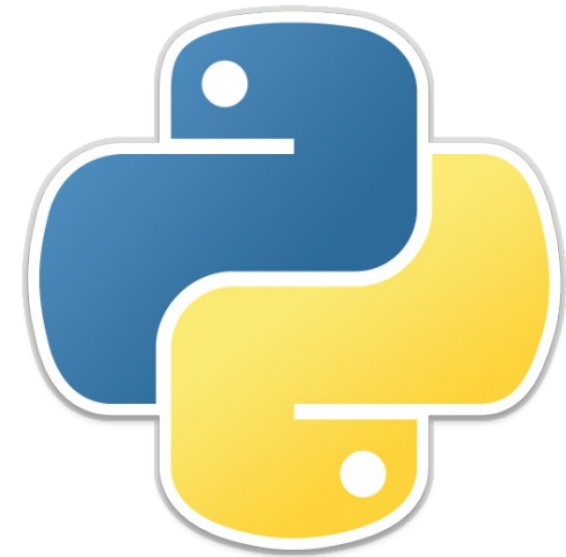


Python : Getting Started

Tushar B. Kute,
<http://tusharkute.com>



First Python program

- Let us execute programs in different modes of programming.
- Interactive Mode Programming:
 - Invoking the interpreter without passing a script file as a parameter brings up the following prompt:

```
rashmi@rashmi-dell:~$ python3
Python 3.4.3 (default, Oct 14 2015, 20:33:09)
[GCC 4.8.4] on linux
Type "help", "copyright", "credits" or "license" for
>>> print("Hello World...!!!")
Hello World...!!!
>>> █
```

Script Mode Programming

- Invoking the interpreter with a script parameter begins execution of the script and continues until the script is finished. When the script is finished, the interpreter is no longer active.
- Let us write a simple Python program in a script. Python files have the extension .py. Type the following source code in a test.py file-

```
print ("Hello, Python!")
```
- Now, try to run this program as follows-

```
$ python test.py
```

Script Mode Programming

- Let us try another way to execute a Python script in Linux. Here is the modified test.py file-

```
#!/usr/bin/python3  
  
print ("Hello, Python!")
```

- We assume that you have Python interpreter available in the /usr/bin directory. Now, try to run this program as follows-

```
$ chmod +x test.py # This is to make file executable  
$ ./test.py
```

Python Identifiers

- A Python identifier is a name used to identify a variable, function, class, module or other object.
- An identifier starts with a letter A to Z or a to z or an underscore (_) followed by zero or more letters, underscores and digits (0 to 9).
- Python does not allow punctuation characters such as @, \$, and % within identifiers.
- Python is a case sensitive programming language. Thus, Co1lege and co1lege are two different identifiers in Python.

Python Identifiers – Naming Conventions

- Class names start with an uppercase letter. All other identifiers start with a lowercase letter.
- Starting an identifier with a single leading underscore indicates that the identifier is private.
- Starting an identifier with two leading underscores indicates a strong private identifier.
- If the identifier also ends with two trailing underscores, the identifier is a language-defined special name.

Keywords

- Keywords are the **reserved words** in Python.
- We cannot use a keyword as a variable name, function name or any other identifier. They are used to define the syntax and structure of the Python language.
- In Python, keywords are case sensitive.
 - All the keywords except True, False and None are in lowercase and they must be written as it is.
- There are 33 keywords in Python 3.7

Python keywords

- False class finally is return
- None continue for lambda try
- True def from nonlocal while
- and del global not with
- as elif if or yield
- assert else import pass
- break except in raise

Declaring and using variables

```
>>> num1 = 45
```

```
>>> num2 = 56
```

```
>>> print(num1)
```

```
45
```

```
>>> num3 = 12.33
```

```
>>> print(num3)
```

```
12.33
```

```
>>> name = 'Tushar'
```

```
>>> print(name)
```

```
Tushar
```

Data types

- Numbers:
 - int
 - float
 - complex
- String
- Boolean
- List
- Tuple
- Set
- Dictionary

Integers

```
>>> num = 23
```

```
>>> type(num)
```

```
<class 'int'>
```

```
>>> num + 10
```

```
33
```

```
>>> num ** 100
```

```
148861915063630393937915565865597542319  
871196538013686865769882092224332785393  
313521523901432773468042334765921794473  
10859520222529876001
```

Integer length

- Try this:

```
>>> num ** 1000
```

- This will generate a big number with 100s of digits.
- There is NO inherent limit to the integer to store in memory. It goes on using until we run out of memory.

Floating point numbers

```
>>> num = 59.33
>>> print(num)
59.33
>>> num = 5933e18
>>> print(num)
5.933e+21
>>> type(num)
<class 'float'>
>>> num = 12.9567255478
>>> num * 11.43
148.09537301135398
```

Floating point numbers

```
>>> num1 = 4.233e221
>>> num2 = 12.322E212
>>> num1 * num
```

```
inf
```

```
>>> 2.0 ** 1023
8.98846567431158e+307
```

Floating point limit

```
>>> 2.1 ** 1023
```

```
Traceback (most recent call last):
```

```
File "<stdin>", line 1, in <module>
```

```
OverflowError: (34, 'Numerical result out of
range')
```

Other number systems

- **Octal number system**

```
>>> num = 0o123
```

```
>>> print(num)
```

```
83
```

- **Hexadecimal number system**

```
>>> num = 0x123
```

```
>>> print(num)
```

```
291
```

- **Binary Number system**

```
>>> num = 0b101
```

```
>>> print(num)
```

```
5
```

Multiple assignment

```
>>> num1, num2, num3 = 12, 34, 55
```

```
>>> print(num1)
```

```
12
```

```
>>> print(num2)
```

```
34
```

```
>>> print(num3)
```

```
55
```


Multiple assignment

```
>>> num1 = num2 = num3 = 27
```

```
>>> print(num1)
```

```
27
```

```
>>> print(num2)
```

```
27
```

```
>>> print(num3)
```

```
27
```

Semicolon separator

```
>>> num1 = 12; num2 = 34; num3 = 31
```

```
>>> print(num2)
```

```
34
```

```
>>> num1 = 10; num1 = num1 + 2; print(num1)
```

```
12
```

Strings

- Strings can be declared in single or double quotes.

```
>>> name = 'Hello World'
```

```
>>> print(name)
```

```
Hello World
```

```
>>> name = "Hello World"
```

```
>>> print(name)
```

```
Hello World
```

```
>>> type(name)
```

```
<class 'str'>
```

Making combinations

```
>>> data = 'Learning "Python" is fun'
```

```
>>> print(data)
```

```
Learning "Python" is fun
```

```
>>> data = "Learning 'Python' is fun"
```

```
>>> print(data)
```

```
Learning 'Python' is fun
```

String concatenation

```
>>> first = 'Python'
>>> second = 'Programming'
>>> last = first + second
>>> print(last)
PythonProgramming
>>> print(first+second)
PythonProgramming
>>> print('Python'+ 'Programming')
PythonProgramming
```

Escape Sequences

<code>\n</code>	New Line
<code>\t</code>	Tab
<code>\v</code>	Vertical tab
<code>\r</code>	Carriage Return
<code>\b</code>	Backspace
<code>\a</code>	Audio bell
<code>\\</code>	Single slash

Using escape sequences

```
>>> print('Hello\nWorld')
```

```
Hello
```

```
World
```

```
>>> print('Hello\bWorld')
```

```
HellWorld
```

```
>>> print('Hello\vWorld')
```

```
Hello
```

```
World
```

```
>>> print('Hello\rWorld')
```

```
World
```

```
>>> print('Hello\\World')
```

```
Hello\World
```

Comment

- Python Syntax 'Comments' let you store tags at the right places in the code.
- You can use them to explain complex sections of code. The interpreter ignores comments.
- Declare a comment using an octothorpe / hash (#).

```
# This is a comment
```

```
>>> num = 34      #Variable declared
```

- Python does not support general multiline comments like Java or C++.

Docstring

- A docstring is a documentation string. Like a comment, this Python Syntax is used to explain code.
- But unlike comments, they are more specific. Also, they are retained at runtime.
- This way, the programmer can inspect them at runtime. Delimit a docstring using three double or single quotes.

Multi-line string

```
>>> line = '''Hello  
... Welcome to MITU  
... Pune'''
```

```
>>> print(line)
```

Hello

Welcome to MITU

Pune

Multi-line comment

```
'''This is my first program  
Date: 15/05/2019 '''  
num1 = 45  
num2 = 55  
result = 45 + 55  
print(result)
```

Common string functions

- `title()`
- `upper()`
- `lower()`
- `swapcase()`
- `isalpha()`
- `isdigit()`
- `islower()`
- `isupper()`
- `split()`
- `strip()`
- `lstrip()`
- `rstrip()`
- `startswith()`
- `endswith()`

Using string functions

```
>>> data = 'hello'
>>> data.upper()
'HELLO'
>>> data.isalpha()
True
>>> data.split()
['hello']
>>> data.startswith('he')
True
>>> data.replace('e','a')
'hallo'
```

The Unicode strings

```
>>> s = u'\u0937'
```

```
>>> print(s)
```

७

```
>>> s = u'\u0567'
```

```
>>> print(s)
```

Է

```
s = u'\u0756'
```

```
>>> print(s)
```

٦

The dir() function

- The dir() function returns all properties and methods of the specified object, without the values.
- This function will return all the properties and methods, even built-in properties which are default for all object.
- If the object has `__dir__()` method, the method will be called and must return the list of attributes.
- If the object doesn't have `__dir__()` method, this method tries to find information from the `__dict__` attribute (if defined), and from type object. In this case, the list returned from dir() may not be complete.

Using dir and help

- How to use dir() ?
 - `>>> data = 'hello'`
 - `>>> dir(data)`
- How to see the help of functions ?
 - `>>> help(data.upper) # Object function`
 - `>>> help(len) # basic function`
- You can apply the dir() and help() function to all kind of variables and objects.

The print function

- The print() function prints the given object to the standard output device (screen) or to the text stream file.
- The full syntax of print() is:
 - `print(*objects, sep=' ', end='\n')`
 - objects - object to be printed. * indicates that there may be more than one object
 - sep - objects are separated by sep. Default value: ' '
 - end - end is printed at last

Using print()

```
>>> name = 'Tushar'
```

```
>>> age = 34
```

```
>>> print('My name is',name,'and age is',age)
```

```
My name is Tushar and age is 34
```

```
>>> print('My name is %s and age is %d' %  
(name,age))    # Formatted print
```

```
My name is Tushar and age is 34
```

```
>>> print('My name is {} and age is  
{}`'.format(name,age))    #Using .format
```

```
My name is Tushar and age is 34
```

Print options

```
>>> print('My name is',name)
```

```
My name is Tushar
```

```
>>> print('My name is',name,end='\n\n')
```

```
My name is Tushar
```

```
>>> print(name,age)
```

```
Tushar 34
```

```
>>> print(name,age,sep='\t')
```

```
Tushar 34
```

```
>>> print(name,age,sep='\n')
```

```
Tushar
```

```
34
```

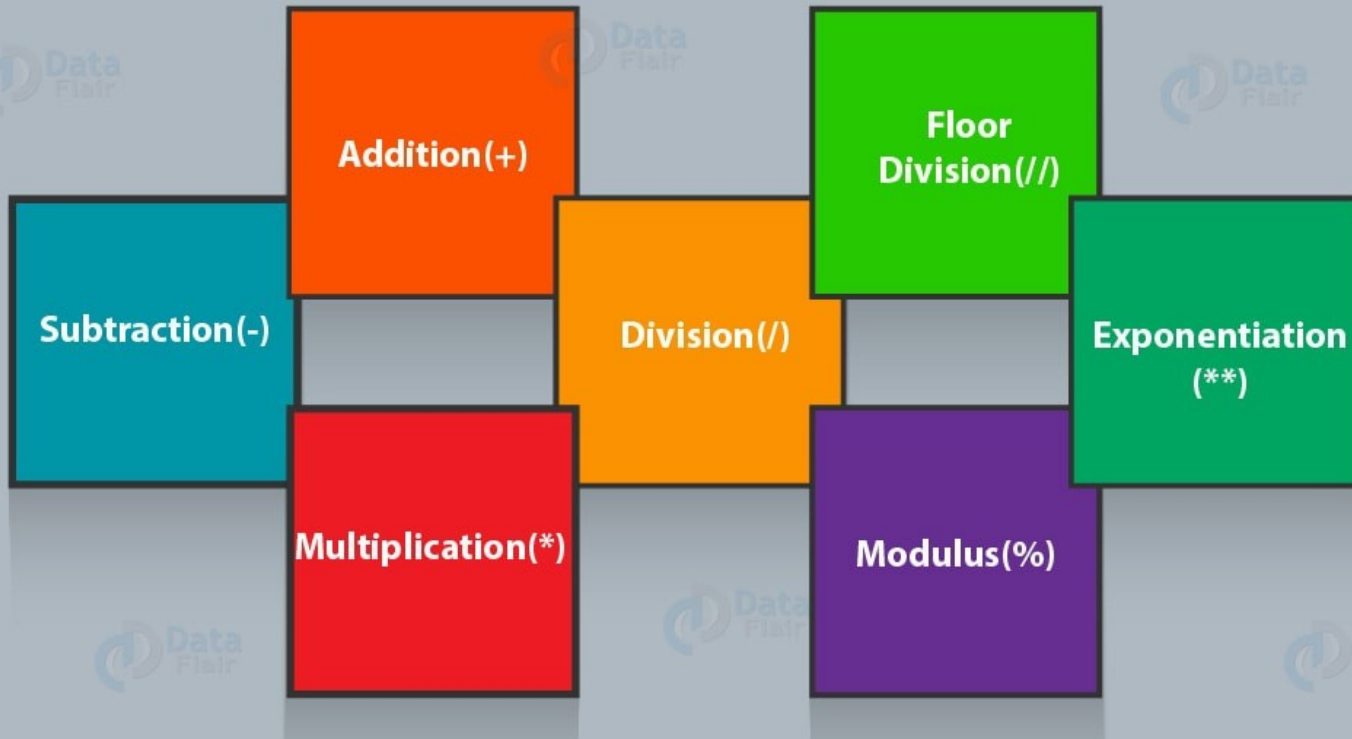
Operators



Arithmetic Operators



Python Arithmetic Operator



Arithmetic operators

```
>>> num1 = 23; num2 = 11
```

```
>>> result = num1 + num2
```

```
>>> result
```

```
34
```

```
>>> num1 - num2
```

```
12
```

```
>>> num1 * num2
```

```
253
```

```
>>> num1 / num2
```

```
2.090909090909091
```

```
>>> num1 // num2
```

```
2
```

```
>>> num1 % num2
```

```
1
```

Arithmetic operators on strings

- The multiplication operator can be used on strings too.

```
>>> name = 'Tushar'
```

```
>>> name * 5
```

```
'TusharTusharTusharTusharTushar'
```

Relational operators



Relational operators

```
>>> num1 > num2
```

```
True
```

```
>>> num1 <= num2
```

```
False
```

```
>>> num1 == num2
```

```
False
```

```
>>> num1 != num2
```

```
True
```

Relational operators on strings

```
>>> 'Abc' != 'AbC'
```

```
True
```

```
>>> 'Abc' == 'AbC'
```

```
False
```

```
>>> 'Abc' < 'AbC'
```

```
False
```

```
>>> 'Abc' < 'AbCdef'
```

```
False
```

Assignment operators

Python Assignment Operator

Assign(=)

Add and
Assign(+ =)

Subtract
and
Assign(- =)

Divide
and
Assign(/ =)

Multiply
and
Assign(* =)

Modulus
and
Assign(% =)

Exponent
and
Assign(** =)

Floor-Divide
and
Assign(// =)

Assignment operators

```
>>> print(num1)
```

```
25
```

```
>>> num1 += 2
```

```
>>> print(num1)
```

```
27
```

```
>>> num1 *= 2
```

```
>>> print(num1)
```

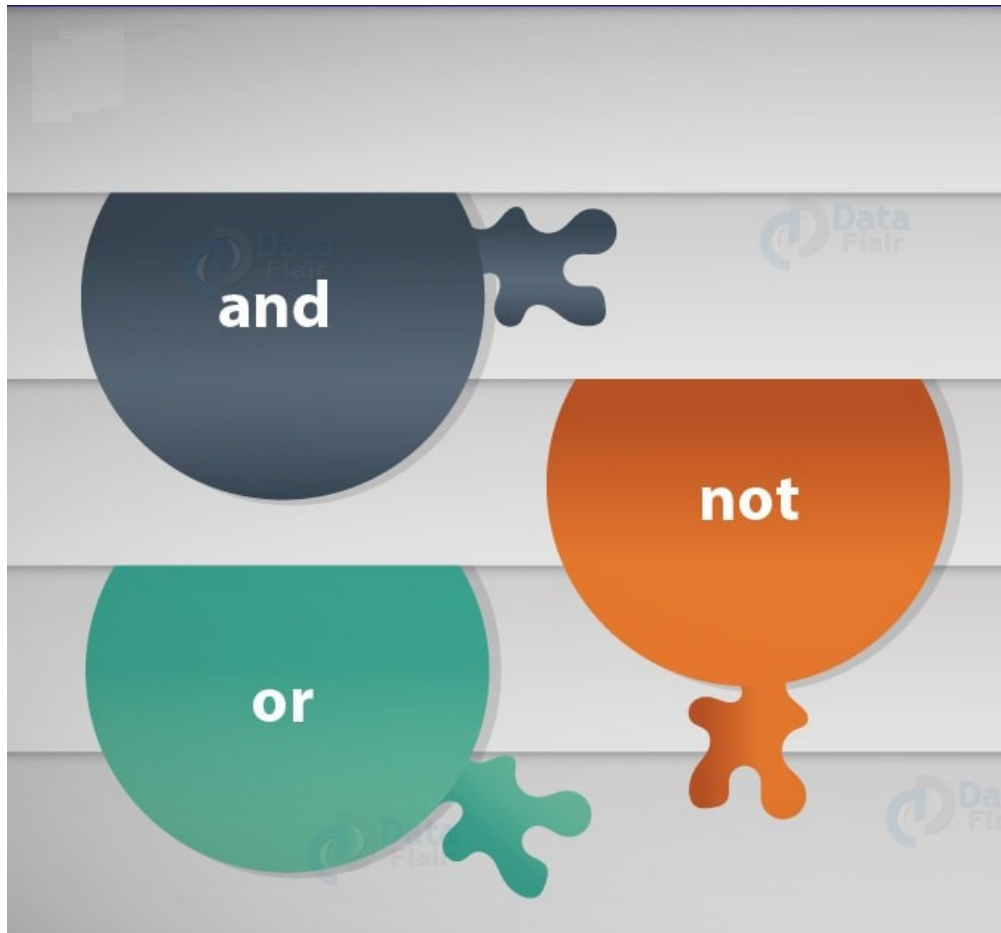
```
54
```

```
>>> num1 /= 2
```

```
>>> print(num1)
```

```
27.0
```

Logical operators



Python
Logical Operator

Logical operators

```
>>> num1 > num2 and num1 < 100
```

```
True
```

```
>>> num1 > 100 or num1 == num2
```

```
False
```

```
>>> not num1 < 100
```

```
False
```

Membership operators

- These operators test whether a value is a member of a sequence. The sequence may be a list, a string, or a tuple. We have two membership python operators- 'in' and 'not in'.
 - in
 - This checks if a value is a member of a sequence.
 - not in
 - Unlike 'in', 'not in' checks if a value is not a member of a sequence.

Membership operators

```
>>> x = 10
```

```
>>> x in [34,10,32,17]
```

```
True
```

```
>>> 15 in [34,10,32,17]
```

```
False
```

```
>>> 15 not in [34,10,32,17]
```

```
True
```

```
>>> 'kar' in 'Tendulkar'
```

```
True
```


Identity operators

- These operators test if the two operands share an identity. We have two identity operators- 'is' and 'is not'.
 - is
 - If two operands have the same identity, it returns True.
 - is not
 - If two operands have the different identity, it returns True.

Identity operators

```
>>> 2 is 2
```

```
True
```

```
>>> 2 is '2'
```

```
False
```

```
>>> 20 is 20.0
```

```
False
```

```
>>> 20 is not 20.0
```

```
True
```

```
>>> 2000.0 is 2e3
```

```
True
```

Bitwise operators



Python Bitwise Operator

01

Binary AND(&)

02

Binary OR(|)

03

Binary XOR(^)

Binary One's
Complement(~)

04

Binary Left-Shift(<<)

05

Binary Right-Shift(>>)

06

Bitwise operators

```
>>> x = 19; y = 34
```

```
>>> x & y
```

```
2
```

```
>>> x | y
```

```
51
```

```
>>> x ^ y
```

```
49
```

```
>>> y << 2
```

```
136
```

```
>>> ~x
```

```
-20
```

Operators Precedence

Operator	Description
**	Exponentiation (raise to the power)
~ + -	Complement, unary plus and minus (method names for the last two are +@ and -@)
* / % //	Multiply, divide, modulo and floor division
+ -	Addition and subtraction
>> <<	Right and left bitwise shift
&	Bitwise 'AND'
^ 	Bitwise exclusive 'OR' and regular 'OR'
<= < > >=	Comparison operators
<> == !=	Equality operators
= %= /= //= -= += *= **=	Assignment operators
is is not	Identity operators
in not in	Membership operators
not or and	Logical operators

Two more types

- Complex

```
>>> num = 2.3 + 4.5j
```

```
>>> print(num)
```

```
(2.3+4.5j)
```

```
>>> type(num)
```

```
<class 'complex'>
```

- Boolean

```
>>> num = True
```

```
>>> print(num)
```

```
True
```

```
>>> type(num)
```

```
<class 'bool'>
```

Special type: None

- The null keyword is commonly used in many programming languages, such as Java, C++, C# and Javascript. It is a value that is assigned to a variable.
- The equivalent of the null keyword in Python is **None**. It was designed this way for two reasons:
 - Many would argue that the word "null" is somewhat esoteric. It's not exactly the most friendliest word to programming novices. Also, "None" refers exactly to the intended functionality - it is *nothing*, and has no behavior
 - In most object-oriented languages, the naming of objects tend to use camel-case syntax. eg. ThisIsMyObject. As you'll see soon, Python's None type is an object, and behaves as one.

Basic use

```
>>> num = None
```

```
>>> print(num)
```

```
None
```

```
>>> num
```

```
>>> type(num)
```

```
<class 'NoneType'>
```


Type conversion

- The process of converting the value of one data type (integer, string, float, etc.) to another data type is called type conversion. Python has two types of type conversion.
 - Implicit Type Conversion
 - Explicit Type Conversion
- Implicit Type Conversion:
 - In Implicit type conversion, Python automatically converts one data type to another data type. This process doesn't need any user involvement.

Type conversion

```
>>> num1 = 45          #int
>>> num2 = 56.23       #float
>>> result = num1 + num2
>>> print(result)      #float
101.22999999999999
```

Explicit type conversion

- In Explicit Type Conversion, users convert the data type of an object to required data type. We use the predefined functions like `int()`, `float()`, `str()`, etc to perform explicit type conversion.
- This type conversion is also called typecasting because the user casts (change) the data type of the objects.
- Syntax :
`(required_datatype) (expression)`
- Typecasting can be done by assigning the required data type function to the expression.

Explicit type conversion

```
>>> num1 = 45
>>> num2 = 56.23
>>> result = num1 + int(num2)
>>> print(result)
101
```

Type casting on strings

```
>>> num = '178'
```

```
>>> num * 3
```

```
'178178178'
```

```
>>> int(num) * 3
```

```
534
```

```
>>> num = 123
```

```
>>> s = 'hello' + str(num)
```

```
>>> s
```

```
'hello123'
```

Compatibility code

- Many interpreter based languages are having similar kind of syntax. Check the below code. We can run this code by three different kinds of interpreters i.e. Python, R and Ruby.

add.py

```
# Addition  
num1 = 45  
num2 = 55  
result = 45 + 55  
print(result)
```

Output

```
mitu@skillologies:~$ python add.py
100
mitu@skillologies:~$ Rscript add.py
[1] 100
mitu@skillologies:~$ ruby add.py
100mitu@skillologies:~$
```

Taking user input

- The `input()` function is used to read the values from keyboard. It prints the string and reads a string from keyboard which then will be stored in a variable.
- Example:
 - `s = input('Enter your name:')`
 - `num = int(input('Enter a number:'))`
 - `marks = float(input('Enter marks:'))`

Sample code:

Addition

```
num1 = int(input('Enter first:'))  
num2 = int(input('Enter second:'))  
result = num1 + num2  
print('Addition is', result)
```

```
mitu@skillologies:~$ python3 add.py  
Enter first:12  
Enter second:23  
Addition is 35
```

Exercises

- Write a program to read Celsius temperature and print equivalent Fahrenheit temperature on screen.
- Read radius of the circle from user and find the area and perimeter of it.
- Read the amount and percentage of interest from the keyboard and find final amount after adding interest in original amount.
- Write a program to read distance value in meters and convert it into centimeters, inches, and yards.

Thank you

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Web Resources

<http://mitu.co.in>

<http://tusharkute.com>

contact@mitu.co.in

tushar@tusharkute.com