

# PYTHON NUMBERS

[http://www.tutorialspoint.com/python/python\\_numbers.htm](http://www.tutorialspoint.com/python/python_numbers.htm)

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Number data types store numeric values. They are immutable data types, which means that changing the value of a number data type results in a newly allocated object.

Number objects are created when you assign a value to them. For example:

```
var1 = 1
var2 = 10
```

You can also delete the reference to a number object by using the **del** statement. The syntax of the del statement is:

```
del var1[,var2[,var3[...[,varN]]]]
```

You can delete a single object or multiple objects by using the del statement. For example:

```
del var
del var_a, var_b
```

Python supports four different numerical types:

- **int (signed integers)**: often called just integers or ints, are positive or negative whole numbers with no decimal point.
- **long (long integers)**: or longs, are integers of unlimited size, written like integers and followed by an uppercase or lowercase L.
- **float (floating point real values)**: or floats, represent real numbers and are written with a decimal point dividing the integer and fractional parts. Floats may also be in scientific notation, with E or e indicating the power of 10 ( $2.5e2 = 2.5 \times 10^2 = 250$ ).
- **complex (complex numbers)**: are of the form  $a + bJ$ , where a and b are floats and J (or j) represents the square root of -1 (which is an imaginary number). a is the real part of the number, and b is the imaginary part. Complex numbers are not used much in Python programming.

## Examples:

Here are some examples of numbers:

int	long	float	complex
10	51924361L	0.0	3.14j
100	-0x19323L	15.20	45.j
-786	0122L	-21.9	9.322e-36j
080	0xDEFABCECBDAECBFBAE1	32.3+e18	.876j
-0490	535633629843L	-90.	-.6545+0J
-0x260	-052318172735L	-32.54e100	3e+26J
0x69	-4721885298529L	70.2-E12	4.53e-7j

- Python allows you to use a lowercase L with long, but it is recommended that you use only an uppercase L to avoid confusion with the number 1. Python displays long integers with an uppercase L.

- A complex number consists of an ordered pair of real floating point numbers denoted by  $a + bj$ , where  $a$  is the real part and  $b$  is the imaginary part of the complex number.

## Number Type Conversion:

Python converts numbers internally in an expression containing mixed types to a common type for evaluation. But sometimes, you'll need to coerce a number explicitly from one type to another to satisfy the requirements of an operator or function parameter.

- Type **int(x)** to convert  $x$  to a plain integer.
- Type **long(x)** to convert  $x$  to a long integer.
- Type **float(x)** to convert  $x$  to a floating-point number.
- Type **complex(x)** to convert  $x$  to a complex number with real part  $x$  and imaginary part zero.
- Type **complex(x, y)** to convert  $x$  and  $y$  to a complex number with real part  $x$  and imaginary part  $y$ .  $x$  and  $y$  are numeric expressions

## Mathematical Functions:

Python includes following functions that perform mathematical calculations.

Function	Returns ( description )
<a href="#"><u>abs(x)</u></a>	The absolute value of $x$ : the (positive) distance between $x$ and zero.
<a href="#"><u>ceil(x)</u></a>	The ceiling of $x$ : the smallest integer not less than $x$
<a href="#"><u>cmp(x, y)</u></a>	-1 if $x < y$ , 0 if $x == y$ , or 1 if $x > y$
<a href="#"><u>exp(x)</u></a>	The exponential of $x$ : $e^x$
<a href="#"><u>fabs(x)</u></a>	The absolute value of $x$ .
<a href="#"><u>floor(x)</u></a>	The floor of $x$ : the largest integer not greater than $x$
<a href="#"><u>log(x)</u></a>	The natural logarithm of $x$ , for $x > 0$
<a href="#"><u>log10(x)</u></a>	The base-10 logarithm of $x$ for $x > 0$ .
<a href="#"><u>max(x1, x2,...)</u></a>	The largest of its arguments: the value closest to positive infinity
<a href="#"><u>min(x1, x2,...)</u></a>	The smallest of its arguments: the value closest to negative infinity
<a href="#"><u>modf(x)</u></a>	The fractional and integer parts of $x$ in a two-item tuple. Both parts have the same sign as $x$ . The integer part is returned as a float.
<a href="#"><u>pow(x, y)</u></a>	The value of $x^{**}y$ .
<a href="#"><u>round(x [,n])</u></a>	$x$ rounded to $n$ digits from the decimal point. Python rounds away from zero as a tie-breaker: $\text{round}(0.5)$ is 1.0 and $\text{round}(-0.5)$ is -1.0.
<a href="#"><u>sqrt(x)</u></a>	The square root of $x$ for $x > 0$

## Random Number Functions:

Random numbers are used for games, simulations, testing, security, and privacy applications. Python includes following functions that are commonly used.

Function	Description
<a href="#"><code>choice(seq)</code></a>	A random item from a list, tuple, or string.
<a href="#"><code>randrange([start,] stop [,step])</code></a>	A randomly selected element from range(start, stop, step)
<a href="#"><code>random()</code></a>	A random float r, such that 0 is less than or equal to r and r is less than 1
<a href="#"><code>seed([x])</code></a>	Sets the integer starting value used in generating random numbers. Call this function before calling any other random module function. Returns None.
<a href="#"><code>shuffle(lst)</code></a>	Randomizes the items of a list in place. Returns None.
<a href="#"><code>uniform(x, y)</code></a>	A random float r, such that x is less than or equal to r and r is less than y

## Trigonometric Functions:

Python includes following functions that perform trigonometric calculations.

Function	Description
<a href="#"><code>acos(x)</code></a>	Return the arc cosine of x, in radians.
<a href="#"><code>asin(x)</code></a>	Return the arc sine of x, in radians.
<a href="#"><code>atan(x)</code></a>	Return the arc tangent of x, in radians.
<a href="#"><code>atan2(y, x)</code></a>	Return <code>atan(y / x)</code> , in radians.
<a href="#"><code>cos(x)</code></a>	Return the cosine of x radians.
<a href="#"><code>hypot(x, y)</code></a>	Return the Euclidean norm, <code>sqrt(x*x + y*y)</code> .
<a href="#"><code>sin(x)</code></a>	Return the sine of x radians.
<a href="#"><code>tan(x)</code></a>	Return the tangent of x radians.
<a href="#"><code>degrees(x)</code></a>	Converts angle x from radians to degrees.
<a href="#"><code>radians(x)</code></a>	Converts angle x from degrees to radians.

## Mathematical Constants:

The module also defines two mathematical constants:

Constants	Description
pi	The mathematical constant pi.
e	The mathematical constant e.