

Algorithm and Problem Solving

Part II

Adapted for 204111
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Basic Program Instructions

A few basic instructions appear in just about every language:

- Input
 - Get data from the keyboard, a file, or some other device.
- Output
 - Display data on the screen or send data to a file or other device.

Reference: <http://www.openbookproject.net/thinkcs/python/english2e/ch01.html>

Recap

- **Algorithm Representation**
 - Pseudocode vs Flowchart
- **High level vs Low Level Programming**
- **int (integer) vs float (real number)**
- **Variable declaration vs initialization vs assignment**
- **printf() function**

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Basic Program Instructions [2]

- Math
 - Perform basic mathematical operations like addition and multiplication.
- Conditional execution
 - Check for certain conditions and execute the appropriate sequence of statements.
- Repetition
 - Perform some action repeatedly, usually with some variation.

Reference: <http://www.openbookproject.net/thinkcs/python/english2e/ch01.html>

Conditional Execution

- In order to write useful programs, we almost always need the ability to **check conditions** and **change the behavior** of the program **accordingly** (making **decision**). **Conditional statements** give us this ability. The simplest form is the **if** statement.

Reference: <http://www.openbookproject.net/thinkcs/python/english2e/ch04.html>

SYMBOL	NAME	DESCRIPTION
	Terminal	Indicates the beginning or end of an algorithm
	Input/Output	Indicates an input or output operation
	Process	Indicates computation or data manipulation
	Flow Lines	Connects the flowchart symbols and indicates the logic flow
	Decision	Indicates a decision point in an algorithm
	Loop	Indicates the initial, final, and increment values of a loop
	Predefined Process	Indicates a predefined process, as in calling a sorting process
	Connector	Indicates an entry to or exit from another part of the flowchart

Figure 1.13 Flowchart symbols

Conditional: if

Example 1

Statement

- ถ้าวันนี้เป็นวันเสาร์
- ดู Hormones the Series

today is Saturday	Statement
YES	"Watch Hormones the Series"
NO	

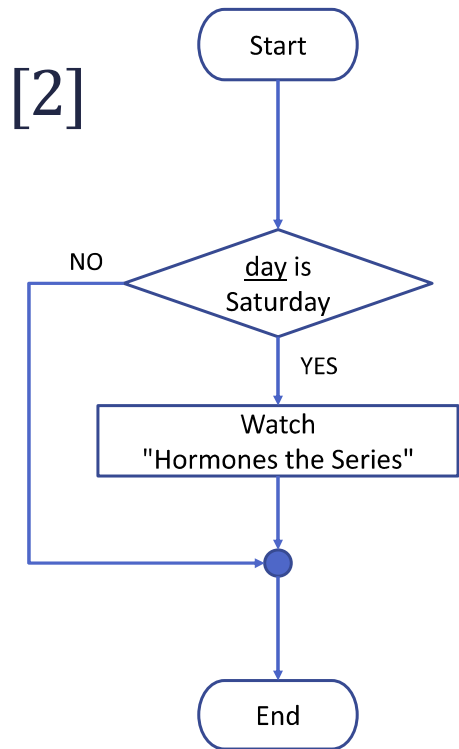
Pseudocode format

if condition then statement ➔ if today is Saturday then Watch Hormones the Series

Conditional: if [2]

Pseudocode

if day is Saturday **then** watch Hormones the series



Conditional: if [3]

- เราสามารถมีการตัดสินใจเงื่อนไขต่อกันเป็นลำดับได้ เช่น

Pseudocode

เปิดตู้เย็น

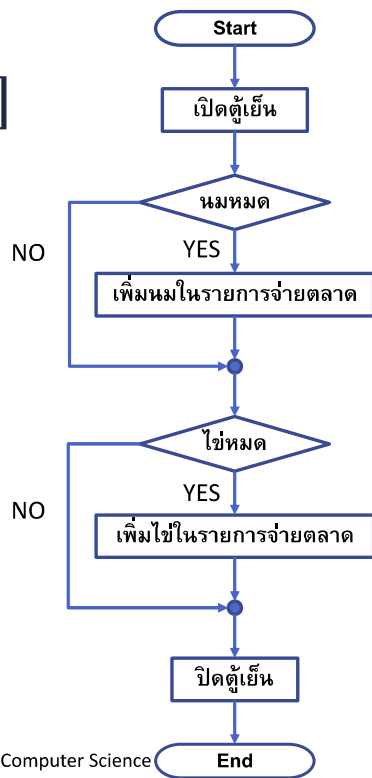
if นมหมด **then**

 เพิ่มนมในรายการจ่ายตลาด

if ไข่หมด **then**

 เพิ่มไข่ในรายการจ่ายตลาด

ปิดตู้เย็น



Conditional: if-else

Pseudocode format

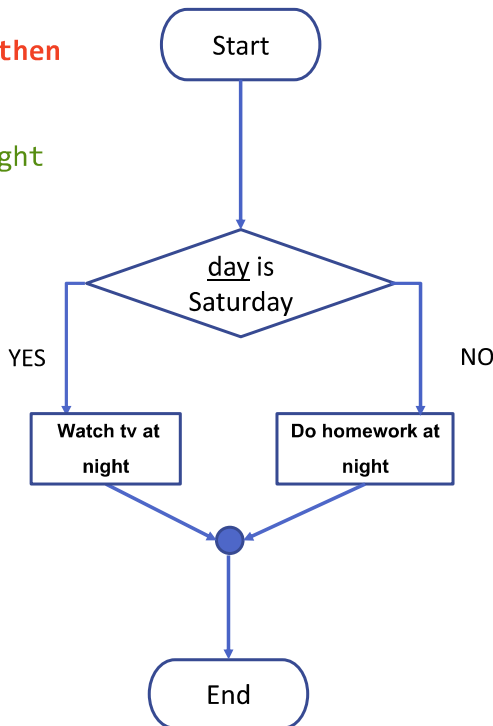
if condition **then**
 statement1
else
 statement2



if today is Saturday **then**
 Watch tv at night
else
 Do homework at night

Flowchart format?

if today is Saturday **then**
 Watch tv at night
else
 Do homework at night



Conditional: if-else [2]

All Possible Inputs and outputs

Example 2

- Problem Statement

- What to do when driving to a traffic signal (สัญญาณไฟจราจร)

Inputs	Outputs
Signal = GREEN	Action = GO
Signal = RED	Action = STOP
Signal = YELLOW	Action = STOP

Step 1: Problem Solving

- สัญญาณไฟมี 3 สี คือ สีเขียว, สีเหลือง, และสีแดง
- หากสัญญาณไฟเป็น สีเขียว ขับต่อไปได้
- หากสัญญาณไฟเป็น สีอื่น ๆ (แดง, เหลือง) ให้หยุด

Conditional: if-else [3]

Example 2

- Problem Statement
 - What to do when driving to a traffic signal (สัญญาณไฟจราจร)

Our Condition

Inputs	Outputs
Signal = GREEN	Action = GO
Signal = RED	Action = STOP
Signal = YELLOW	Action = STOP
Signal = BLUE	Action = STOP

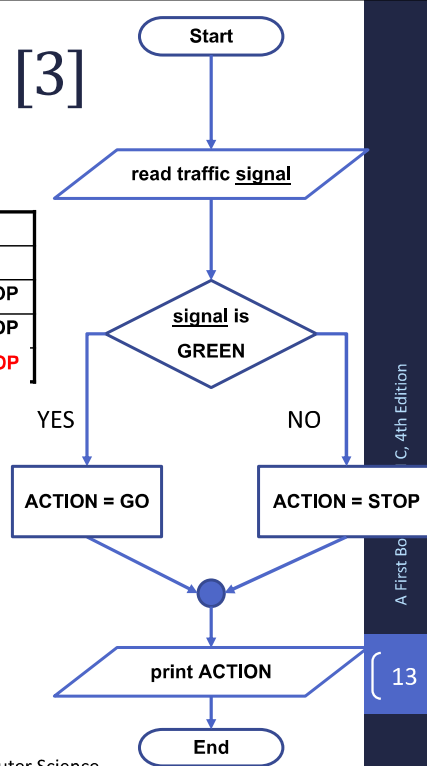
Step 2: Algorithm Representation

Pseudocode

```

read traffic signal
if signal is GREEN then
    set Action as GO
else
    set Action as STOP
print Action
    
```

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Algorithm Representation (3)

Example 3

- Problem Statement

Read a number from the keyboard.
Check and output if a given number N is ODD (เลขคี่) or EVEN (เลขคู่).

Inputs	Outputs
N = 5	Answer = ODD
N = 8	Answer = EVEN
N = 0	Answer = EVEN
N = -1	Answer = ODD

Step 1: Problem Solving

- เลขคู่ คือ เลขที่หารด้วย 2 ลงตัว (divisible by 2)
- เลขคี่ คือ เลขที่หารด้วย 2 ไม่ลงตัว

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Algorithm Representation (4)

Example 3

- Problem Statement
 - Read a number from the keyboard.
 - Check and output if a given number N is ODD or EVEN.

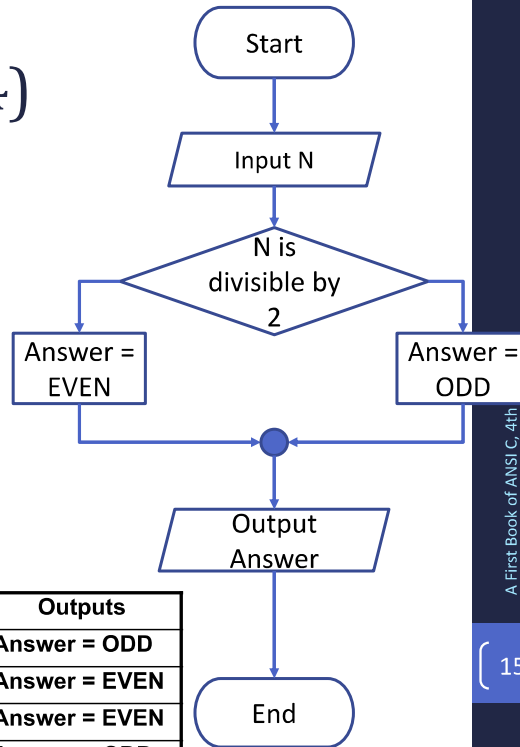
Step 2: Algorithm Representation

Pseudocode

```

read N
if N is divisible by 2 then
    set Answer as EVEN
else
    set Answer as ODD
print Answer
    
```

Inputs	Outputs
N = 5	Answer = ODD
N = 8	Answer = EVEN
N = 0	Answer = EVEN
N = -1	Answer = ODD



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