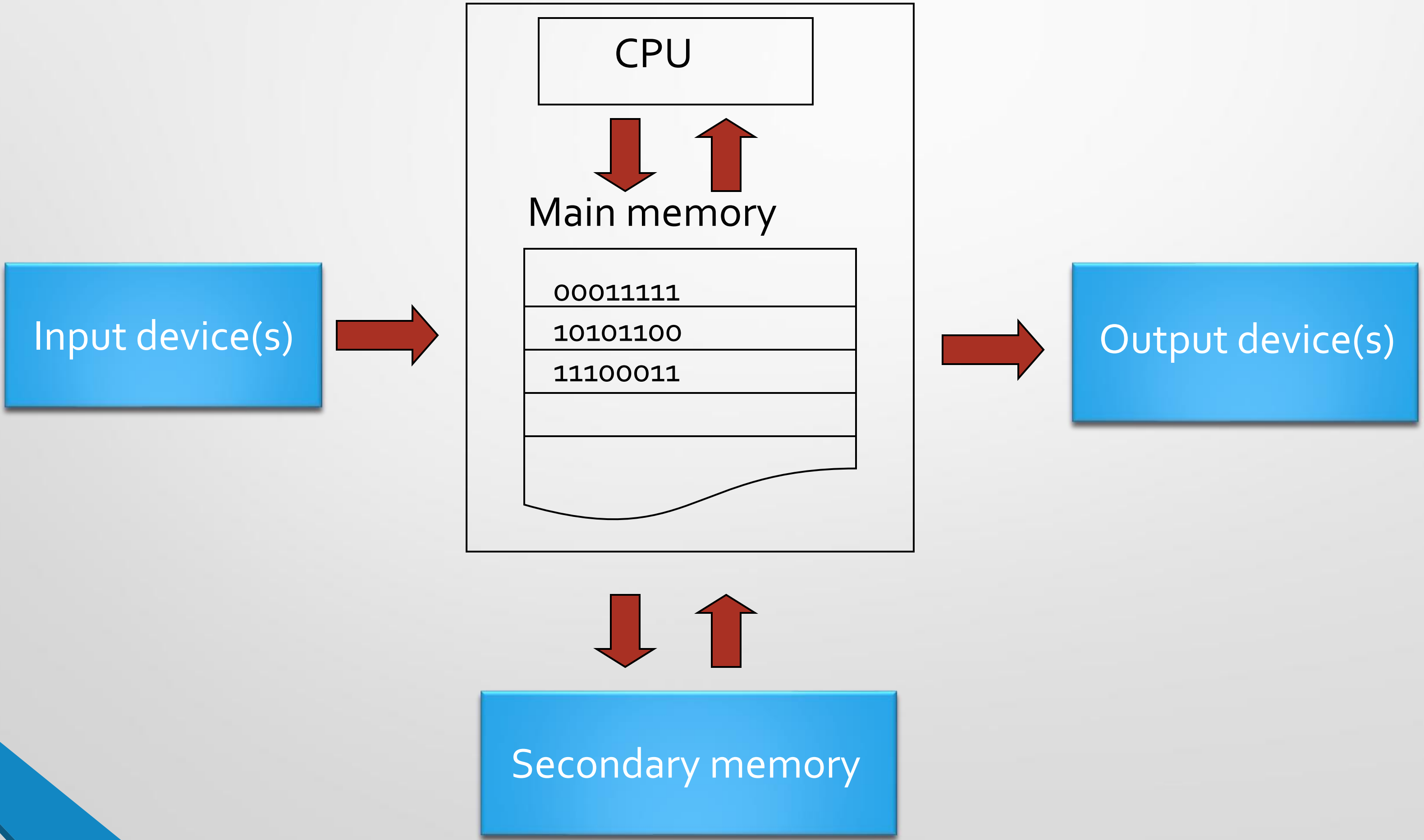
جامعة الملك سعود
King Saud University
1957

Introduction to Computers and C++ Programming

Lecture 1

Outline

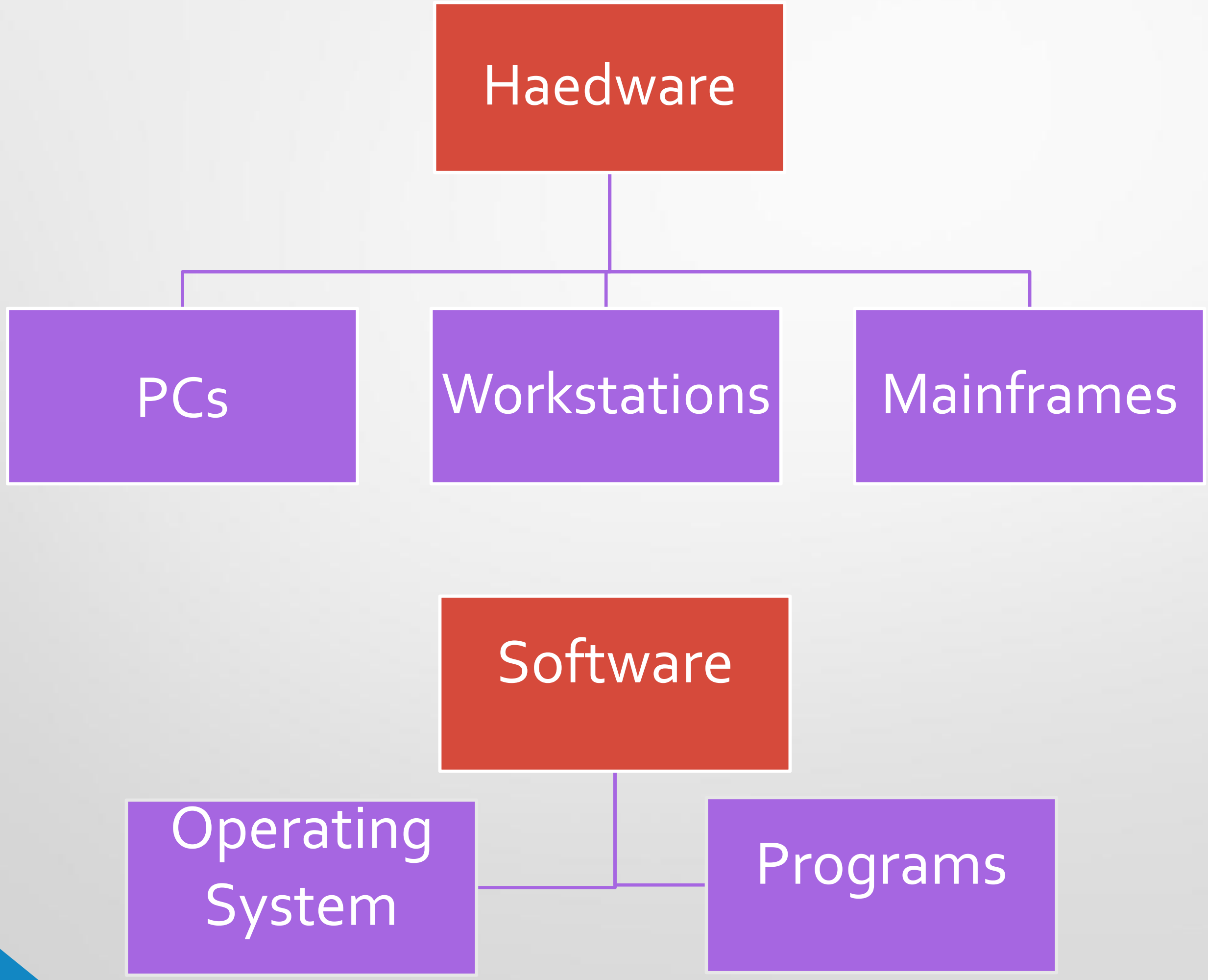
Main Components of a Computer



Bytes and Addresses

- Main memory is divided into numbered locations called bytes.
- The number associated with a byte is called its address.
- A group of consecutive bytes is used as the location for a a data item, such as a number or letter. The address of the first byte in the group is used as the address of this larger memory location.

Computer Systems



Haedware

PCs

Workstations

Mainframes

Software

Operating System

Programs

What is a program?

- A program is set of instructions for a computer to follow
- Whenever we give a computer both a program to follow and some data for the program, we are said to be **running** the program on the data, and the computer is said to **execute** the program on the data.

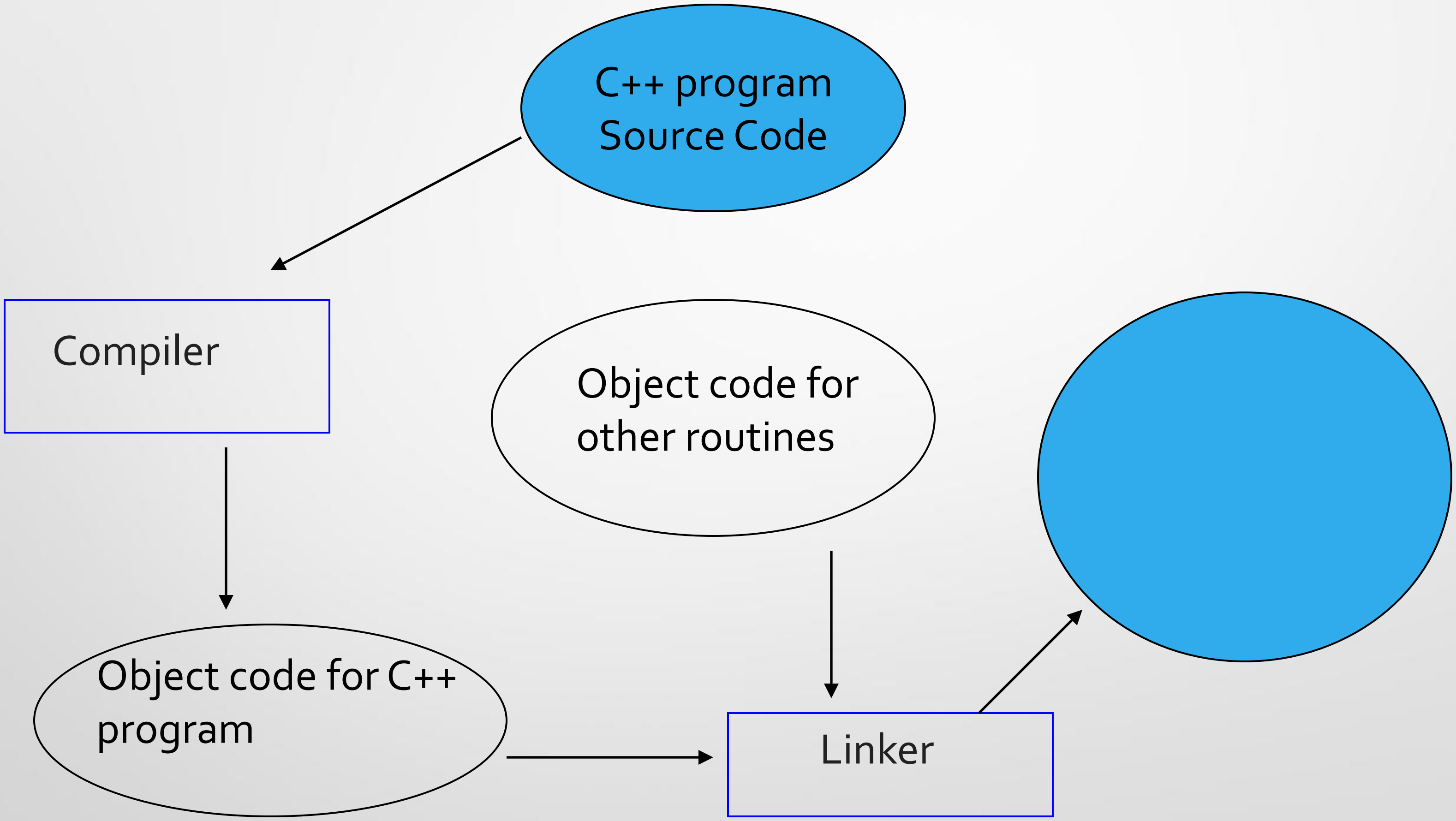
Languages

- High Level Languages
  - C++
  - Java
- Low Level Languages
  - Assembly Language
    - Add X Y Z
  - Machine Language
    - 00011101

Compilers

Programs that translate a high-level language like C++ to a machine-language that the computer can directly understand and execute.

Preparing a C++ program for Running



C++ program Source Code

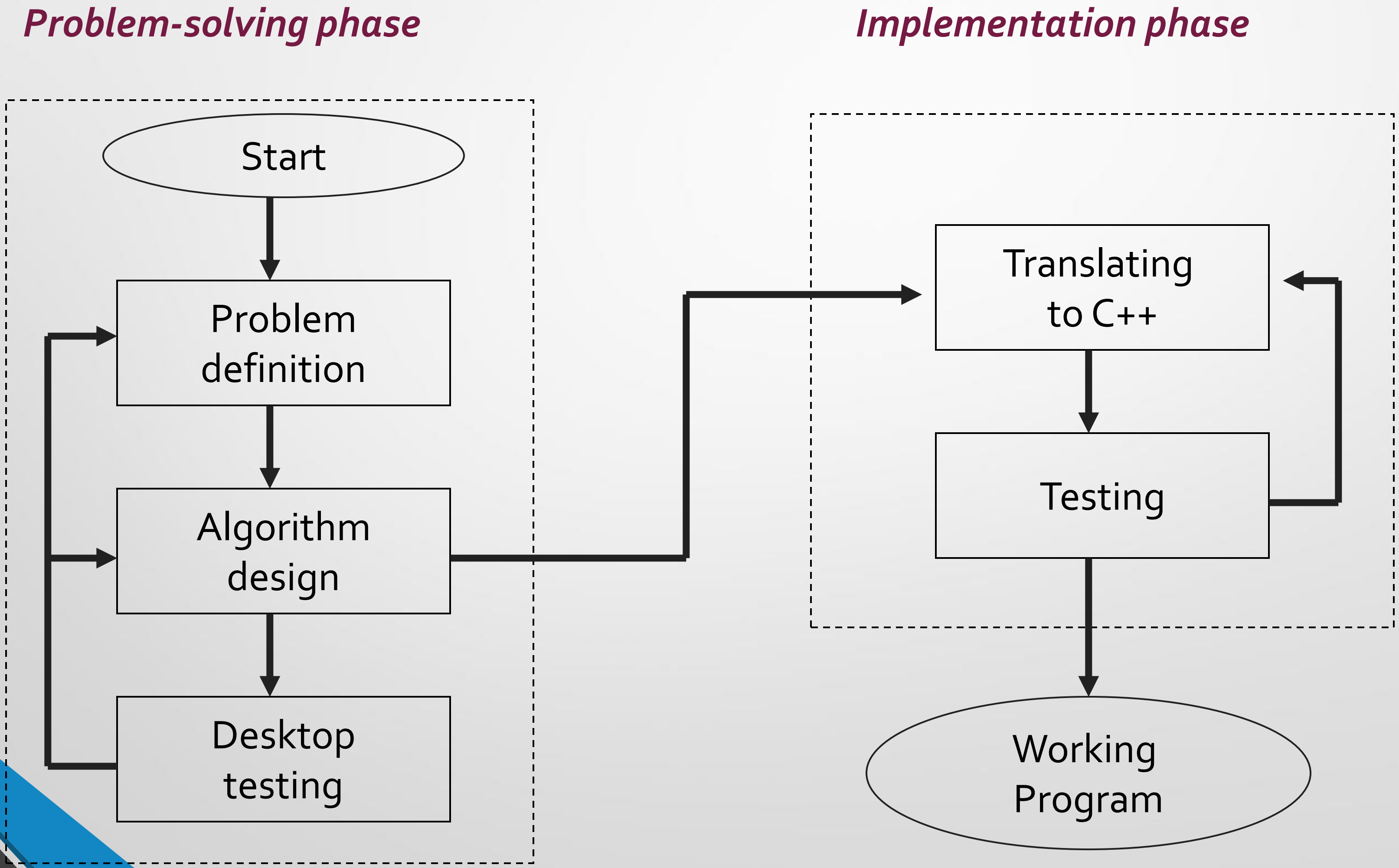
Compiler

Object code for other routines

Object code for C++ program

Linker

Program Design Process


Problem-solving phase

Implementation phase

Start

Problem definition

Algorithm design

Desktop testing

Translating to C++

Testing

Working Program

The Software Development Method

1. Specify the problem requirements.
2. Analyze the problem.

   Input:

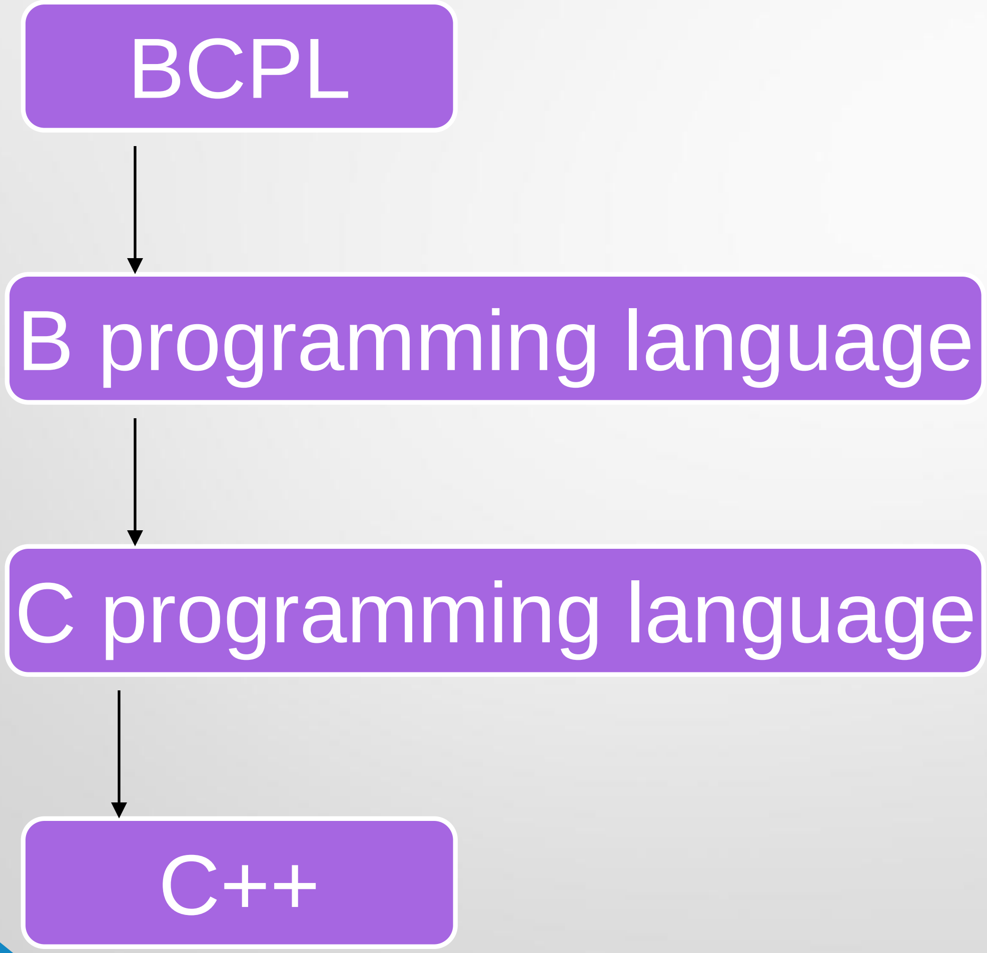
   Output:

   Formulas:
3. Design the algorithm to solve the problem.
4. Implement the algorithm.
5. Test and verify the completed program.
6. Maintain and update the program.

The Software Life Cycle

1. Analysis and specification of the task (problem definition)
2. Design of the software (algorithm design)
3. Implementation (coding)
4. Testing
5. Maintenance and evolution of the system
6. Obsolescense

Introduction to C++



BCPL

B programming language

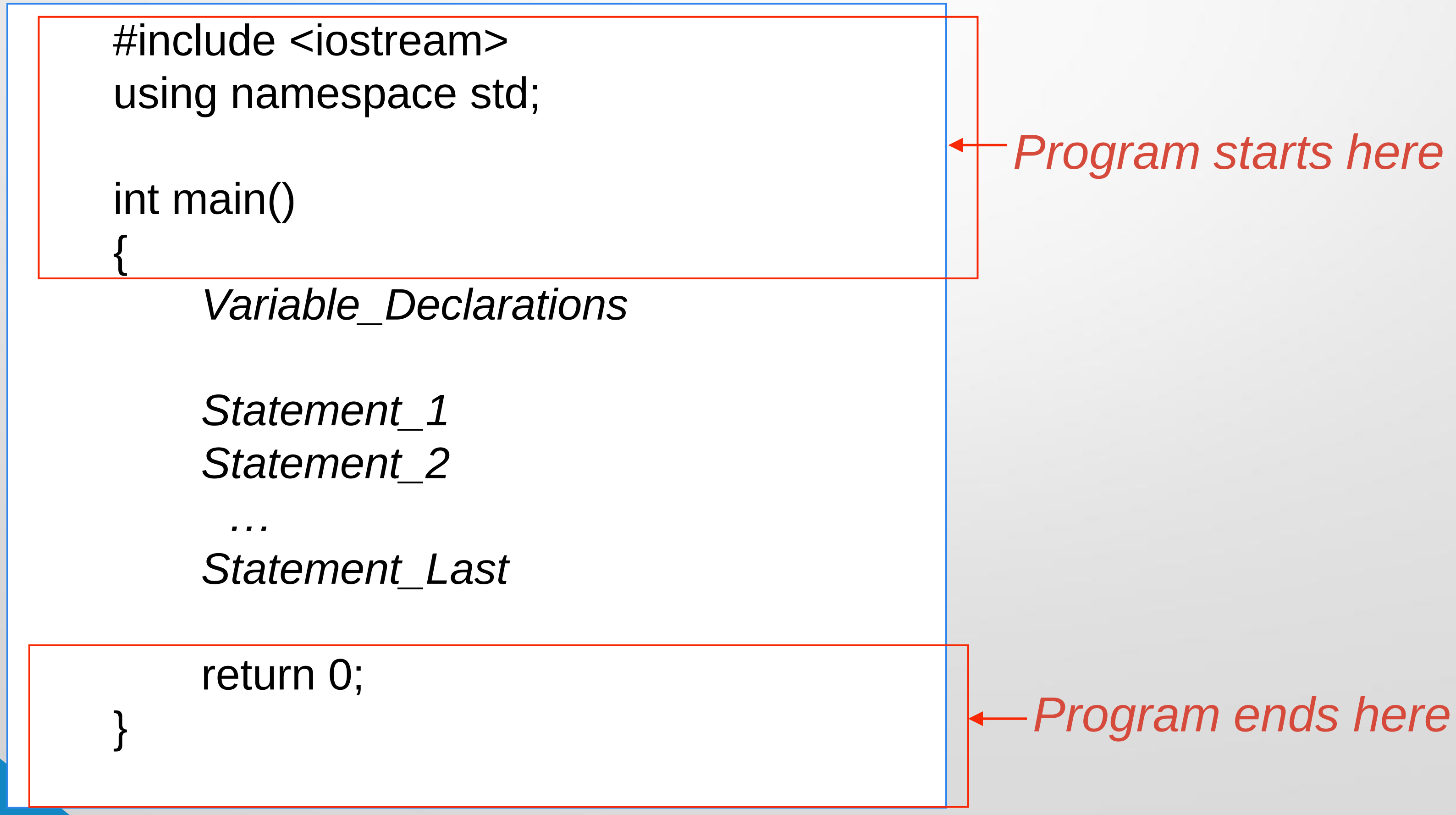
C programming language

C++

- Dennis Ritchie
- 1970s

- Bjarne Stroustrap
- 1980s

Layout of a C++ Program



```
#include <iostream>
using namespace std;

int main()
{
        Variable_Declarations

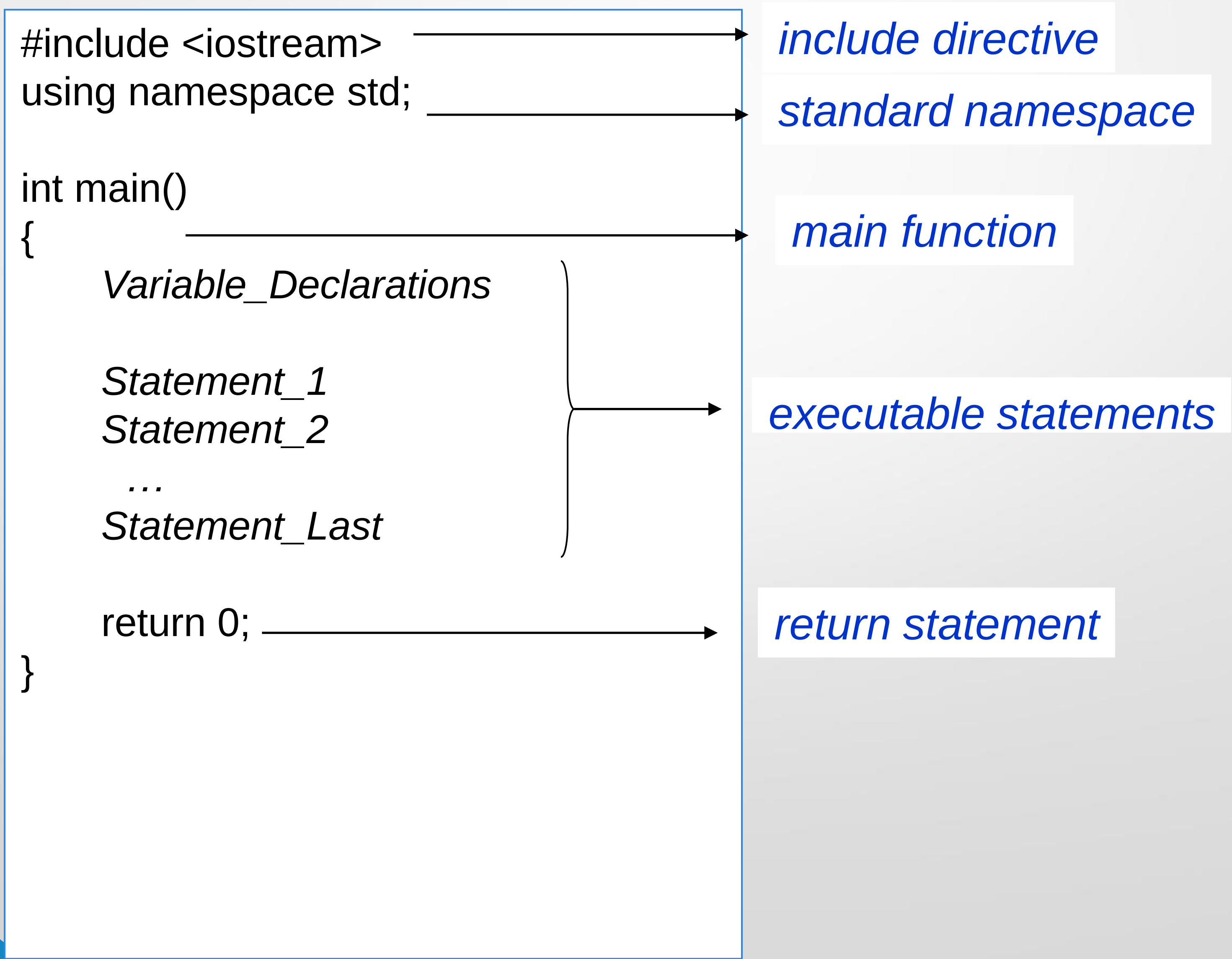
        Statement_1
        Statement_2
          …
        Statement_Last

        return 0;
}
```

Program starts here

Program ends here

Layout of a C++ Program



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using namespace std;

int main()
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    Statement_1
    Statement_2
      …
    Statement_Last

    return 0;
}
```

include directive

standard namespace

main function

executable statements

return statement

Sample C++ Program

```
#include <iostream>
using namespace std;

int main()
{
      int number1, number2, sum;

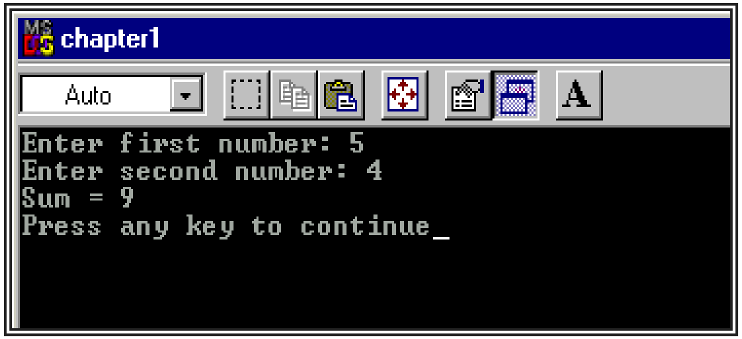
      cout << "Enter first number: ";
      cin  >> number1;

      cout << "Enter second number: ";
      cin  >> number2;

      sum = number1 + number2;

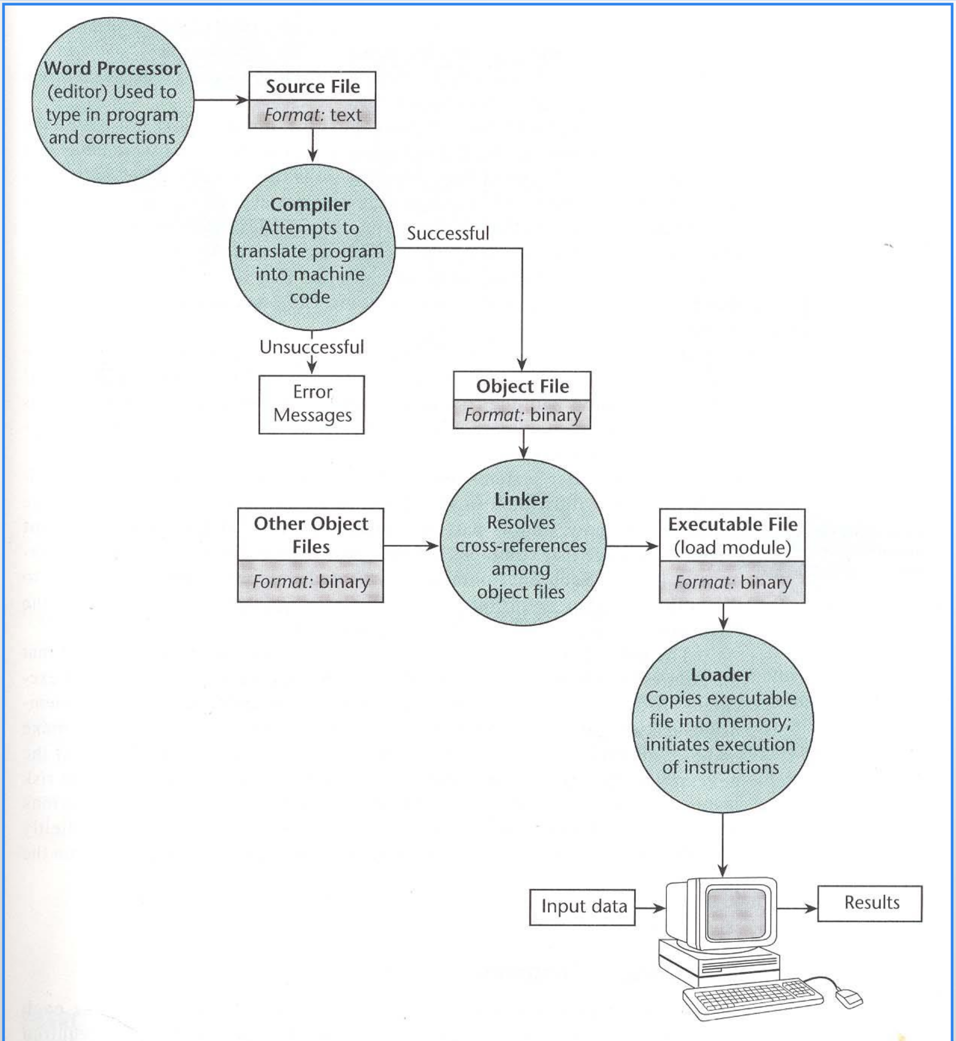
      cout  << "Sum = " << sum << “\n”;

      return 0;
}
```



```
Enter first number: 5
Enter second number: 4
Sum = 9
Press any key to continue_
```

Compiling and Running a C++ Program



Word Processor (editor) Used to type in program and corrections

Source File
Format: text

Compiler Attempts to translate program into machine code

Successful

Unsuccessful

Error Messages

Object File
Format: binary

Other Object Files
Format: binary

Linker Resolves cross-references among object files

Executable File (load module)
Format: binary

Loader Copies executable file into memory; initiates execution of instructions

Input data

Results

Figure 1.11 Entering, Translating, and Running a High-Level Language Program

Testing and Debugging

- Bug

  A mistake/error in the program

- Debugging

  The process of eliminating bugs in a program

Testing and Debugging

- Types of program errors:
  - Syntax errors
    - Violations of the rules of the programming language
  - Run-time errors
    - Detected by computers when the program is run (numeric calcualtions)
  - Logic errors
    - Mistakes in the underlying algorithm or translating the algorithm into C++ language

Sample C++ Program

Try this:

Write a program that displays the product of two integers

```
#include <iostream>
using namespace std;

int main()
{
	int number1, number2, product;

	cout << "Enter first number: ";
	cin  >> number1;

	cout << "Enter second number: ";
	cin  >> number2;

	product =…………………..?

	cout  << “Product = " << product << “\n”;

	return 0;
}
```

Thank You