recursive functions

In [15]:

```
# a function call itself
def mi(n):
    if n==1:
        return 1
    else:
        return n*mi(n-1)
#5*4*3*2*1(terminate)
n=5
print(mi(n))
```

```
120
```

In [7]:

```
def kkr(n):
    if n==1:
        return 1
    else:
        return n*kkr(n-1)
n=int(input())
print (kkr(n))
#6*5*4*3*2*1(terminates)
```

```
6
720
```

In [10]:

```
# arbitrary *,**
def name(*names):
    for i in names:
        print(i)
name('harsha','joel',"mani")
# for single star value stores in tuple
```

```
harsha
joel
mani
```

In [13]:

```
# for double star value stores in dictionary
def name(**names):
    print (names['team_1'],names["team_2"])
name(team_1="rcb",team_2="mi")
```

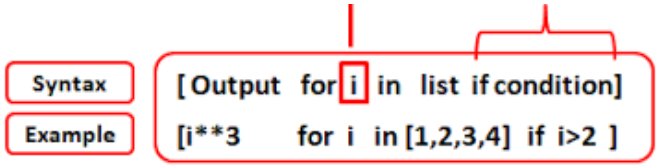
```
rcb mi
```

list comprehension

In [19]:

```
l=[]
for i in  range (0,21,2):
    l.append(i)
print (l)
```

```
[0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20]
```



In [26]:

```
# [exp itr cond]
[val for val in range (0,21,2)]
```

Out[26]:

```
[0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20]
```

In [28]:

```
[st for st in "kkr ksr college"]
```

Out[28]:

```
['k', 'k', 'r', ' ', 'k', 's', 'r', ' ', 'c', 'o', 'l', 'l', 'e', 'g', 'e']
```

In [34]:

```
abd = ["kkr","ksr","college","mark","guntur"]
a=[]
for i in abd:
    if "k" in i:
        a.append(i)
print (a)
```

```
['kkr', 'ksr', 'mark']
```

In [37]:

```
ab = ["kkr","ksr","college","mark","guntur"]
[out for out in ab if "k" in out]
```

Out[37]:

```
['kkr', 'ksr', 'mark']
```

In [39]:

```
[k for k in [1,2,3,4,5] if k>=3]
```

Out[39]:

```
[3, 4, 5]
```

In [41]:

```
[k*2 for k in [1,2,3,4,5] if k>=3]
```

Out[41]:

```
[6, 8, 10]
```

In [43]:

```
[k**2 for k in [1,2,3,4,5] if k>=3]
```

Out[43]:

```
[9, 16, 25]
```

In [47]:

```
# sub lists in a list
tt=[[1,2,3],[4,5,6],[7,8,9]]
#[b for kk in tt for b in kk]
[nlt for n in tt for nlt in n]
```

Out[47]:

```
[1, 2, 3, 4, 5, 6, 7, 8, 9]
```

In [50]:

```
tt=[[1,2,3],[4,5,6],[7,8,9]]
[da for m in tt for da in m ]
```

Out[50]:

```
[1, 2, 3, 4, 5, 6, 7, 8, 9]
```

In [52]:

```
{i for i in range(10)}
```

Out[52]:

```
{0, 1, 2, 3, 4, 5, 6, 7, 8, 9}
```

In [54]:

```
a={i for i in range(0,100,2)}
print (a,end=",")
```

```
{0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46
, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90,
92, 94, 96, 98},
```

In [56]:

```
a={i for i in range (0,100) if i%2==0}
print(a,end=",")
```

```
{0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46
, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90,
92, 94, 96, 98},
```

In [61]:

```
#assignment
s=[(x,x*2) for x in range (10)]
print(s,sep=",")
```

```
[(0, 0), (1, 2), (2, 4), (3, 6), (4, 8), (5, 10), (6, 12), (7, 14), (8, 16), (9, 18)]
```

python MODULES & PACKAGE

- **module is collection of variables & functions**
- **package is collection of modules**

In [67]:

```
import builtins
print(dir(builtins))
```

```
['ArithmeticError', 'AssertionError', 'AttributeError', 'BaseException', 'BlockingIOError
', 'BrokenPipeError', 'BufferError', 'BytesWarning', 'ChildProcessError', 'ConnectionAbor
tedError', 'ConnectionError', 'ConnectionRefusedError', 'ConnectionResetError', 'Deprecat
ionWarning', 'EOFError', 'Ellipsis', 'EnvironmentError', 'Exception', 'False', 'FileExist
sError', 'FileNotFoundError', 'FloatingPointError', 'FutureWarning', 'GeneratorExit', 'IO
Error', 'ImportError', 'ImportWarning', 'IndentationError', 'IndexError', 'InterruptedErr
or', 'IsADirectoryError', 'KeyError', 'KeyboardInterrupt', 'LookupError', 'MemoryError',
'ModuleNotFoundError', 'NameError', 'None', 'NotADirectoryError', 'NotImplemented', 'NotI
mplementedError', 'OSError', 'OverflowError', 'PendingDeprecationWarning', 'PermissionErr
or', 'ProcessLookupError', 'RecursionError', 'ReferenceError', 'ResourceWarning', 'Runtim
eError', 'RuntimeWarning', 'StopAsyncIteration', 'StopIteration', 'SyntaxError', 'SyntaxW
arning', 'SystemError', 'SystemExit', 'TabError', 'TimeoutError', 'True', 'TypeError', 'U
nboundLocalError', 'UnicodeDecodeError', 'UnicodeEncodeError', 'UnicodeError', 'UnicodeTr
```

```
anslateError', 'UnicodeWarning', 'UserWarning', 'ValueError', 'Warning', 'ZeroDivisionErr
or', '__IPYTHON__', '__build_class__', '__debug__', '__doc__', '__import__', '__loader__'
, '__name__', '__package__', '__spec__', 'abs', 'all', 'any', 'ascii', 'bin', 'bool', 'br
eakpoint', 'bytearray', 'bytes', 'callable', 'chr', 'classmethod', 'compile', 'complex',
'copyright', 'credits', 'delattr', 'dict', 'dir', 'display', 'divmod', 'enumerate', 'eval
', 'exec', 'filter', 'float', 'format', 'frozenset', 'get_ipython', 'getattr', 'globals',
'hasattr', 'hash', 'help', 'hex', 'id', 'input', 'int', 'isinstance', 'issubclass', 'iter
', 'len', 'license', 'list', 'locals', 'map', 'max', 'memoryview', 'min', 'next', 'object
', 'oct', 'open', 'ord', 'pow', 'print', 'property', 'range', 'repr', 'reversed', 'round'
, 'set', 'setattr', 'slice', 'sorted', 'staticmethod', 'str', 'sum', 'super', 'tuple', 't
ype', 'vars', 'zip']
```

In [70]:

```
print (dir (builtins))
```

```
['ArithmeticError', 'AssertionError', 'AttributeError', 'BaseException', 'BlockingIOError
', 'BrokenPipeError', 'BufferError', 'BytesWarning', 'ChildProcessError', 'ConnectionAbor
tedError', 'ConnectionError', 'ConnectionRefusedError', 'ConnectionResetError', 'Deprecat
ionWarning', 'EOFError', 'Ellipsis', 'EnvironmentError', 'Exception', 'False', 'FileExist
sError', 'FileNotFoundError', 'FloatingPointError', 'FutureWarning', 'GeneratorExit', 'IO
Error', 'ImportError', 'ImportWarning', 'IndentationError', 'IndexError', 'InterruptedErr
or', 'IsADirectoryError', 'KeyError', 'KeyboardInterrupt', 'LookupError', 'MemoryError',
'ModuleNotFoundError', 'NameError', 'None', 'NotADirectoryError', 'NotImplemented', 'NotI
mplementedError', 'OSError', 'OverflowError', 'PendingDeprecationWarning', 'PermissionErr
or', 'ProcessLookupError', 'RecursionError', 'ReferenceError', 'ResourceWarning', 'Runtim
eError', 'RuntimeWarning', 'StopAsyncIteration', 'StopIteration', 'SyntaxError', 'SyntaxW
arning', 'SystemError', 'SystemExit', 'TabError', 'TimeoutError', 'True', 'TypeError', 'U
nboundLocalError', 'UnicodeDecodeError', 'UnicodeEncodeError', 'UnicodeError', 'UnicodeTr
anslateError', 'UnicodeWarning', 'UserWarning', 'ValueError', 'Warning', 'ZeroDivisionErr
or', '__IPYTHON__', '__build_class__', '__debug__', '__doc__', '__import__', '__loader__'
, '__name__', '__package__', '__spec__', 'abs', 'all', 'any', 'ascii', 'bin', 'bool', 'br
eakpoint', 'bytearray', 'bytes', 'callable', 'chr', 'classmethod', 'compile', 'complex',
'copyright', 'credits', 'delattr', 'dict', 'dir', 'display', 'divmod', 'enumerate', 'eval
', 'exec', 'filter', 'float', 'format', 'frozenset', 'get_ipython', 'getattr', 'globals',
'hasattr', 'hash', 'help', 'hex', 'id', 'input', 'int', 'isinstance', 'issubclass', 'iter
', 'len', 'license', 'list', 'locals', 'map', 'max', 'memoryview', 'min', 'next', 'object
', 'oct', 'open', 'ord', 'pow', 'print', 'property', 'range', 'repr', 'reversed', 'round'
, 'set', 'setattr', 'slice', 'sorted', 'staticmethod', 'str', 'sum', 'super', 'tuple', 't
ype', 'vars', 'zip']
```

In [72]:

```
import math as mt
print (dir(mt))
```

```
['__doc__', '__file__', '__loader__', '__name__', '__package__', '__spec__', 'acos', 'aco
sh', 'asin', 'asinh', 'atan', 'atan2', 'atanh', 'ceil', 'comb', 'copysign', 'cos', 'cosh'
, 'degrees', 'dist', 'e', 'erf', 'erfc', 'exp', 'expm1', 'fabs', 'factorial', 'floor', 'f
mod', 'frexp', 'fsum', 'gamma', 'gcd', 'hypot', 'inf', 'isclose', 'isfinite', 'isinf', 'i
snan', 'isqrt', 'ldexp', 'lgamma', 'log', 'log10', 'log1p', 'log2', 'modf', 'nan', 'perm'
, 'pi', 'pow', 'prod', 'radians', 'remainder', 'sin', 'sinh', 'sqrt', 'tan', 'tanh', 'tau
', 'trunc']
```

In [75]:

```
import math as mt
a=mt.tan(45)
print (a)
```

```
1.6197751905438615
```

In [77]:

```
a=mt.sin(90)
print(a)
```

```
0.8939966636005579
```

In [82]:

```
a=mt.cos(37)
```

```
print(a)
```

```
0.7654140519453434
```

In [86]:

```
a=mt.pow(2,3)
print(a)
```

```
8.0
```

In [87]:

```
a=mt.pow (5,3)
print (a)
```

```
125.0
```

In [89]:

```
a=mt.pi
print(a)
```

```
3.141592653589793
```

In [90]:

```
a=mt.sqrt(36)
print(a)
```

```
6.0
```

In [91]:

```
a=mt.floor(23.250)
b=mt.ceil(23.250)
c=mt.floor(23.750)
d=mt.ceil(23.750)
print(a)
print(b)
print(c)
print(d)
```

```
23
24
23
24
```

In [93]:

```
a=mt.gcd(12,18)
print(a)
```

```
6
```

In [99]:

```
a=mt.factorial(6)
print(a)
```

```
720
```

In [101]:

```
import random as rd
print (dir (rd))
```

```
['BPF', 'LOG4', 'NV_MAGICCONST', 'RECIP_BPF', 'Random', 'SG_MAGICCONST', 'SystemRandom',
'TWOPI', '_Sequence', '_Set', '__all__', '__builtins__', '__cached__', '__doc__', '__file
__', '__loader__', '__name__', '__package__', '__spec__', '_accumulate', '_acos', '_bisec
t', '_ceil', '_cos', '_e', '_exp', '_inst', '_log', '_os', '_pi', '_random', '_repeat', '
_sha512', '_sin', '_sqrt', '_test', '_test_generator', '_urandom', '_warn', 'betavariate'
```

```
, 'choice', 'choices', 'expovariate', 'gammavariate', 'gauss', 'getrandbits', 'getstate',
'lognormvariate', 'normalvariate', 'paretovariate', 'randint', 'random', 'randrange', 'sa
mple', 'seed', 'setstate', 'shuffle', 'triangular', 'uniform', 'vonmisesvariate', 'weibul
lvariate']
```

In [145]:

```
# gives random value for each time
import random
x=random.randint(0,7)
print (x)
```

```
2
```

In [146]:

```
# gives +ve outputs only
# must be in range
import random as rd
a=rd.randint(0,100)
print (a)
```

```
6
```

In [162]:

```
a=rd.choice([1,2,3,4,5,6,70,57,100])
print (a)
```

```
2
```

In [ ]:

```

```