

Python - Math Module

Some of the most popular mathematical functions are defined in the math module. These include trigonometric functions, representation functions, logarithmic functions, angle conversion functions, etc. In addition, two mathematical constants are also defined in this module.

Pie (π) is a well-known mathematical constant, which is defined as the ratio of the circumference to the diameter of a circle and its value is 3.141592653589793.

```
>>> import math
>>> math.pi
3.141592653589793
```

Another well-known mathematical constant defined in the math module is **e**. It is called **Euler's number** and it is a base of the natural logarithm. Its value is 2.718281828459045.

```
>>> math.e
2.718281828459045
```

The math module contains functions for calculating various trigonometric ratios for a given angle. The functions (sin, cos, tan, etc.) need the angle in radians as an argument. We, on the other hand, are used to express the angle in degrees. The math module presents two angle conversion functions: `degrees()` and `radians()`, to convert the angle from degrees to radians and vice versa. For example, the following statements convert the angle of 30 degrees to radians and back (Note: π radians is equivalent to 180 degrees).

```
>>> math.radians(30)
0.5235987755982988
>>> math.degrees(math.pi/6)
29.999999999999996
```

The following statements show **sin**, **cos** and **tan** ratios for the angle of 30 degrees (0.5235987755982988 radians):

```
>> math.sin(0.5235987755982988)
0.49999999999999994
>>> math.cos(0.5235987755982988)
0.8660254037844387
>>> math.tan(0.5235987755982988)
0.5773502691896257
```

You may recall that $\sin(30)=0.5$, $\cos(30)=\frac{\sqrt{3}}{2}$ (which is 0.8660254037844387) and $\tan(30)=\frac{1}{\sqrt{3}}$ (which is 0.5773502691896257).

math.log()

The `math.log()` method returns the natural logarithm of a given number. The natural logarithm is calculated to the base e .

```
>>>math.log(10)
2.302585092994046
```

math.log10()

The `math.log10()` method returns the base-10 logarithm of the given number. It is called the standard logarithm.

```
>>>math.log10(10)
1.0
```

math.exp()

The `math.exp()` method returns a float number after raising e (`math.e`) to given number. In other words, `exp(x)` gives e^{**x} .

```
>>>math.exp(10)
1.0
```

This can be verified by the exponent operator.

```
>>>math.e**10
22026.465794806703
```

math.pow()

The `math.pow()` method receives two float arguments, raises the first to the second and returns the result. In other words, `pow(4,4)` is equivalent to 4^{**4} .

```
>>>math.pow(2,4)
16.0
>>>2**4
16
```

math.sqrt()

The `math.sqrt()` method returns the square root of a given number.

```
>>>math.sqrt(100)
10.0
```

```
>>>math.sqrt(3)
1.7320508075688772
```

The following two functions are called representation functions. The **ceil()** function approximates the given number to the smallest integer, greater than or equal to the given floating point number. The **floor()** function returns the largest integer less than or equal to the given number.

```
>>>math.ceil(4.5867)
5
>>>math.floor(4.5687)
4
```