BASIC PROGRAMMING

C PROGRAMMING LANGUAGE

Le Thi Ngoc Tho, PhD
Faculty of Information Technology, HUTECH
ltn.tho@hutech.edu.vn

1

CONTENTS

2

AGENDA

No.	Contents	# periods
0	Introduction	2
1	Flow Chart	4
2	Variable Types, Operators, Expressions	6
3	Control Flow – Choices	3
4	Control Flow – Loops	6
5	Functions	6
6	Arrays & Strings	9
7	Structured Data Types	9
	Total	**45**

3

COURSE ASSESSMENT

Mid-term exam	50%
Final exam	50%
Total	**100%**

- Mid-term exam: A paper-based test about all things you have learned after lesson #5.
- Final exam: A paper-based test about all things which you have studied in my class.

4

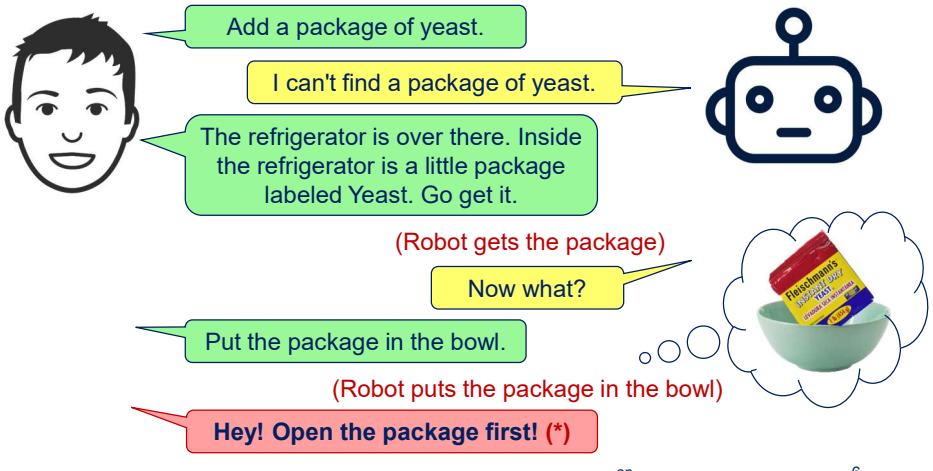
INTRODUCTION

- Why C?
  - The most commonly used programming language to write OS.
  - Simple
  - Clarity
  - Portability
  - Modularity
  - Easy availability

5

Some Fundamentals

- *Programming*: Guide computers step-by-step



(*) Referenced from Book "Python for Dummies" by Aahz Maruch and Stef Maruch, 2006

6

Some Fundamentals

- *Program*: collection of instructions necessary to solve a specific problem.
- *Algorithm*: approach or method to solve a problem.
- *Programming language*: interface serves for communication between human and computers.

7

Some Fundamentals

- *Information*: facts provided or learned about something or someone.
- *Information Technology*: the study of computers for storing, retrieving, and sending information.
- How to represent information to computer?

8

Some Fundamentals

- Basic unit of information: bit (**b**inary dig**it**).
  - Two states: on/off or 1/0
- Use sequence of bits to represent information.

# of bits	# of states
1	2
2	$2^2 = 4$
3	$2^3 = 8$
4	$2^4 = 16$
5	$2^5 = 32$
n	2^n

Some Fundamentals

- Representation of Information:
  - *Binary numeral system* (base-2) uses only two symbols: **0** and **1**.
  - D*ecimal numeral system* (base-10) uses ten symbols: **0, 1,…** and **9**.
  - Hexadecimal numeral system (base-16) use sixteen symbols: 0,…,9, **A, B, C, D, E, F**.
- Value of a number N base-**b** numeral system:

$$N = a_n a_{n-1} a_{n-2} \cdots a_1 a_0$$

$$= a_n b^n + a_{(n-1)} b^{n-1} + \cdots + a_1 b + a_0$$

Some Fundamentals

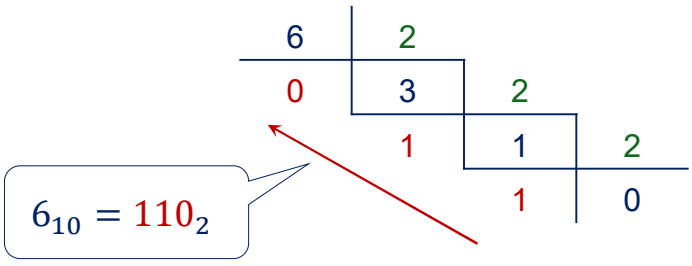
- How to convert: base-b → decimal

$$N = a_n a_{n-1} a_{n-2} \cdots a_1 a_0 = a_n b^n + a_{(n-1)} b^{n-1} + \cdots + a_1 b + a_0$$

- E.g., get the values of following numbers:
  - $1101_2 = (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + 1$
  - $123_{10} = (1 \times 10^2) + (2 \times 10^1) + 3$
  - $2A5_{16} = (2 \times 16^2) + (10 \times 16^1) + 5$
  - $712_8 = (7 \times 8^2) + (1 \times 8^1) + 2$

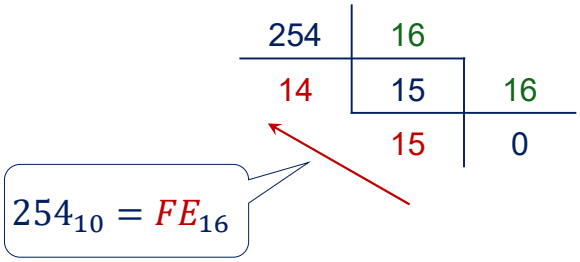
Some Fundamentals

- How to convert: decimal → base-b
  - Divide decimal number to b until quotient is zero,
  - Get surplus in reverse order.
- E.g., Convert 6_{10} to binary number



Some Fundamentals

- How to convert: decimal → base-b
  - Divide decimal number to b until quotient is zero,
  - Get surplus in reverse order.
- E.g., Convert 254_{10} to hexadecimal number



EXERCISES

- Find the values of following numbers:

number	value	number	value	number	value
10_2		7_8		F_{16}	
1010_2		12_8		18_{16}	
10100_2		25_8		$2C_{16}$	
1011111_2		117_8		AF_{16}	
11011100_2		287_8		BC_{16}	
11110101_2		577_8		FA_{16}	

- Do you have any comments on the red octal number?

EXERCISES

- Convert the following decimal numbers to binary (base-2), octal (base-8) and hexadecimal (base-16) numbers:

decimal	binary	octal	hexadecimal
2_{10}	10_2		
8_{10}		10_8	
16_{10}			10_{16}
95_{10}			
156_{10}			
253_{10}			

- Do you have any comments on the way of converting among binary, octal and hexadecimal?

15

Any Questions?

16

EXERCISES

- Find the values of following numbers:

number	value	number	value	number	value
10_2	2	7_8	7	F_{16}	15
1010_2	10	12_8	10	18_{16}	24
10100_2	20	25_8	21	$2C_{16}$	44
1011111_2	95	117_8	79	AF_{16}	175
11011100_2	220	287_8	NA	BC_{16}	188
11110101_2	245	577_8	383	FA_{16}	250

- Do you have any comments on the red octal number?

17

EXERCISES

- Convert the following decimal numbers to binary (base-2), octal (base-8) and hexadecimal (base-16) numbers:

decimal	binary	octal	hexadecimal
2_{10}	10_2	2_8	2_{16}
8_{10}	1000_2	10_8	8_{16}
16_{10}	10000_2	20_8	20_{16}
95_{10}	1011111_2	137_8	$5F_{16}$
156_{10}	10011100_2	234_8	$9C_{16}$
253_{10}	11111101_2	375_8	FD_{16}

- Do you have any comments on the way of converting among binary, octal and hexadecimal?

18