float data type and float literal

What is float value or float literal?
Float value is a numeric value with fractional part.
Float value is having two parts

1. Integer part
2. Fractional part or decimal part

In python float values or literals are represented in memory using float data type.
The size of float data type is fixed
The maximum size of float values is 8 bytes. Float values are scientific values and these values are represented by following the rules given by IEEE.

```
>>> a=1.5
>>> a
1.5
>>> type(a)
<class 'float'>
>>> b=15
>>> b
15
>>> type(b)
<class 'int'>
```

In python float value is represented in two formats

1. Fixed notations or Standard notation
2. Exponent notation

The default notation is fixed notation or standard notation, which is having integer and fractional part.

```
>>> pi=3.147
>>> pi
3.147
>>> type(pi)
<class 'float'>
>>> p=67.76
>>> p
67.76
```

```
>>> type(p)
<class 'float'>
```

Larger values are represented in exponent notation. In exponent notation a float value uses one special character called “e” or “E”.
The value of “e” or “E” is 10

```
>>> a=12e-1
>>> a
1.2
>>> type(a)
<class 'float'>
>>> b=12e2
>>> b
1200.0
>>> type(b)
<class 'float'>
>>> c=12.45e1
>>> c
124.5
>>> type(c)
<class 'float'>
>>> d=12.45e-2
>>> d
0.1245
>>> type(d)
<class 'float'>
>>> a=1.123456789123456789
>>> a
1.1234567891234568
>>> b=1.12341231231234123412341123223333
>>> b
1.1234123123123412
```

Q: How to find information about float?

```
>>> import sys
>>> sys.float_info
sys.float_info(max=1.7976931348623157e+308, max_exp=1024,
max_10_exp=308, min=2.2250738585072014e-308, min_exp=-1021,
min_10_exp=-307, dig=15, mant_dig=53, epsilon=2.220446049250313e-16, radix=2, rounds=1)
>>> a=1.79e308
>>> a
1.79e+308
>>> b=1.79e309
>>> b
inf
>>> c=1.8e308
>>> c
inf
```

Complex literal and complex data type

Complex literal or complex number is numeric value having two values

1. real
2. imaginary

In python complex number or literal is represented using “complex” data type.

In real time complex numbers are used in linear algebra.

Syntax: real+imag**j**

Real and imaginary values are separated + and imaginary value is suffix with j. real and imaginary values are of type of float

```
>>> import math
>>> math.sqrt(9)
3.0
>>> math.sqrt(-9)
Traceback (most recent call last):
  File "<pyshell#39>", line 1, in <module>
    math.sqrt(-9)
ValueError: math domain error
>>> import cmath
>>> cmath.sqrt(-9)
3j
>>> c1=1+2j
>>> c1
```

```
(1+2j)
>>> type(c1)
<class 'complex'>
>>> c1.real
1.0
>>> c1.imag
2.0
>>> c2=1j
>>> c2.real
0.0
>>> c2.imag
1.0
>>> c3=1+0j
>>> c3.real
1.0
>>> c3.imag
0.0
```

Example:

```
>>> rollno=12
>>> fee=6000.0
>>> type(rollno)
<class 'int'>
>>> type(fee)
<class 'float'>
>>> rollno=0xc
>>> rollno
12
>>> fee=6e3
>>> fee
6000.0
```

Boolean literals and Boolean data type

In python Boolean values or literals are represented using 2 keywords

1. True
2. False

“bool” is name of the data type, which represents Boolean value

```
>>> fee_paid=True
>>> type(fee_paid)
<class 'bool'>
>>> reserved=False
>>> type(reserved)
<class 'bool'>
>>> f1=true
Traceback (most recent call last):
  File "<pyshell#66>", line 1, in <module>
    f1=true
NameError: name 'true' is not defined. Did you mean: 'True'?
>>> 10>5
True
>>> 10+5
15
>>> 5>10
False
>>> rollno=1
>>> fee=6000.0
>>> feepaid=True
>>> rollno
1
>>> fee
6000.0
>>> feepaid
True
>>> type(rollno)
<class 'int'>
>>> type(fee)
<class 'float'>
>>> type(feepaid)
<class 'bool'>
```

Internal representation of True is 1 and False is 0

```
>>> True+True
2
>>> True+False
1
```

```
>>> False+False
0
```

NoneType

NoneType is name of the data type.
This data type is used to represent null value or None value
“None” is keyword which represents null or no value

```
>>> rollno=1
>>> name=None
>>> fee=6000.0
>>> feepaid=True
>>> type(rollno)
<class 'int'>
>>> type(name)
<class 'NoneType'>
>>> type(fee)
<class 'float'>
>>> type(feepaid)
<class 'bool'>
>>> x=None
>>> type(x)
<class 'NoneType'>
>>> x
>>> a=0
>>> b=1
>>> c=a+b
>>> c
1
>>> x=10
>>> y=None
>>> x+y
Traceback (most recent call last):
  File "<pyshell#99>", line 1, in <module>
    x+y
TypeError: unsupported operand type(s) for +: 'int' and 'NoneType'
```

str data type and string literal

What is string?

String is a collection of characters. These character can be alphabets (a-z,A-Z), digits (0-9) and special characters.

String is a non numeric data type and we cannot perform arithmetic operations.

In python string is represented in memory using “str” data type.

How to create string (OR) How to represent string value?