Data Structures

Library, Format Specifier and Output

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Department of Computer Science and Engineering
Shiv Nadar University

Last Class Summary

- **Variable Declaration**
- **Program**

Remember

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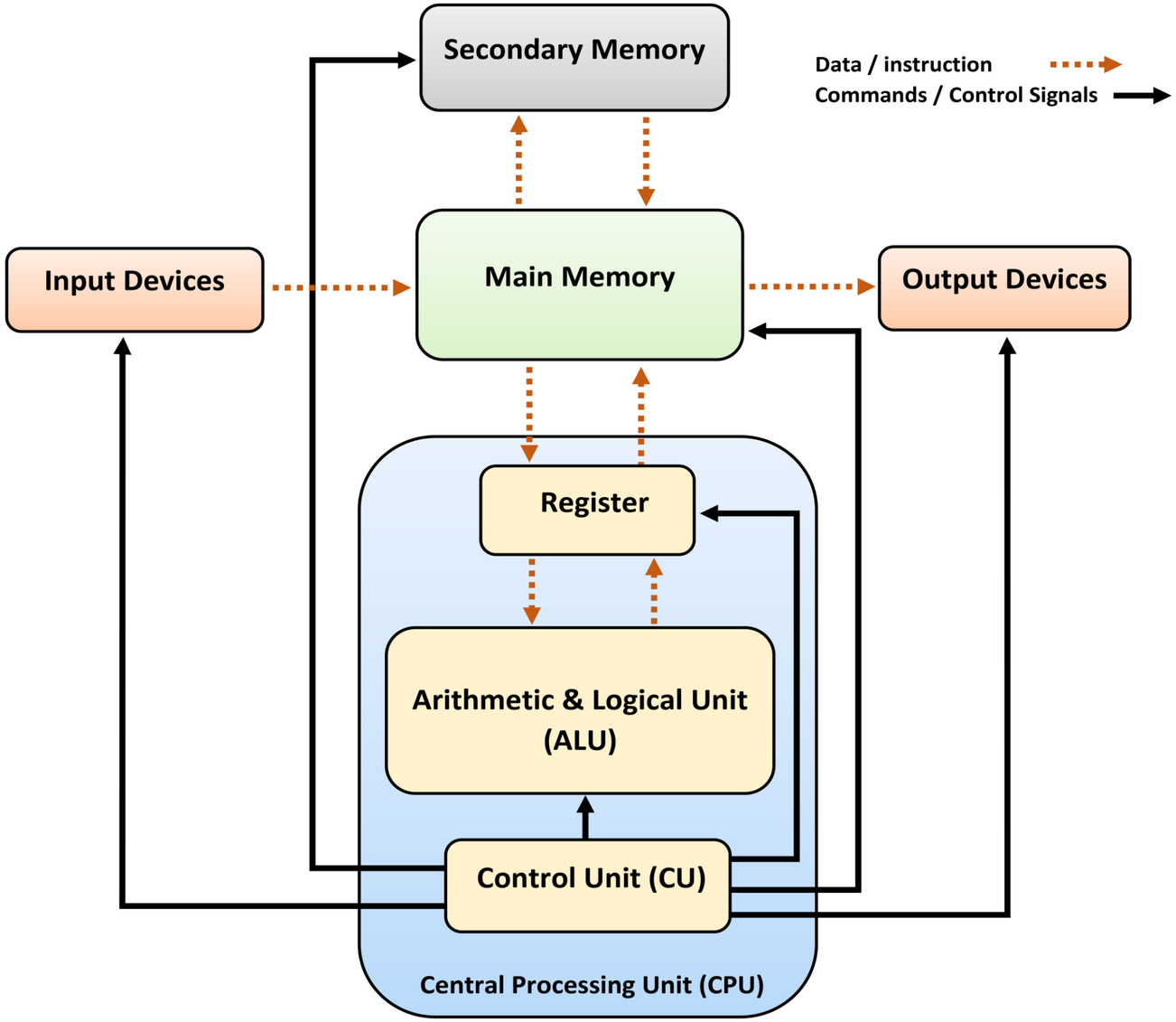
General Parts of a Computer

- **Processor**
- **Memory**
- **Input**
- **Output**



K1

Language

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	English	C
Alphabet	A-Z, a-z	A-Z, a-z
Numbers	0-9	0-9, 0 and 1, 0-7, 0-F
Words	Words	Tokens
Sentences	Grammar + Words = Sentences	Syntax + Tokens = Statements
Paragraph	Paragraph	Block
Chapter/Book	Chapter/Book	Program
Library	Library	Library

K1

Compiler and Linker

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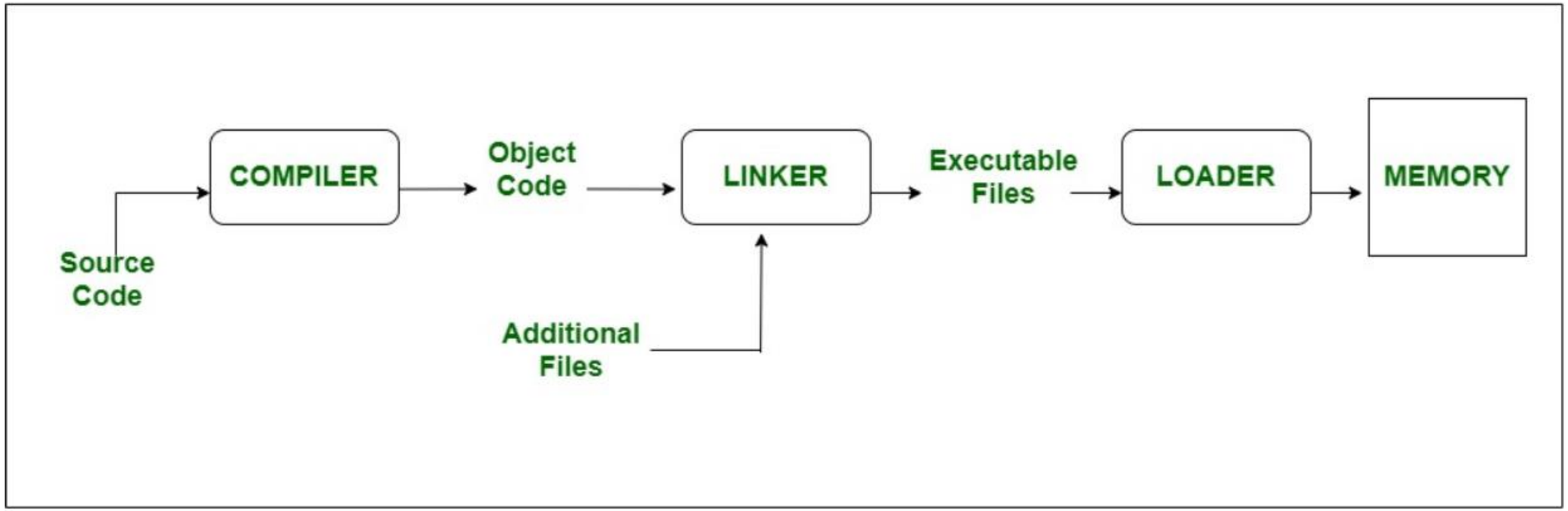
- **Software Programs**
- **People Language Analogy**
- **Machine (Binary) <=> Operating System (Object Codes) <=> C program (Humans)**
- **Compiler and Linker – Between OS and C Program**
- **Compilation Command**
  - **gcc filename.c**
    - **Creates a.out (Ubuntu) and a.exe (Windows)**
  - **gcc filename.c -o obj**
    - **Creates obj.out (Ubuntu) and obj.exe (Windows)**
- **Compilation fails => Compile Time Error**

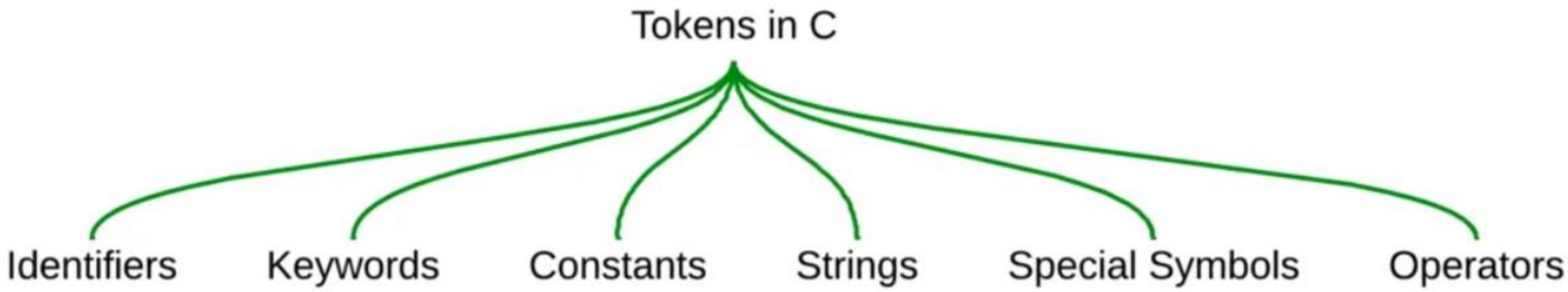
Compiler, Linker and Loader



K1

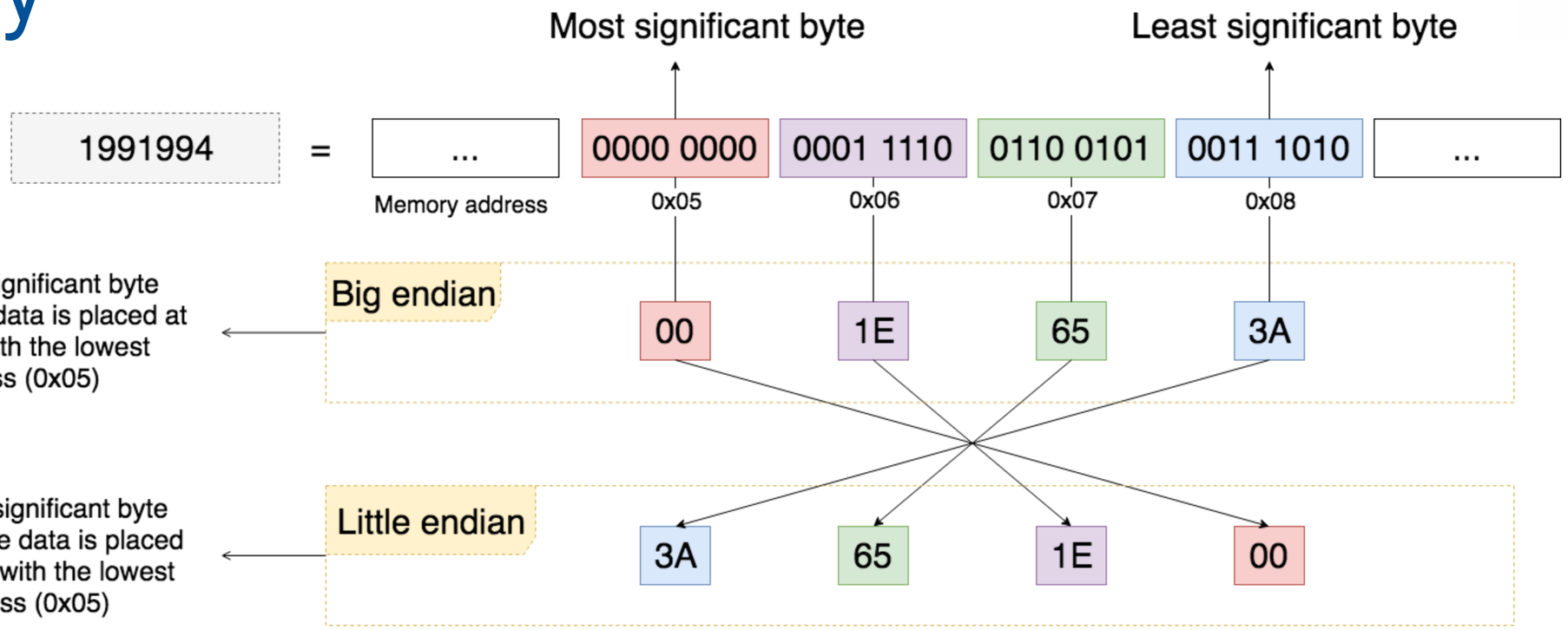
Types of Tokens

- **Tokens – Smallest unit in a program**
  - **Identifiers**
  - **Keywords**
  - **Constants a.k.a., Literals**
  - **Strings**
  - **Special Symbols or Special Characters**
  - **Operators**



K1

Memory



	Address	Big Endian	Little Endian
1991994	1000	0000 0000	0011 1010
	1001	0001 1110	0110 0101
	1002	0110 0101	0001 1110
	1003	0011 1010	0000 0000

K2

Program – Variable Declaration

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- **Declaration Statement**
- **Syntax**
  - **datatype identifier1, .. , identifier n;**
  - **identifier = constants/literals;**
  - **identifier = identifier;**

Keywords

main	**void**	**int**	**float**	**char**	**struct**
double	**union**				

Special Characters

()	**{}**			

K1

Software Development Life-Cycle

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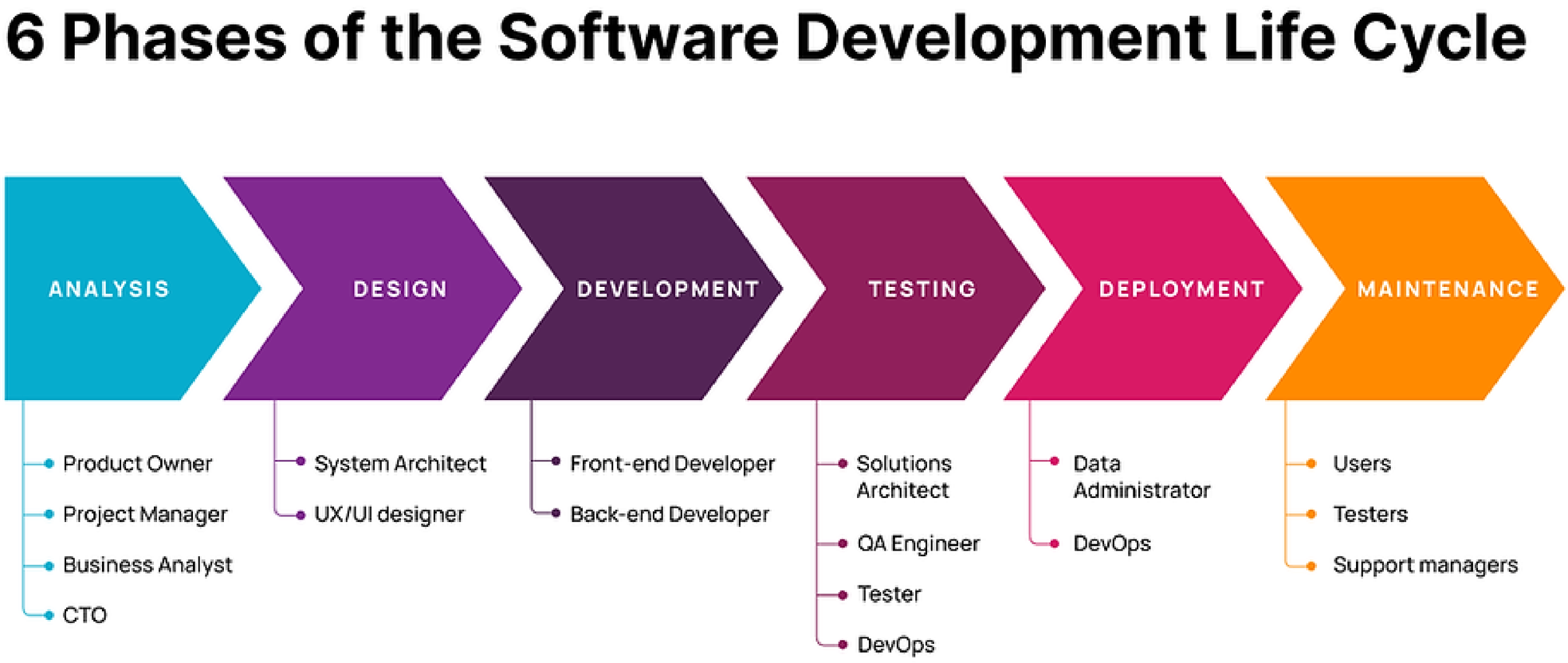


K2

Program

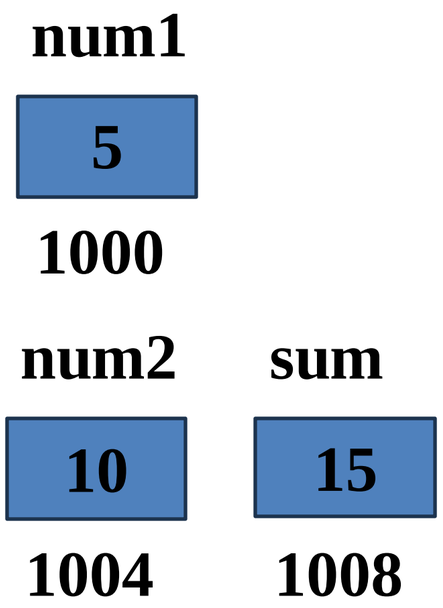
Algorithm 1: Adding two numbers

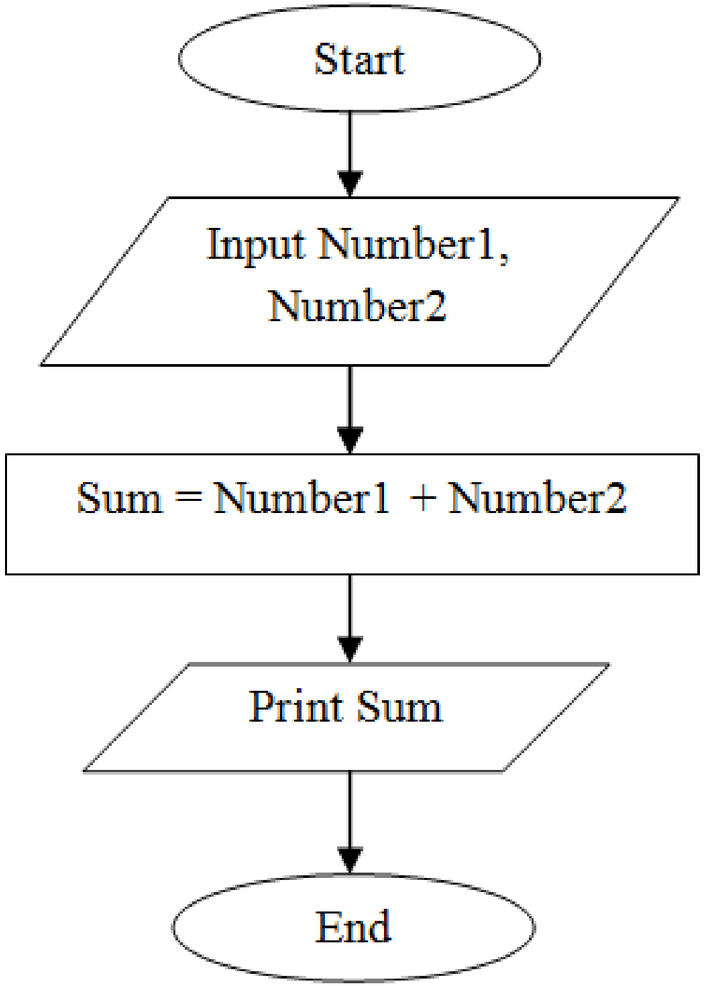
Input: Two numbers num1, num2

Output: Sum of two numbers

1. **sum = num1 + num2**
2. **return sum**

```
void main()
{
    int num1, num2, sum;
    num1 = 5;
    num2 = 10;
    sum = num1 + num2;
}
```





K3

Remember

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Library

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	English	C
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Chapter/Book	Chapter/Book	Program
Library	Library	Library

Library

- **Collection of programs**

Keywords

main	**void**	**int**	**float**	**char**	**struct**
double	**union**				

Special Characters

()	**{}**			

K2

Library

- **Collection of programs**
- **stdio.h - Standard Input/Output**

Keywords

main	void	int	float	char	struct
double	union				

Special Characters

()	{}			

K2

Library

- **Collection of programs**
- **stdio.h - Standard Input/Output**
  - **Header file**
  - **Print and Read from User**
  - **printf**
  - **scanf**

Keywords

main	**void**	**int**	**float**	**char**	**struct**
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Special Characters

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K2

Library

- **Collection of programs**
- **stdio.h - Standard Input/Output**
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  - **printf**
  - **scanf**
- **Add file to a program**

Keywords

main	void	int	float	char	struct
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Special Characters

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K2

Library

- **Collection of programs**
- **stdio.h - Standard Input/Output**
  - **Header file**
  - **Print and Read from User**
  - **printf**
  - **scanf**
- **Add file to a program**
  - **Use include keyword**

Keywords

main	void	int	float	char	struct
double	union	include			

Special Characters

()	{}			

K2

Library

- **Collection of programs**
- **stdio.h - Standard Input/Output**
  - **Header file**
  - **Print and Read from User**
  - **printf**
  - **scanf**
- **Add file to a program**
  - **Use include keyword**
- **Syntax:**
  - **#include <headerfile name>**

Keywords

main	void	int	float	char	struct
double	union	include			

Special Characters

()	{}			

K2

Library

- **Collection of programs**
- **stdio.h - Standard Input/Output**
  - **Header file**
  - **Print and Read from User**
  - **printf**
  - **scanf**
- **Add file to a program**
  - **Use include keyword**
- **Syntax:**
  - **#include <headerfile name>**
- **# - Denotes preprocessor statement**

Keywords

main	void	int	float	char	struct
double	union	include			

Special Characters

()	{}			

K2

Library

- Collection of programs
- stdio.h - Standard Input/Output
  - Header file
  - Print and Read from User
  - printf
  - scanf
- Add file to a program
  - Use include keyword
- Syntax:
  - #include <headerfile name>
- # - Denotes preprocessor statement
- Process starts at main function

Keywords

main	void	int	float	char	struct
double	union	include			

Special Characters

()	{}			

K2

Questions?

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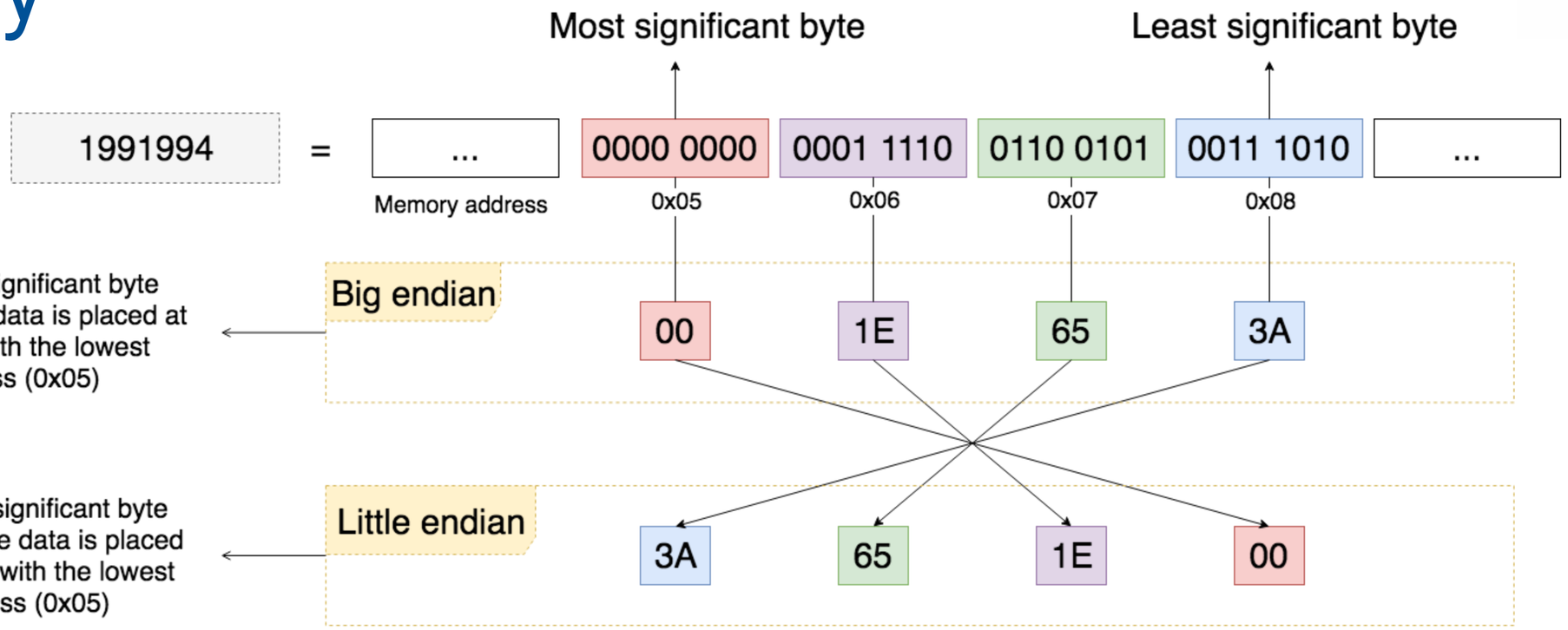
Format Specifier

- **Way to Present Data**

Memory



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	1002	0110 0101	0001 1110
	1003	0011 1010	0000 0000

K2

Format Specifier

- **Way to Present Data**

%d: for printing integers

%f: for printing floating-point numbers

%c: for printing characters

%s: for printing strings

%p: for printing memory addresses

%x: for printing hexadecimal values

Print Formatted - printf

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- **printf - identifier**

Print Formatted - printf

- **printf - identifier**
- **Print "Hello World"**

Print Formatted - printf

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- **printf - identifier**
- **Print "Hello World"**
- **Syntax**
  - **printf ("formatted_string", arguments_list);**

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Print Formatted - printf

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- **printf - identifier**
- **Print "Hello World"**
- **Syntax**
  - **printf ("formatted_string", arguments_list);**
  - **String – Collection of letters (characters)**
  - **Formatted – Format Specifier**
  - **Argument List – Number of variables specified in the format specifier**

Print Formatted - printf

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- **printf - identifier**
- **Print "Hello World"**
- **Syntax**
  - **printf ("formatted_string", arguments_list);**
  - **String – Collection of letters (characters)**
  - **Formatted – Format Specifier**
  - **Argument List – Number of variables specified in the format specifier**
- **Returns the number of characters printed**
  - **Negative value if error**

Print Formatted - printf

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- **printf - identifier**
- **Print "Hello World"**
- **Syntax**
  - **printf ("formatted_string", arguments_list);**
  - **String – Collection of letters (characters)**
  - **Formatted – Format Specifier**
  - **Argument List – Number of variables specified in the format specifier**
- **Returns the number of characters printed**
  - **Negative value if error**
- **printf("Hello World");**

Print Formatted - printf

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- **printf - identifier**
- **Print "Hello World"**
- **Syntax**
  - **printf ("formatted_string", arguments_list);**
  - **String – Collection of letters (characters)**
  - **Formatted – Format Specifier**
  - **Argument List – Number of variables specified in the format specifier**
- **Returns the number of characters printed**
  - **Negative value if error**
- **printf("Hello World");**
- **printf("%d",printf("Hello World"));**

K3

Print Formatted - printf

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- **printf - identifier**
- **Print "Hello World"**
- **Syntax**
  - **printf ("formatted_string", arguments_list);**
  - **String – Collection of letters (characters)**
  - **Formatted – Format Specifier**
  - **Argument List – Number of variables specified in the format specifier**
- **Returns the number of characters printed**
  - **Negative value if error**
- **printf("Hello World");**
- **printf(printf("Hello World"));**
- **Addition of two numbers**

Program

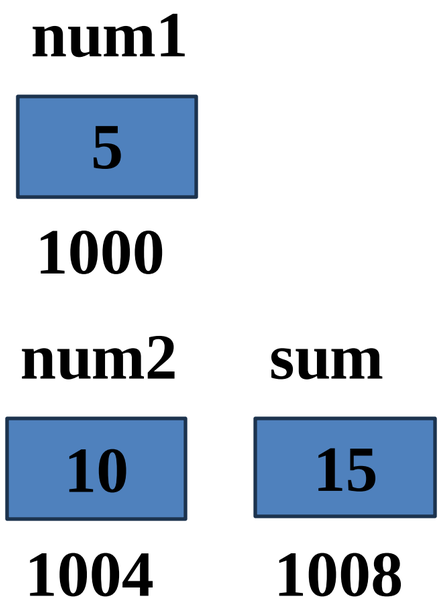
Algorithm 1: Adding two numbers

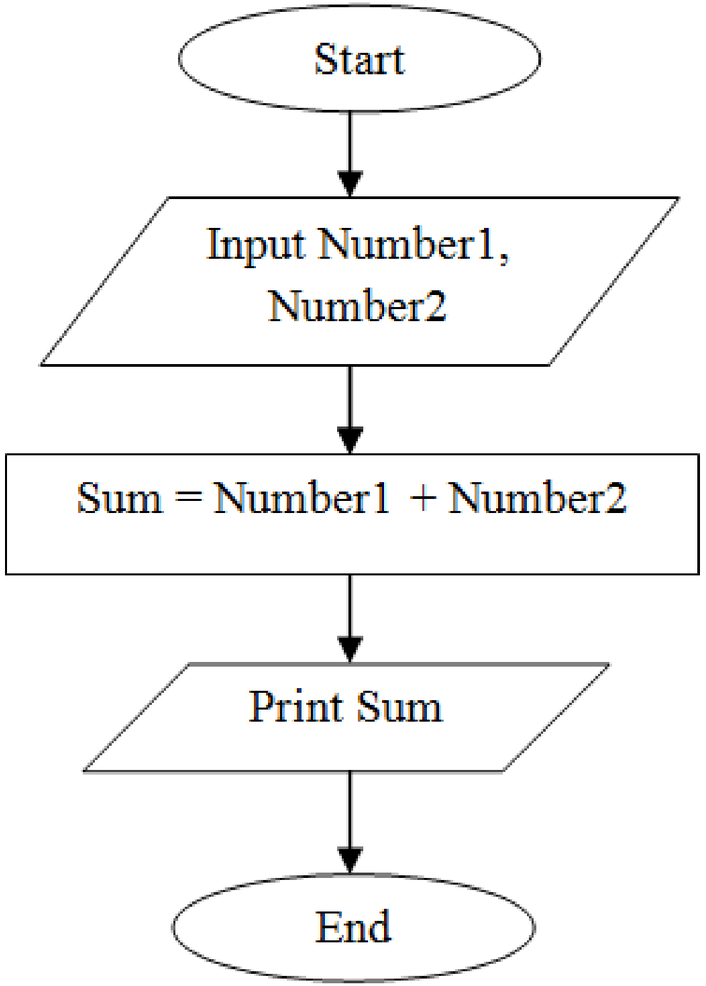
Input: Two numbers num1, num2

Output: Sum of two numbers

1. **sum = num1 + num2**
2. **return sum**

```
void main()
{
    int num1, num2, sum;
    num1 = 5;
    num2 = 10;
    sum = num1 + num2;
}
```

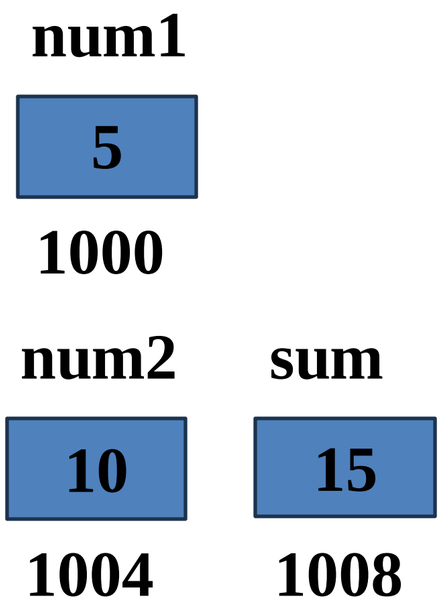


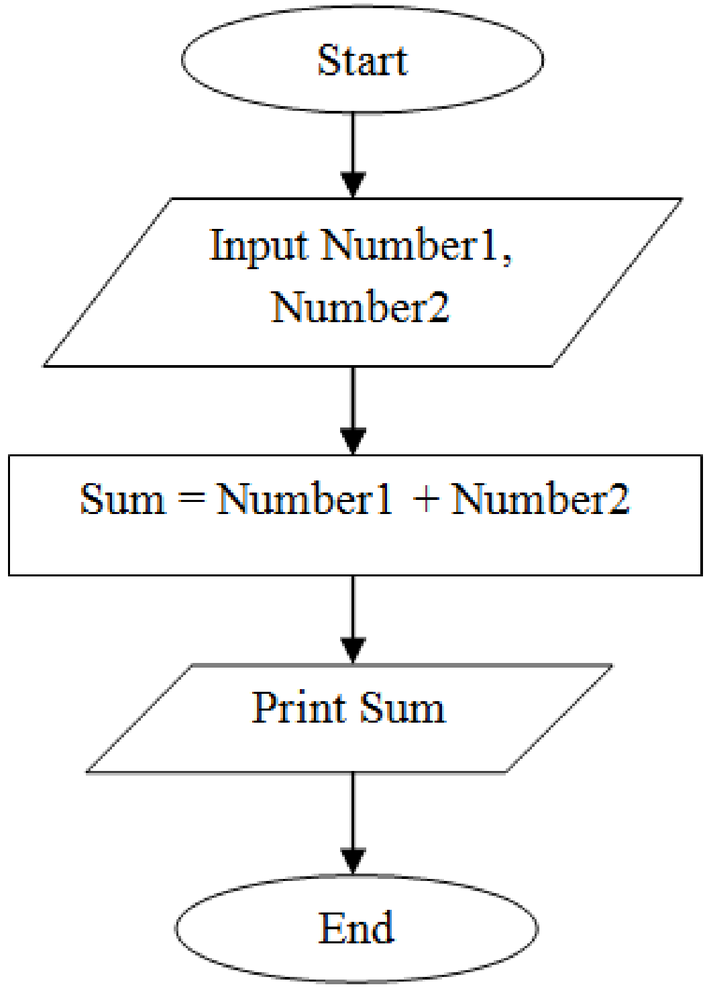


K3

Program

```
#include <stdio.h>
void main()
{
    int num1, num2, sum;
    num1 = 5;
    num2 = 10;
    sum = num1 + num2;
}
```

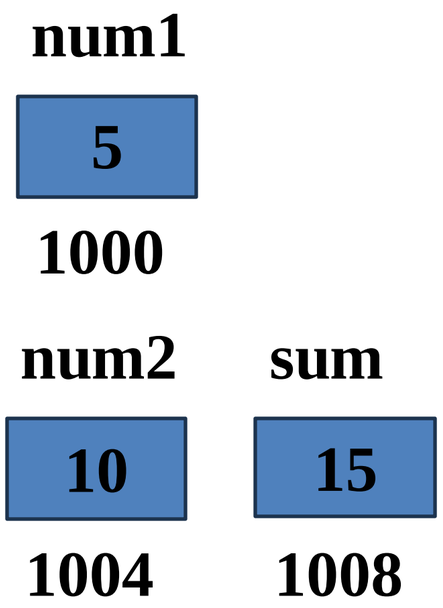


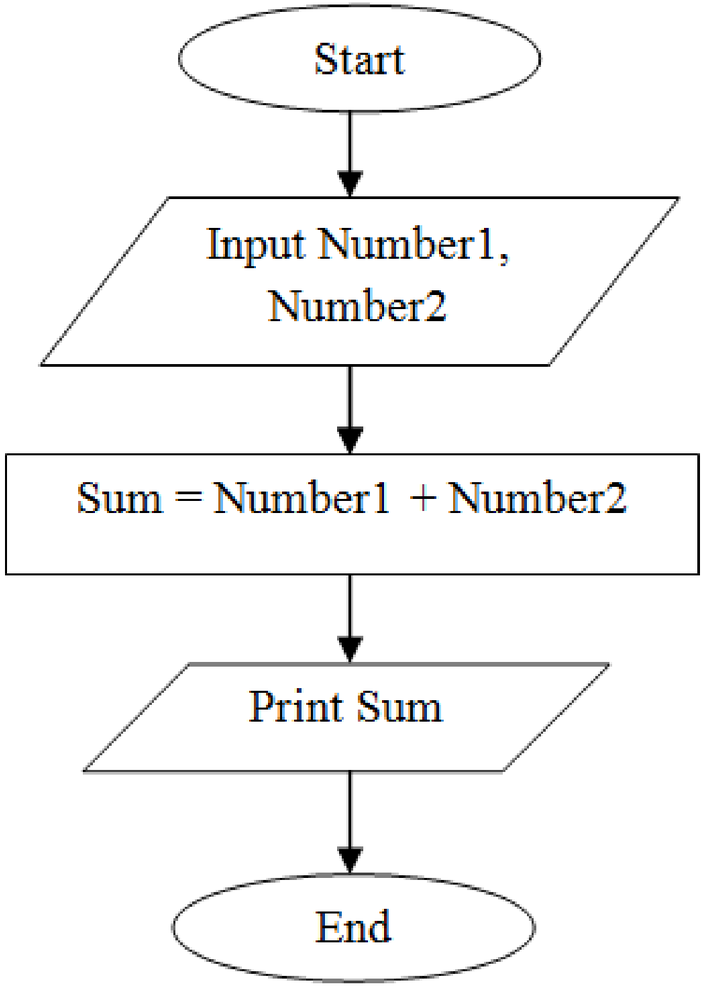


K3

Program

```
#include <stdio.h>
void main()
{
    int num1, num2, sum;
    num1 = 5;
    num2 = 10;
    sum = num1 + num2;
    printf("Addition of two
    numbers %d and %d is:
    %d", num1, num2, sum);
}
```





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Questions?

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Today's Course Outcomes

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- **CO1 – Implement C programs from algorithms and flowcharts with error handling. – K3**
- **CO2 – Implement programming fundamentals, decision and looping statements – K3**
- **CO3 – Implement C programs with pointers, arrays, and strings – K3**
- **CO4 – Implement C programs with structures, union, file-handling concepts, and additional features – K3**
- **CO5 – Analyze, breakdown, and solve large computational problems using functions – K4**

K1

Summary

- **Library**
- **Format Specifier**
- **printf – Print Formatted**
- **Today's Course Outcome**

References

SHIV NADAR UNIVERSITY CHENNAI

- **Kernighan, B.W and Ritchie, D. M, “The C Programming language”, 2nd edition, Pearson Education, 2006**

THANK YOU

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