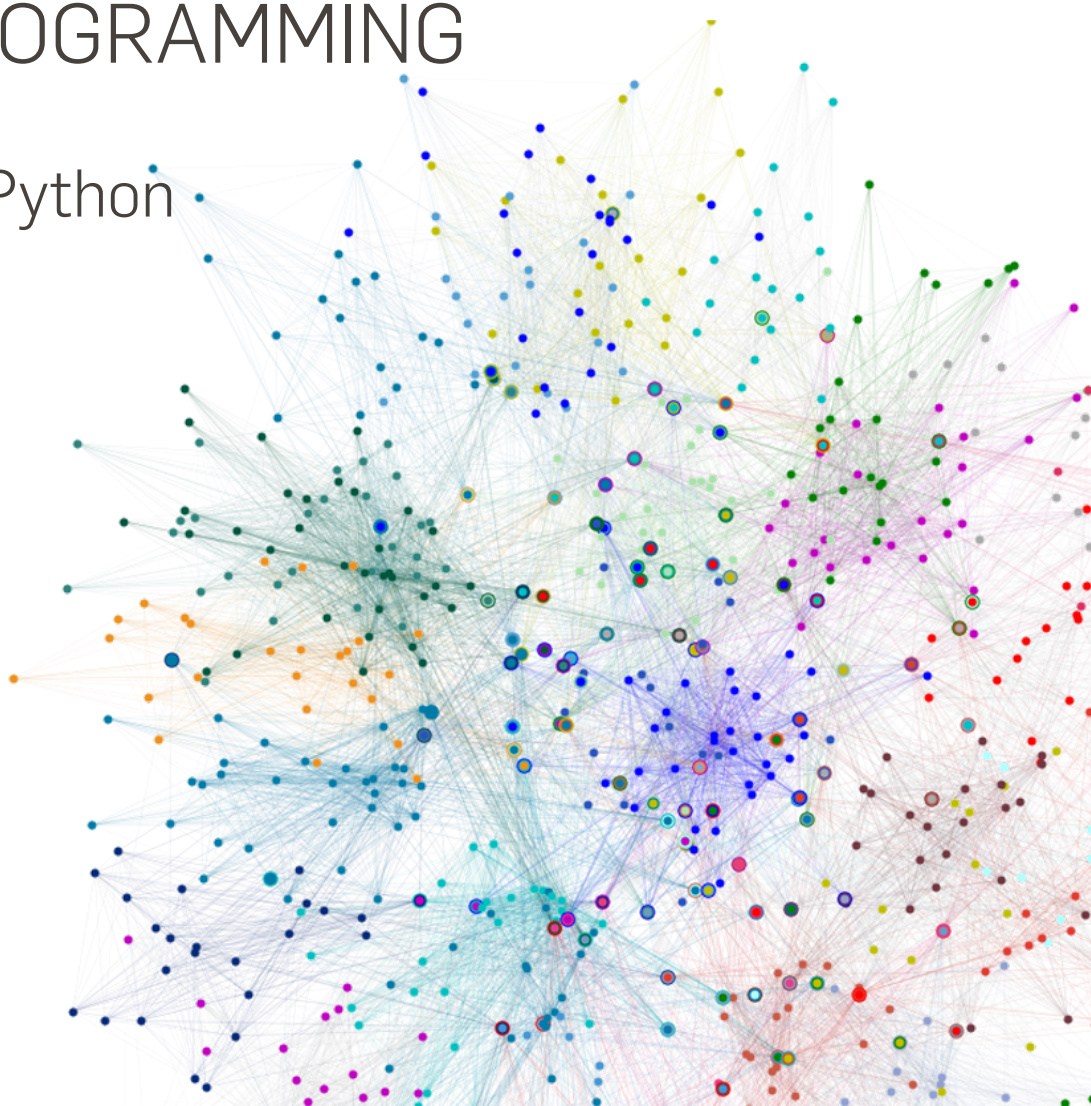
ThangLong University

CS100: INTRO TO PROGRAMMING

Making decisions with code
Conditional statements in Python

October 24, 2017



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Overview

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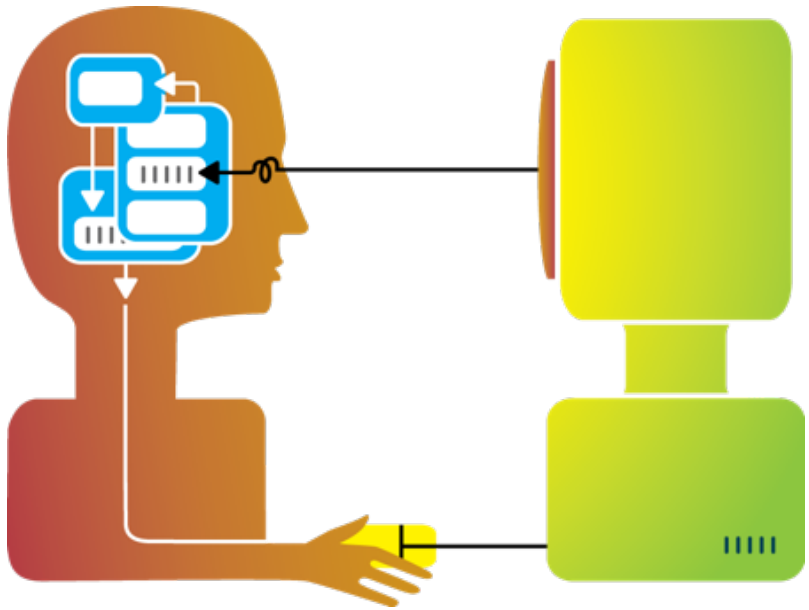
Using conditional statements, you can write Python code that makes decisions in your problems. In this lecture, We're going to learn "Human computer interaction" or "How to use the term flow of control" to refer to the sequence of statements that are executed in a program.

Overview

HUMAN COMPUTER INTERACTION

Human computer interaction

- → Websites need your address and payment information so they can ship you products
- → Insurance companies need information to calculate how much you would pay for car insurance
- → Cortana will tell you a joke if you ask her



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Two way conversations allow you to do more with computers

How can we ask a user for information?

$gedit myprogram.py &

```
1    import stdio
2
3    stdio.write("What's your name? ")
4    name = stdio.readString()
5    stdio.writeln('Hi, '+name+'How are you?')
```

$python3 myprogram.py
> What's your name? Thang
> Hi, Thang. How are you?

How can we ask a user for information?

- → stdio.readString(): To read a string value, and return it
- → stdio.readInt() : To read an integer number, and return it
- → stdio.readFloat() : To read a floating-point number, and return
- → stdio.readBool(): To read a true-false value, and return it

Your problem and Bug!

$gedit add.py &

```
1   import stdio
2
3   stdio.write("Enter a number of A = ")
4   a = stdio.readFloat()
5
6   stdio.write("Enter a number of B = ")
7   b = stdio.readFloat()
8
9   stdio.write('min('+str(a)+','+str(b)+')= ')
10  stdio.writeln(min(a,b))
```

$python3 add.py

> Enter a number of A = 5.6

> Enter a number of B = 4.4

> min(5.6, 4.4) = 4.4

DECISION MAKING IN PYTHON

Why make decisions in programming?

Every day we are faced with decisions

- → Should I drive or take the bus?
- → Should I cook at home or go out for dinner?
- → Which laptop should I buy?

Why make decisions in programming?

The choice we make depends on different conditions

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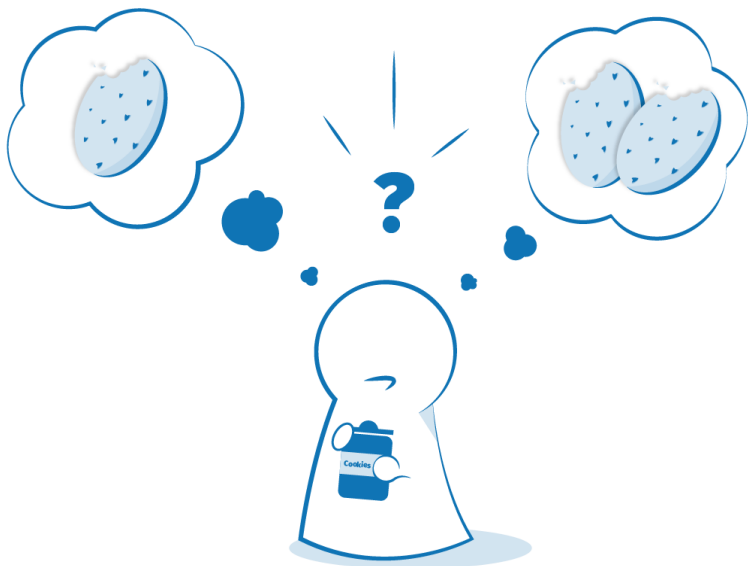
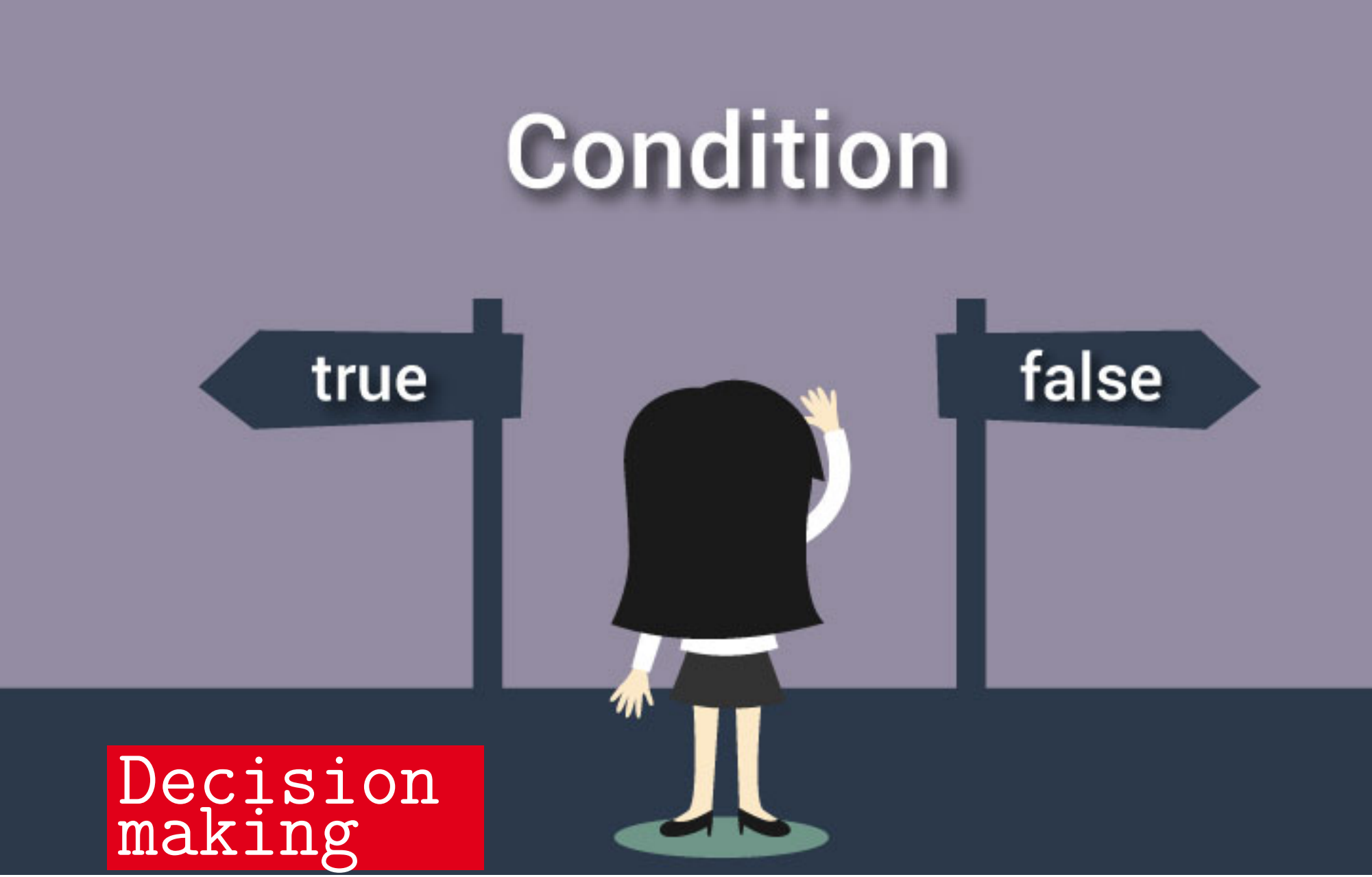
- → Should I drive or take the bus?
  Am I late? What's the price of gas?
- → Should I cook at home or go out for dinner?
  Do I have any food at home? Do I have enough money to go out?
- → Which laptop should I buy?
  How much RAM do I need? How much money do I have?

Conditionals?

In any programming language, code needs to make decisions and carry out actions accordingly depending on different inputs.
For example:

- → In a game, if the player's number of lives is 0, then it's game over.
- → In a weather app, if it is being looked at in the morning, show a sunrise graphic; show stars and a moon if it is nighttime.





Decision making

is required when we want to execute a code only if a certain condition is satisfied.

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Booleans

The bool data type has just two values: True and False.

A	B	A AND B	A OR B	NOT A
False	False	False	False	True
False	True	False	True	True
True	False	False	True	False
True	True	True	True	False

Source: wikibooks.org

Comparisons

The comparison operators ==, !=, <, <=, >, and >= are defined for both integers and floats, and evaluate to a boolean result.

op	*meaning*	True	False
==	*equal*	`2 == 2`	`2 == 3`
!=	*not equal*	`3 != 2`	`2 != 2`
<	*less than*	`2 < 13`	`2 < 2`
<=	*less than or equal*	`2 <= 2`	`3 <= 2`
>	*greater than*	`13 > 2`	`2 > 13`
>=	*greater than or equal*	`3 >= 2`	`2 >= 3`

Comparisons with `int` operands and a `bool` result

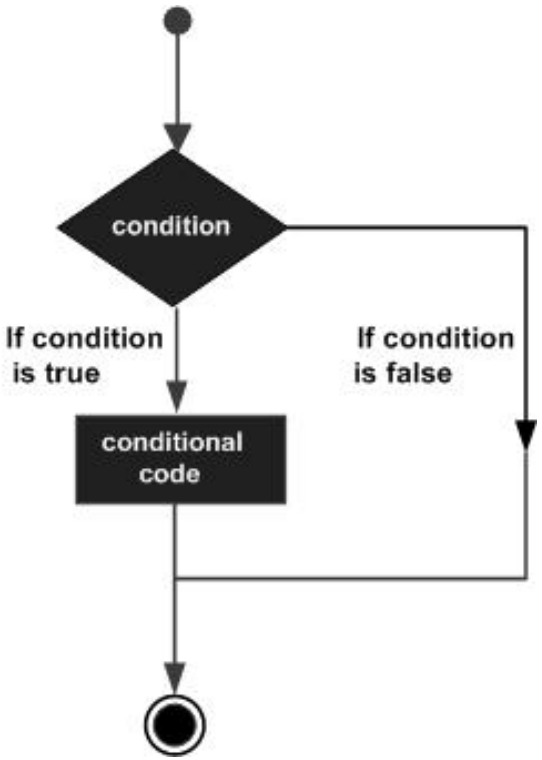
Source: intro to programming in python

#Task01

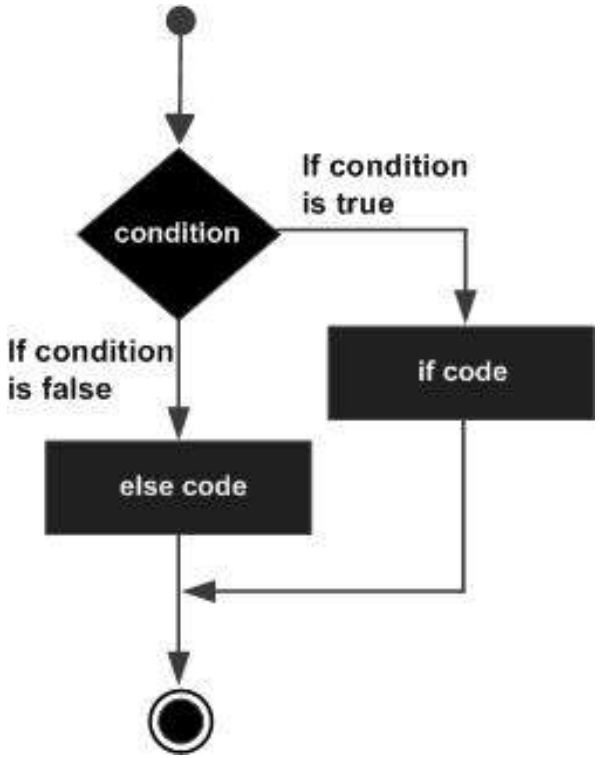
Show that those expressions are True or False:

1. a = True
   b = True
   (not (a and b) and (a or b)) or ((a and b) or not (a or b))
2. a = 5
   b = 6
   (not (a < b) and not (a > b))
3. a = True
   a = not a
   a = not a
   a = not a
   a = ?

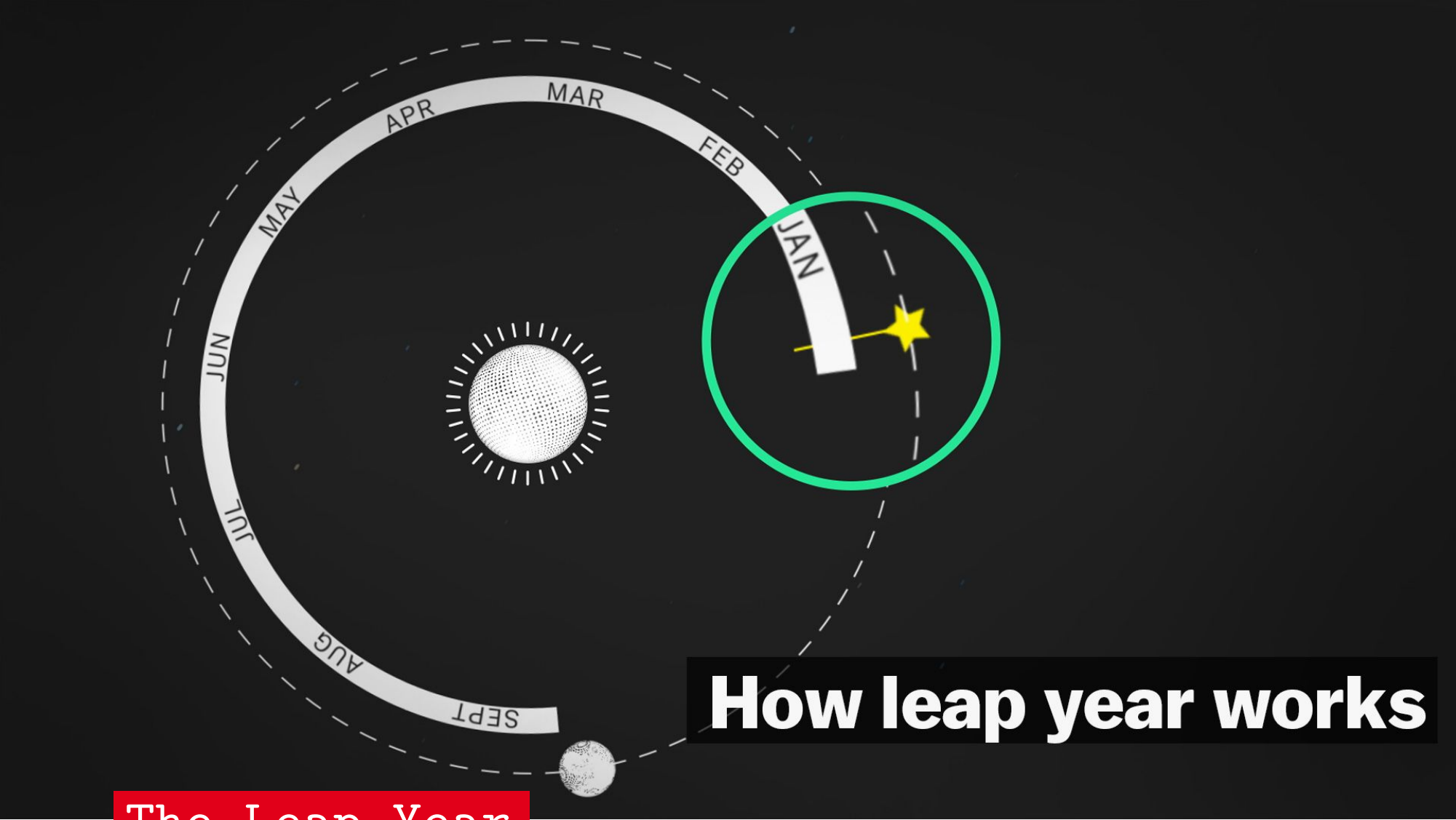
IF and IF ELSE statement



IF statement



IF statement
ELSE statement



The Leap Year Explained

https://www.youtube.com/watch?v=YTOr8_lLqGw

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Leap year program

$gedit leapyear.py &

```
1   import stdio
2   import sys
3
4   year = int(sys.argv[1])
5
6   isLeapYear = (year % 4 == 0)
7   isLeapYear = isLeapYear and (year % 100 != 0)
8   isLeapYear = isLeapYear or  (year % 400 == 0)
9
10  stdio.writeln(isLeapYear)
```

$python3 leapyear.py 2016
> True
$python3 leapyear.py 1900
> False

[Update] Leap year program

$gedit leapyear.py &

```
1       import stdio
2       import sys
3
4       year = int(sys.argv[1])
5
6       if ((year % 4 == 0) and (year % 100 != 0)) or
              (year % 400 == 0):
7           stdio.writeln('It is a leap year')
8       else:
9           stdio.writeln('It is a common year')
```

$python3 leapyear.py 2016

> It is a leap year

$python3 leapyear.py 1900

> It is a common year

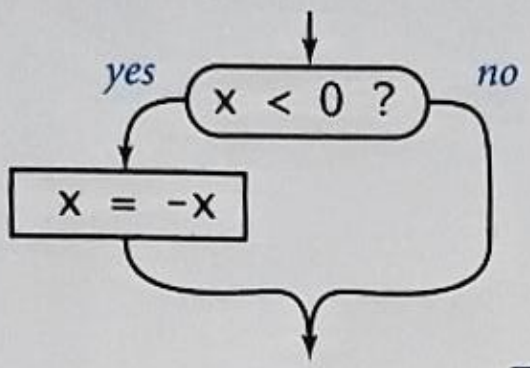
Odd-even number program

$gedit oddeven.py &

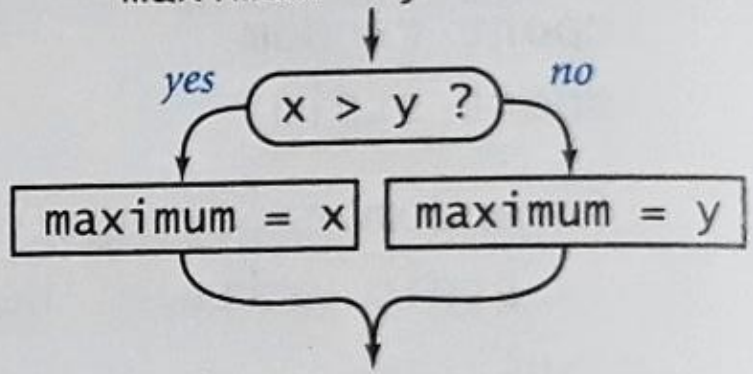
```
1       import stdio
2       import sys
3
4       number = int(sys.argv[1])
5
6       if number % 2 == 0:
7           stdio.writeln('It is a even number')
8       else:
9           stdio.writeln('It is a odd number')
```

$python3 oddeven.py 26
> It is a even number
$python3 oddeven.py 15
> It is a odd number

```
if x < 0:
    x = -x
```




```
if x > y:
    maximum = x
else:
    maximum = y
```



Flowchart examples (if statements)

Common example Programs

absolute value	`if x < 0:` `    x = -x`

put x and y into sorted order	`if x > y:`
	`    temp = x`
	`    x = y`
	`    y = temp`

maximum of x and y	`if x > y: maximum = x` `else:     maximum = y`
error check for remainder operation	`if den == 0: stdio.writeln('Division by zero')` `else:        stdio.writeln('Remainder = ' + num % den)`

error check for quadratic formula	`discriminant = b*b - 4.0*a*c`
	`if discriminant < 0.0:`
	`    stdio.writeln('No real roots')`
	`else:`
	`    d = math.sqrt(discriminant)`
	`    stdio.writeln((-b + d)/2.0)`
	`    stdio.writeln((-b - d)/2.0)`

Common example Programs

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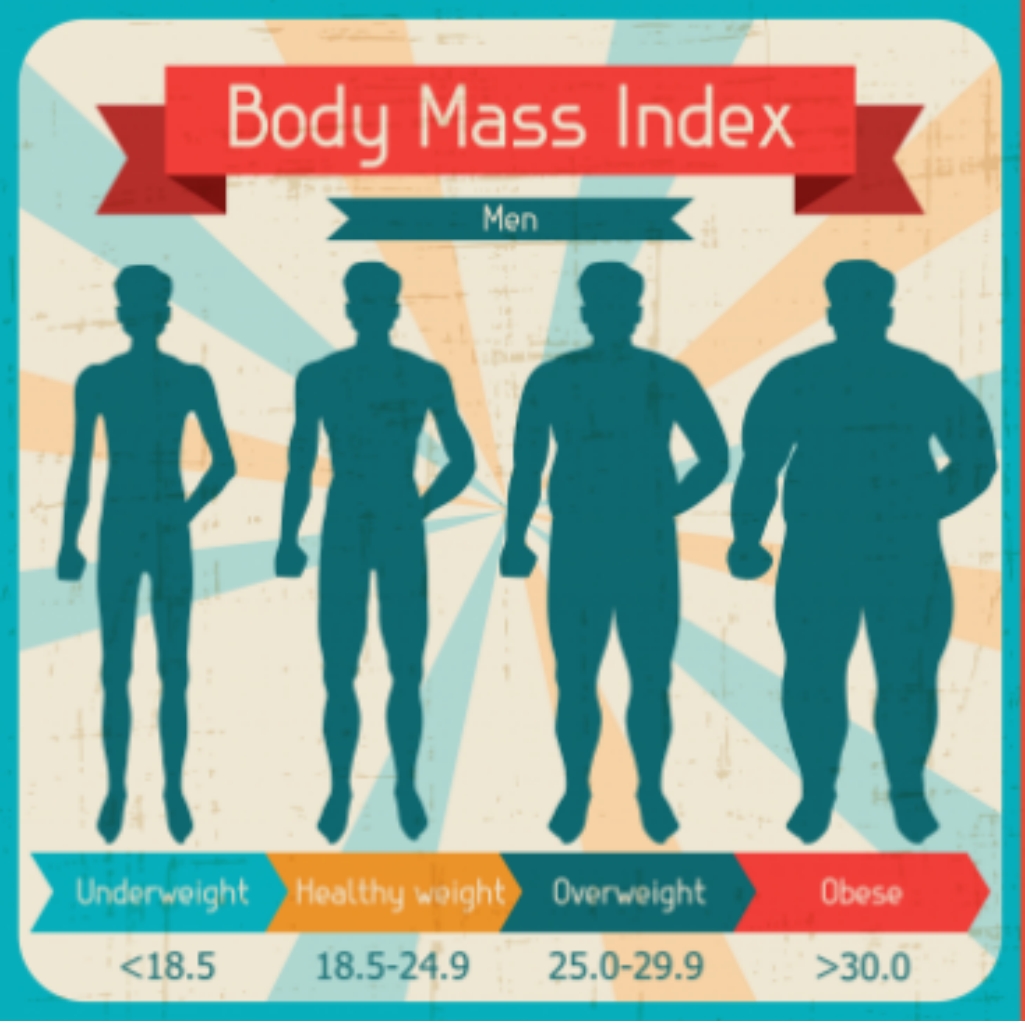

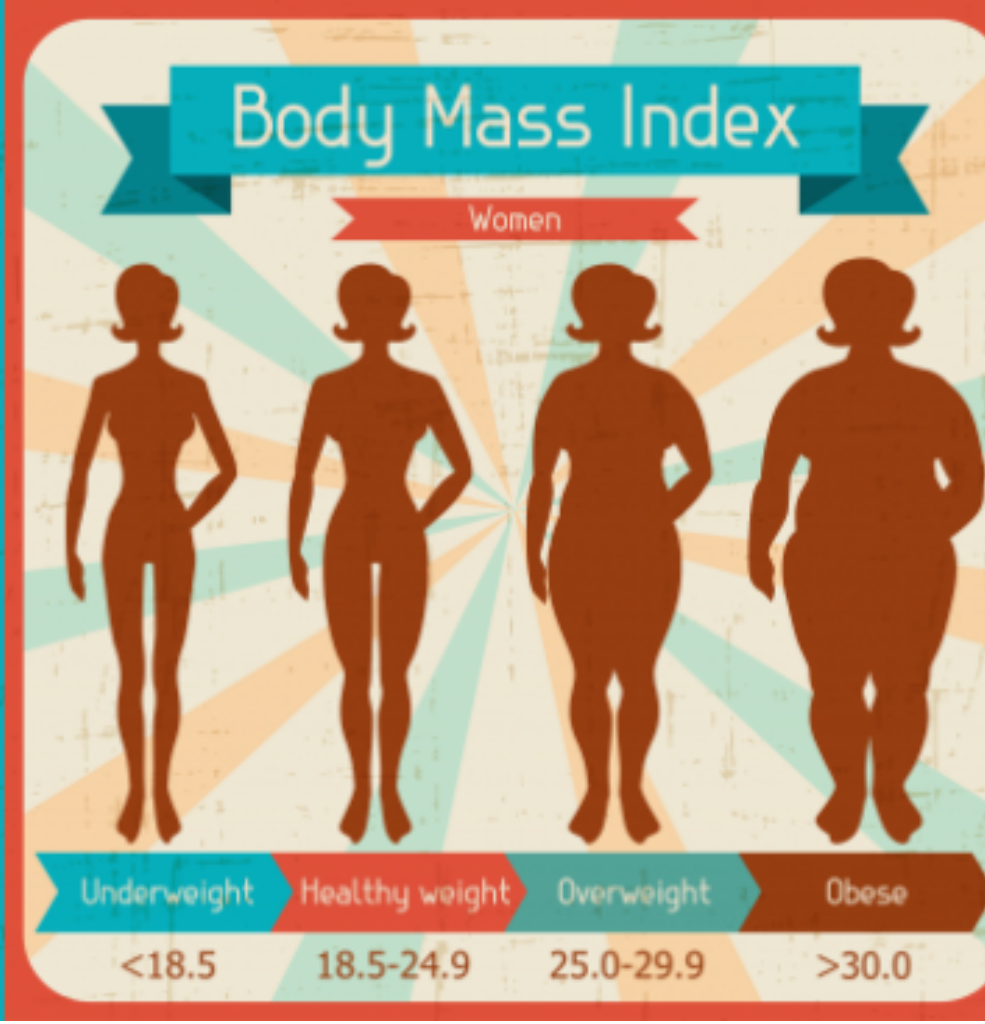

Body Mass Index

$$BMI = \frac{mass}{height^2}$$

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BMI Calculator

```
1       import stdio
2       import sys
3       height = float(sys.argv[1])
4       mass = float(sys.argv[2])
5       BMI = mass / (height**2)
6       if BMI < 18.5:
7           stdio.writeln("Underweight")
8       else:
9           if BMI < 24.9:
10              stdio.writeln("Healthy weight")
11          else:
12              if BMI < 29.9:
13                  stdio.writeln("Overweight")
14              else:
15                  stdio.writeln("Obese")
```

BEST EDITOR FOR PROGRAMMERS

Sublime Text

is a super fast and feature packed text and development editor.

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Sublime Text, Smart editor for programmer!

- → Search "install sublime text in Ubuntu" on Google
- → Choose result of askubuntu.
- → and ...

For Sublime-Text-3:

```
sudo add-apt-repository ppa:webupd8team/sublime-text-3
sudo apt-get update
sudo apt-get install sublime-text-installer
```

Run Sublime-Text on terminal

```
subl
```

ELIF

Sometimes there are multiple conditions that affect the outcome of a decision

- → If you are in England say hello, if you are in Germany say guten tag, if you are in France say bonjour, ...
- → If you win the lottery and the prize is over a million dollars then retire to a life of luxury
- → If it is Monday, check to see if there is fresh coffee. If there is no fresh coffee go to the nearest café

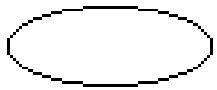
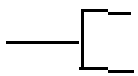
How can we ask a user for information?

The “elif” allows you to check for different values

```
1       import stdio
2
3       stdio.write('Where are you from?')
4       country = stdio.readString()
5       if  country =="CANADA" :
6           stdio.writeln("Hello")
7       elif  country =="GERMANY" :
8           stdio.writeln(" GutenTag")
9       elif  country =="FRANCE" :
10          stdio.writeln("Bonjour")
11      else:
12          stdio.writeln("Xin Chao")
```

BLOCK DIGRAM OF ALGORITHM

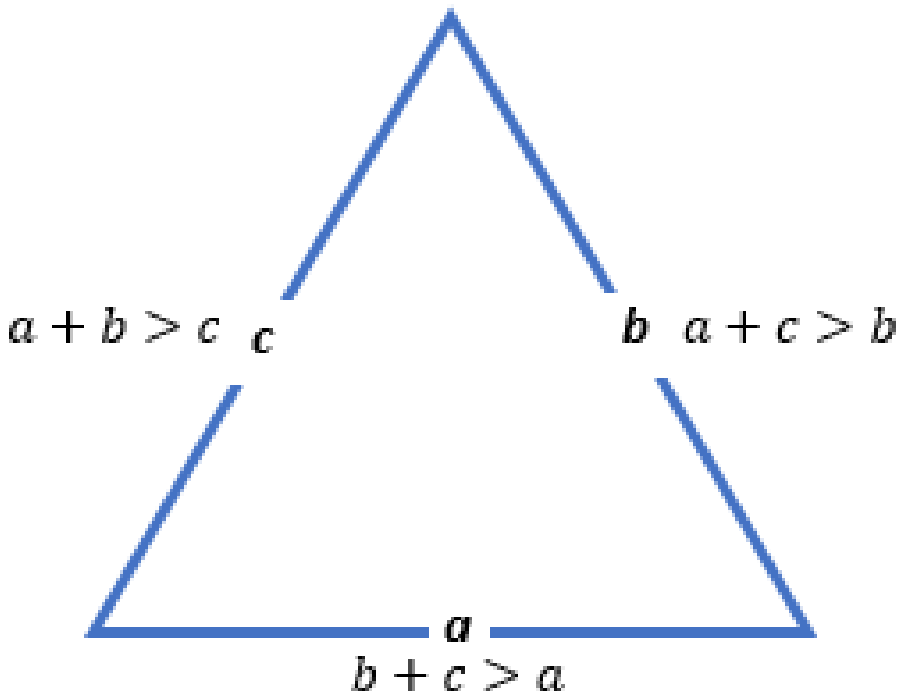
Block digram of Algorithm

Ký hiệu	Mô tả
	Điểm bắt đầu và chấm dứt thuật toán
	Thao tác nhập hay xuất dữ liệu
	Khối xử lý công việc
	Khối quyết định chọn lựa
	Điểm nối
	Chuẩn bị
	Tập hợp các tập tin dữ liệu
	Khối chương trình con
	Các ghi chú, giải thích
	Dòng tính toán, thao tác của chương trình

YOUR CHALLENGE

Your challenge: 1

Given three sides a, b, c. Write a program to check whether the triangle is valid or not. And what type of this triangle? Isosceles, Equilateral, Right or normal.



Your challenge: 2

Build python program to read date, month, year and print the next day's date, month, year.

Example:

$ python3 nextyear.py 24 10 2017

> 25 10 2017

CONCLUSION

Have a good nice!

Try your best!