

TIME 2 CODE Python Programming guide

#

text

Examples:

```
# This is a comment
```

Hash symbol: A comment.

Comments are ignored by the computer and discarded when a program is *translated* into *machine code*. They are used by programmers to explain the purpose of sections of code. This is helpful when you return to a program after a period of time, or when you work in teams.

Comments are typically used:

- At the beginning of a program to explain its purpose.
- Before each subprogram: `def`
- Before each selection statement: `if`, `else`, `match`, `case`.
- Before each iteration: `for`, `while`.
- To explain difficult to comprehend code.
- To remind the author why unusual approaches have been taken.

Associated keywords: `def`, `if`, `else`, `match`, `case`, `while`

DEF

def identifier(parameters):

Examples:

```
def square(x):  
    x = x * x  
    return x
```

Command: Defines a new subprogram. Subprograms are also called *subroutines*.

Code must be indented inside the subprogram. You cannot use spaces in the identifier name of the subprogram. It is common to use underscores to separate words in the name of the subprogram instead.

Don't forget the colon at the end of this command.

Subprograms can be *procedures* that do not return a value or *functions* that do return a value. Procedures are used to structure a program into smaller more manageable parts. This is known as *problem decomposition*. Functions are used to create reusable program components. Subprograms avoid unnecessary code duplication and make the code easier to read which also makes finding errors in code, called *debugging* easier.

Associated keywords: **return**

FLOAT

variable = float(parameter)

Examples:

```
x = float("5")
```

```
x = float(6)
```

```
x = float(y)
```

Function: Casts a parameter to a floating point number.

Different types of data are stored in different ways by the computer. Inputs taken from the keyboard are always sequences of alphanumeric characters called *strings*. These sequences of characters are stored as numbers by the computer using a standard such as *ASCII* or *Unicode*. The input string "5.6" (strings are *qualified* by quotes) is stored as the numbers 53, 46, 54. To do calculations on the input, it first needs to be converted from a string to a number, or from 53, 46, 54 to 5.6. This is known as *casting*.

Whole numbers with no fractional part are known as *integers*.

Numbers with a fractional part (decimal places) are known as *floating points*, *floats*, *real numbers* or *reals*.

A *run-time error* will occur if the parameter cannot be cast to a float.

Associated keywords: **int**

IF

If condition:

indented code

elif condition:

indented code

else:

indented code

Examples:

If `x == y`:

```
print("The value of x is the same as y")
```

elif `x < y`:

```
print("The value of x is less than y")
```

else:

```
print("The value of x is greater than y")
```

Command: Selects which code branch to execute next depending on the outcome of a condition.

The condition requires two variables or constants to be compared with mathematical or logic operators (see appendix 1). More than one condition can be combined with logic operators and brackets can be used to group conditions.

TIME 2 CODE Python Programming guide

E.g.

```
if ((x > y) and (x > 6)):
```

Note that you should not use `if x > y > 6` as it will not work as you expect. Instead, be explicit about which **two** items of data are being compared in **each** condition.

The result of an **if** command is always either True or False.

That means you can also use a shorthand for Boolean conditions. E.g.

```
if valid: is the same as if valid == True:
```

```
if not valid: is the same as if valid == False:
```

The **elif** section is an optional part of the command to include alternative conditions. You can include as many additional elif sections as you need but consider using the command **match** instead if you require more than one elif section.

The **else** section is an optional part to execute if none of the conditions are met, including those in elif sections.

Code to be executed for each section must be indented. This is often the source of many logic errors, so check your code is indented correctly.

It is good practice to comment each section of this command to explain the purpose of each condition.

It is possible to include another if command within an indented section. This is known as *nesting*.

Associated keywords: **#**, **match**

INPUT

variable = input(parameter)

Examples:

```
surname = input("Enter your surname: ")
```

```
prompt = "Enter your forename: "
```

```
forename = input(prompt)
```

Function: returns an input from the keyboard.

Inputs from the keyboard allow user interaction with your program. Inputs are always sequences of alphanumeric characters called *strings* terminated when the user presses the enter key.

The parameter prompt to the user is optional but informs the user what data they are expected to enter.

It is common to add an extra space at the end of the prompt to separate the prompt and the input.

Remember to do calculations on the input, the input data will need to be *cast* to an *integer* or *float*.

INT

variable = int(parameter)

Examples:

```
x = int("5")
```

```
x = int(6.5)
```

```
x = int(y)
```

Function: Casts a parameter to an integer.

Different types of data are stored in different ways by the computer. Inputs taken from the keyboard are always sequences of alphanumeric characters called *strings*. These sequences of characters are stored as numbers by the computer using a standard such as *ASCII* or *Unicode*. The input string "5" (strings are *qualified* by quotes) is stored as the number 53. To do calculations on the input, it first needs to be converted from a string to a number, or from 53 to 5. This is known as *casting*.

Whole numbers with no fractional part are known as *integers*. Numbers with a fractional part (decimal places) are known as *floating points*, *floats*, *real numbers* or *reals*. Using `int` to cast a float to an integer also removes the fractional component.

A *run-time error* will occur if the parameter cannot be cast to an integer.

Associated keywords: **float**

MATCH

match variable:

case value:

indented code

case _:

indented code

Examples:

```
match day_name:
    case "Thu" | "Fri" | "Sat":
        print("Open 10-5pm")
    case "Sun":
        print("Open 11-3pm")
    case _:
        print("Closed.")
```

Command: An alternative to the if/elif/else structure that is used when there are more than two outcomes. Match is considered a better command to use because it is more readable for multiple values. Don't forget the colon after match and each case.

Possible values can be separated with pipe characters: | (this is the equivalent to the logical OR operator). You can have as many case statements as you need, and each one should include a comment.

TIME 2 CODE Python Programming guide

`case _:` is the equivalent to `else` and captures any value that was not matched.

Note the `match` command is only supported in Python 3.10+

Associated keywords: `#`, `if`

PRINT

print(parameters)

Examples:

```
print("Hello World")
```

```
print(x)
```

Command: Outputs a value to the screen. The value can be any data type: Boolean, integer, list, float, string.

Don't forget that what you want to output must be enclosed in brackets. Strings will need to be qualified by quotes.

Each print statement puts the output on a new line. You can prevent a new line by concatenating `end = ""` to the output. E.g.

```
print("Hello", end = "")
```

```
print("World")
```

A single blank line, or the end of a line can be output with:

```
print()
```

Multiple parameters can be output on one line. Each parameter is separated with a comma. The output will include an automatic space between each parameter:

```
print("You are", age, "years old")
```

RETURN

return expression

Examples:

```
def square(x):  
    return x * x
```

```
y = square(5)
```

Command: Returns a value from a subprogram.

Subprograms that return values are called *functions*.

In the example above, the number 5 is passed into the function called square and assigned to the parameter x. The variable is then multiplied by itself and returned as the output from the function square into the variable y which assigns it the value 25.

The return expression can be a Boolean, e.g. return True, a variable, e.g. return total, a list or the result of a calculation.

It is possible to return more than one value in Python, each separated with a comma, but many languages do not support this so it is generally avoided in favour of returning a list.

Subprograms that do not return a value are called *procedures*.

Associated keywords: **def**

WHILE

while condition:

indented code

Examples:

```
valid_input = False
while not valid_input:
    print("Enter your choice: ")
```

```
while choice < 0 or choice > 3:
    print("Enter your choice: ")
```

Command: Repeats the indented section of code until the condition is not met.

Code to be executed must be indented. This is often the source of many logic errors, so check your code is indented correctly.

Repeated sections of code are known as *iterations* or *loops*. Use a while command when it is not known in advance how many iterations will be required.

It is common to ensure the condition cannot be met before the first iteration to ensure the indented code executes at least once.

It is good practice to comment before this command to explain the purpose of the iteration or condition.

TIME 2 CODE Python Programming guide

More than one condition can be combined with logic operators and brackets can be used to group conditions.

It is possible to include another while command within an indented section. This is known as *nesting*.

While loops are often used with indented input commands for *validation*, ensuring that the user has entered a valid input before continuing the program.

A special value that uses its presence as a condition to terminate a loop is called a *sentinel value*.

Infinite loops can be created with **while True:** since true will always be true.

Associated keywords: #

Appendix 1

Concatenation

```
x = "Hello" + " " + "World"
```

To concatenate means to join together. A comma can be used to concatenate strings inside a print statement. A plus symbol needs to be used outside of a print statement.

Numbers should be cast to strings before they are concatenated.

Comparison operators

==	if <code>x == y</code>	Is x the same as y? (equal)
!=	if <code>x != y</code>	Are x and y different? (not equal)
<	if <code>x < y</code>	Is x less than y?
<=	if <code>x <= y</code>	Is x less than or equal to y?
>	if <code>x > y</code>	Is x greater than y?
>=	if <code>x >= y</code>	Is x greater than or equal to y?

Note that a double equal is asking a question, a single equal assigns a variable. E.g.

`x == 6` means is x equal to 6?

`x = 6` means x becomes the number 6.

TIME 2 CODE Python Programming guide

Logical operators

and	if x > y and x > 6:	Both conditions must be true for the result to be True.
or	if x > y or x > 6:	One of the conditions must be true for the result to be True.
not	if not x:	The condition must not be met for the result to be True.

Mathematical operators

+	x = 6 + 5	Addition
-	x = 6 - 5	Subtraction
*	x = 6 * 5	Multiplication
/	x = 6 / 5	Division

Command Index

#.....	1
def.....	2
float.....	3
if.....	4
input.....	6
int.....	7
match.....	8
print.....	10
return.....	11
while.....	12