PYTHON PROGRAMMING

Mathematical Functions in Python

- In python a number of mathematical operations can be performed with ease by importing a module named "math" which defines various functions which makes our tasks easier.

- Important mathematical functions in python are:

  - **ceil()** :- This function returns the **smallest integral value greater than the number**. If number is already integer, same number is returned.

  - **floor()** :- This function returns the **greatest integral value smaller than the number**. If number is already integer, same number is returned.

EXAMPLE

```
# Python code to demonstrate the working of ceil() and floor()

# importing "math" for mathematical operations
import math

a = 2.3

# returning the ceil of 2.3
print ("The ceil of 2.3 is : ", end=" ")
print (math.ceil(a))
```

o/p : The ceil of 2.3 is : 3

```
# returning the floor of 2.3
print ("The floor of 2.3 is : ", end=" ")
print (math.floor(a))
```

o/p : The floor of 2.3 is : 2

- **fabs()** :- This function returns the **absolute value** of the number.

- **factorial()** :- This function returns the **factorial** of the number.
  Argument must be a positive integer.

- **fmod()** :- This function returns the **remainder** of the specified arguments.

  Syntax: *math.fmod(x, y)*
  Parameters:
  x any valid number (positive or negative).
  y any valid number(positive or negative).
  Returns: *Returns the remainder in x/y as a floating point number.*

EXAMPLE

```
# Python code to demonstrate the working of  fabs() and factorial()

# importing "math" for mathematical operations
import math
a = -10.3
b= 5

# returning the absolute value.
print ("The absolute value of -10.3 is : ", end=“ ")
print (math.fabs(a))
```

o/p : The absolute value of -10.3 is : 10.3

```
# returning the factorial of 5
print ("The factorial of 5 is : ", end=“ ")
print (math.factorial(b))
```

o/p : The factorial of 5 is : 120

EXAMPLE

```
# Python program to demonstrate fmod() function

import math

# modulus of +ve integer number
print(math.fmod(4, 5))
print(math.fmod(43.50, 4.5))

# modulus of -ve integer number
print(math.fmod(-17, 5))
print('%.2f' %math.fmod(-10, 4.78))
```

o/p : 4.0
3.0
-2.0
-0.44

- **fsum()** :- This function find and return an **accurate floating point sum between some range or an iterable (list).**

- **trunc()** :- This function returns the **integer part of the argument** after truncation.

- **exp(x)** :- This function returns **e**x**.

- **log(a, b)** :- This function returns the **logarithmic value of a with base b**. With one argument , function returns the natural logarithm of a to base e. With two arguments , function returns the logarithm of a to the given base b.

- **pow(a, b)** :- This function is used to compute value of **a raised to the power b (a**b)**.

- **sqrt()** :- This function returns the **square root** of the number.

EXAMPLE

```
# Python code to demonstrate use  of math.fsum() function

# fsum() is found in math library
import math

# range(10)
print(math.fsum(range(10)))

# Integer list
arr = [1, 4, 6]
print(math.fsum(arr))

# Floating point list
arr = [2.5, 2.4, 3.09]
print(math.fsum(arr))
```

o/p : 45.0
11.0
7.99

EXAMPLE

```
# trunc() for a positive number.
import math
print (math.trunc(3.5))

# trunc() for a negative number.
import math
print math.trunc(-4.5)

# Python code to demonstrate the working of  exp() and log()

import math

# returning the exp of 4
print ("The e**4 value is : ", end=" ")
print (math.exp(4))

# returning the log of 2,3
print ("The value of log 2 with base 3 is : ", end=" ")
print (math.log(2,3))
```

o/p : 3
-4

o/p :The e4 value is : 54.598150033144236**
The value of log 2 with base 3 is : 0.6309297535714574

EXAMPLE

```
# Python code to demonstrate the working of pow() and sqrt()

# importing "math" for mathematical operations
import math

# returning the value of 3**2
print ("The value of 3 to the power 2 is : ", end=“ ")
print (math.pow(3,2))

# returning the square root of 25
print ("The value of square root of 25 : ", end=“ ")
print (math.sqrt(25))
```

o/p : The value of 3 to the power 2 is : 9.0
The value of square root of 25 : 5.0

- **pi** :- This is an inbuilt constant that outputs the **value of pi(3.141592)**.
- **e** :- This is an inbuilt constant that outputs the **value of e(2.718281).**
- **sin()** :- This function returns the **sine** of value passed as argument. The value passed in this function should be in **radians**.
- **cos()** :- This function returns the **cosine** of value passed as argument. The value passed in this function should be in **radians**.
- **tan()** :- This function returns the **tangent** of value passed as argument. The value passed in this function should be in **radians**.
- **degrees()** :- This function is used to **convert argument value from radians to degrees**.
- **radians()** :- This function is used to **convert argument value from degrees to radians**.

EXAMPLE

```
# Python code to demonstrate the working of
# const. pi and e

# importing "math" for mathematical operations
import math

# returning the value of const. pi
print ("The value of const. pi is : ", end=" ")
print (math.pi)

# returning the value of const. e
print ("The value of const. e is : ", end=" ")
print (math.e)
```

o/p : The value of const. pi is : 3.141592653589793
The value of const. e is : 2.718281828459045

EXAMPLE

```
# Python code to demonstrate the working of sin() , cos() and tan()
import math
a = math.pi/6

# returning the value of sine of pi/6
print ("The value of sine of pi/6 is : ", end=" ")
print (math.sin(a))
```

o/p : The value of sine of pi/6 is : 0.4999999999999994

```
# returning the value of cosine of pi/6
print ("The value of cosine of pi/6 is : ", end=" ")
print (math.cos(a))
```

o/p :The value of cosine of pi/6 is : 0.8660254037844387

EXAMPLE

```
# returning the value of tangent of pi/6
print ("The value of tangent of pi/6 is : ", end=“ ")
print (math.tan(a))
```

o/p : The value of tangent of pi/6 is : 0.5773502691896257

EXAMPLE

```
# Python code to demonstrate the working of degrees() and radians()
import math

a = math.pi/6
b = 30

# returning the converted value from radians to degrees
print ("The converted value from radians to degrees is : ", end=“ ")
print (math.degrees(a))

# returning the converted value from degrees to radians
print ("The converted value from degrees to radians is : ", end=“ ")
print (math.radians(b))
```

o/p : The converted value from radians to degrees is : 29.999999999999996
The converted value from degrees to radians is : 0.5235987755982988

- **asin()** :- This function returns the **arc sine** of value passed as argument. The value passed in this function should be in **radians**.

- **acos()** :- This function returns the **arc cosine** of value passed as argument. The value passed in this function should be in **radians**.

- **atan()** :- This function returns the **arc tangent** of value passed as argument. The value passed in this function should be in **radians.**

- **sinh()** :- This function returns the **hyperbolic sine** of value passed as argument. The value passed in this function should be in **radians**.

- **cosh()** :- This function returns the **hyperbolic cosine** of value passed as argument. The value passed in this function should be in **radians**.

- **tanh()** :- This function returns the **hyperbolic tangent** of value passed as argument. The value passed in this function should be in **radians.**

EXAMPLE

```
# Python code to implement  the asin() , acos() and atan()
import math
a = math.pi / 6

# returning the value of arc sine of pi / 6
print ("The value of arc sine of pi / 6 is : ", end =“ ")
print (math.asin(a))
# returning the value of arc cosine of pi / 6
print ("The value of arc cosine of pi / 6 is : ", end =“ ")
print (math.acos(a))
# returning the value of arc tangent of pi / 6
print ("The value of arc tangent of pi / 6 is : ", end =“ ")
print (math.atan(a))
```

o/p : The value of arc sine of pi / 6 is : 0.5510695830994463
The value of arc cosine of pi / 6 is : 1.0197267436954502
The value of tangent of pi / 6 is : 0.48234790710102493

EXAMPLE

```
# Python code to implement  the sinh() , cosh() and tanh()

import math

a = math.pi / 6

# Return the hyperbolic sine value
print (math.sinh(a))

# Return the hyperbolic cosine value
print (math.cosh(a))

# Return the hyperbolic tangent value
print (math.tanh(a))
```

o/p : 0.5478534738880397
1.1402383210764286
0.4804727781564516


Thank you