CPSC203 – Introduction to Problem Solving and Using Application Software

Fall 2009

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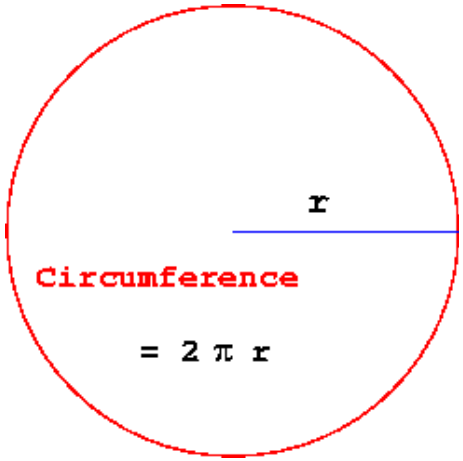
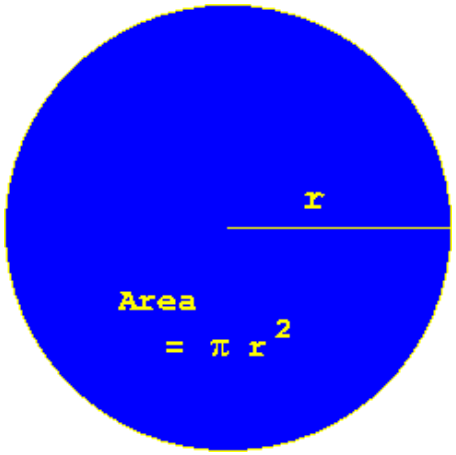
Introduction

- Jython Basics Review Exercise
- Using Loops
- Using Conditions

Circle Area and Circumference (1)

- Write a function named **circle()** that asks the user to enter the radius of a circle, then computes and prints out the area and circumferences of that circle.





Circle Area and Circumference (2)

JES – Jython Environment for Students – circle.py

```
# Author: Mehrdad Nurolahzade
# Date: 30 Oct 2009
# Description: CPSC 203, Fall 2009, Problem Solving, Week 2, Lab 1, Review Exercise

# Function circle() computes and prints the area and circumference of a circle.
# User provides the radius of the circle via the prompt.
def circle():
  # prompt user for input
  radius=float(raw_input('What is the radius of the circle?'))

  # do the computations
  p=3.14
  area=p*radius*radius
  circumference=2*p*radius

  # print out results
  print "Area=", area
  print "Circumference=", circumference
```

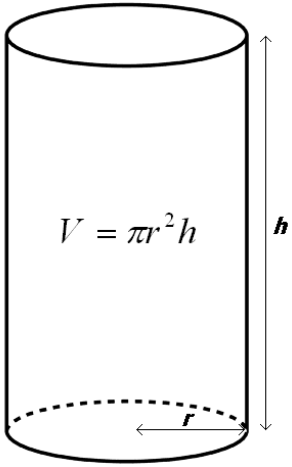
Load Program UNLOADED Watcher Stop

```
>>> ======= Loading Progam =======
>>> circle()
What is the radius of the circle?3
Area= 28.259999999999998
Circumference= 18.84
>>>
```

For help on a particular JES function, move the cursor over it Explain <click> Line Number:2 Position: 9

Cylinder Volume and Area (1)

- Write a function named **cylinder()** that asks the user to enter the radius and height of a cylinder, then computes and prints out the volume and area of that cylinder.



$$A = 2\pi r^2 + 2\pi r h = 2\pi r(r + h).$$

Cylinder Volume and Area (2)

JES – Jython Environment for Students – cylinder.py

```
# Author: Mehrdad Nurolahzade
# Date: 30 Oct 2009
# Description: CPSC 203, Fall 2009, Problem Solving, Week 2, Lab 1, Review Exercise

# Function cylinder() computes and prints the volume and areaof a cylinder.
# User provides the radius and height of the cylinder via the prompt.
def cylinder():
  # prompt user for input
  radius=float(raw_input('What is the radius of the cylinder?'))
  height=float(raw_input('What is the height of the cylinder?'))

  # do the computations
  p=3.14
  volume=p*radius*radius*height
  area=2*p*radius*(radius+height)

  # print out results
  print 'Volume=', volume
  print 'Area=', area
```

Load Program UNLOADED Watcher Stop

```
>>>
>>> cylinder()
What is the radius of the cylinder?3
What is the height of the cylinder?5
Volume= 141.29999999999998
Area= 150.72
>>>
```

For help on a particular JES function, move the cursor over it Explain <click> Line Number:2 Position: 4

if Statement

- The **if** statement selects actions to perform.

- General syntax:

```
if if-condition:
  if-body
```

- Example:

```
radius=float(raw_input('Enter circle radius'))
if radius<0:
  print "Circle radius has to be positive!"
```

Comparison Operators

- Different operators can be used in the condition of an **if** statement:
  - == (equal)
  - != (not equal)
  - < (less than)
  - <= (less than or equal)
  - > (greater than)
  - >= (greater than or equal)

```
if instructor=='Jalal':
   print 'You are in L03 or
   L04'

if instructor!='Jalal':
   print 'You are in L01 or
   L02'

if age>13:
  if age<20:
     print 'You are a teen'
```

if-else Statement

- An **if** statement can have an **else** part.
- General syntax of an **if-else** statement:

```
if if-condition:
  if-body
else:
  else-body
```

- Example:

```
if sex=='Male':
  print 'Good morning Mr. '+name
else:
  print 'Good morning Mrs. '+name
```

Nested if-else Statements

- The **if** statement may contain other **if** statements.

```
if grade>=90:
  letter_grade='A'
else:
  if grade>=80:
    letter_grade='B'
  else:
    if grade>=70:
      letter_grade='C'
    else:
      if grade>=60:
        letter_grade='D'
      else:
        if grade>=50:
          letter_grade='E'
        else:
          letter_grade='F'
```

```
if grade>=90:
  letter_grade='A'
elif grade>=80:
   letter_grade='B'
elif grade>=70:
   letter-grade='C'
elif grade>=60:
   letter_grade='D'
elif grade>=50:
   letter_grade='E'
else:
   letter_grade='F'
```

Logic Operators

- More complex logical conditions can be built using **and**, **or**, **not** operators.

```
if day=='Monday' and hour>18:
  print 'Pizza'
elif day=='Tuesday' or day=='Thursday':
  print 'Wings'
elif hour>19:
  print 'Hamburger'
else:
  print 'Pasta'
```

Logic Exercise (1)

- Write a function **even_or_odd()** that asks user to enter an integer value, then prints out EVEN or ODD if the given value is even or odd respectively.

- Example runs:

```
Give me an integer: 3
ODD

Give me an integer: 6
EVEN
```

Logic Exercise (2)

JES - Jython Environment for Students - evenorodd.py

File Edit Watcher MediaTools JES Functions Window Layout Help

```
1  # Author: Mehrdad Nurolahzade
2  # Date: 30 Oct 2009
3  # Description: CPSC 203, Fall 2009, Problem Solving, Week 2, Lab 1, Review Exercise
4
5  # Function even_or_odd() determines whether a given integer value is even or odd.
6  # If it is even, prints out the word EVEN. If it is odd, prints out the word ODD.
7  def even_or_odd():
8    # prompt user for input
9    x=int(raw_input('Give me an integer:'))
10
11   if x%2==0:
12     print 'EVEN'
13   else:
14     print 'ODD'
```

Load Program | Watcher | Stop

```
>>> even_or_odd()
EVEN
>>>
```

For help on a particular JES function, move the cursor over it | Explain <click> | Line Number:14 Position: 16

Logic Exercise (3)

- Write a function named **salary_tax()** that asks user to enter his/her own monthly salary and computes and prints out the salary tax. If salary is below $3,000 the tax is zero. If salary is between $3,000 and $4,000 the tax is 5%. If salary is between $4,000 and $5,000 the tax is 10%. If salary is above $5,000 the tax is 15%.

- Example run:

```
Enter your monthly salary: 4200
You are monthly tax is: $420.0
```

Lists

- A list is an ordered set of indexed elements.

```
names=['John', 'Mike', 'Rose', 'James', 'Tina']
numbers=[3, 5, 1, 6, 2, 5]
```

- Elements are numbered left to right.
- The index of the first element is 0.
- The index of elements is used to reference them:

`names[1]`	that is 'Mike'
`numbers[3]`	that is 6
`numbers[0]`	that is 3

List Related Functions (1)

```
# Author: Mehrdad Nurolahzade
# Date: 30 Oct 2009
# Description: CPSC 203, Fall 2009, Problem Solving, Week 2, Lab 1, Review Exercise

# Function list_example() demonstrates some useful list related functions
def list_example():
  list1=['a', 'g', 'b', 'a', 'd', 'b']
  list2=['d', 'a', 'c']
  # len(list) returns the number of elements in list
  print "Length of list1 is", len(list1)
  # list.index(element) returns the index of the first occurrence of element in list
  print "Index of 'b' in list1 is", list1.index('b')
  # list.append(element) adds element to the end of list
  list1.append('c')
  # list.insert(i, element) adds element to list at position i
  list2.insert(0, 'b')
  # creates a new list by concatenating list1 and list2
  list3=list1+list2
  # list1.extend(list2) appends list2 to list1
  list1.extend(list2)
```

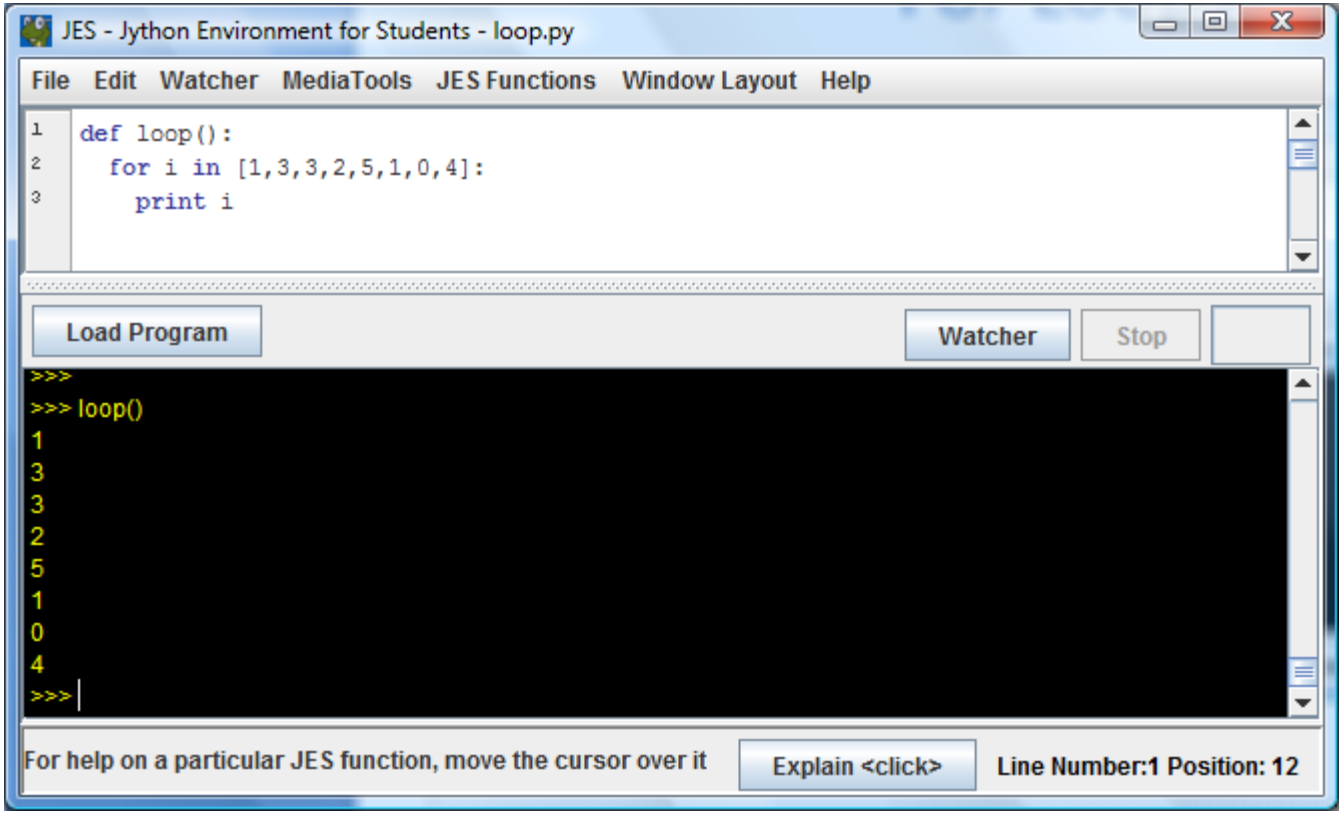
List Related Functions (2)

```
# list=[e]*n initializes list to n elements of value e
 list4=[0]*5
 # list.remove(element) deletes the first occurrence of element in list
 list1.remove('g')
 # list.pop() deletes and returns the last element in list
 last=list1.pop()
 # list.sort() sorts list in ascending order
 list1.sort()
 # list.reverse() reverses list
 list1.reverse()
 # min(list) returns the minimum element in list
 minimum=min(list1)
 # max(list) returns the maximum element in list
 maximum=max(list1)
 # element in list returns true of element is in list, false otherwise
 if 'a' in list1:
   print "a is in list1"
```

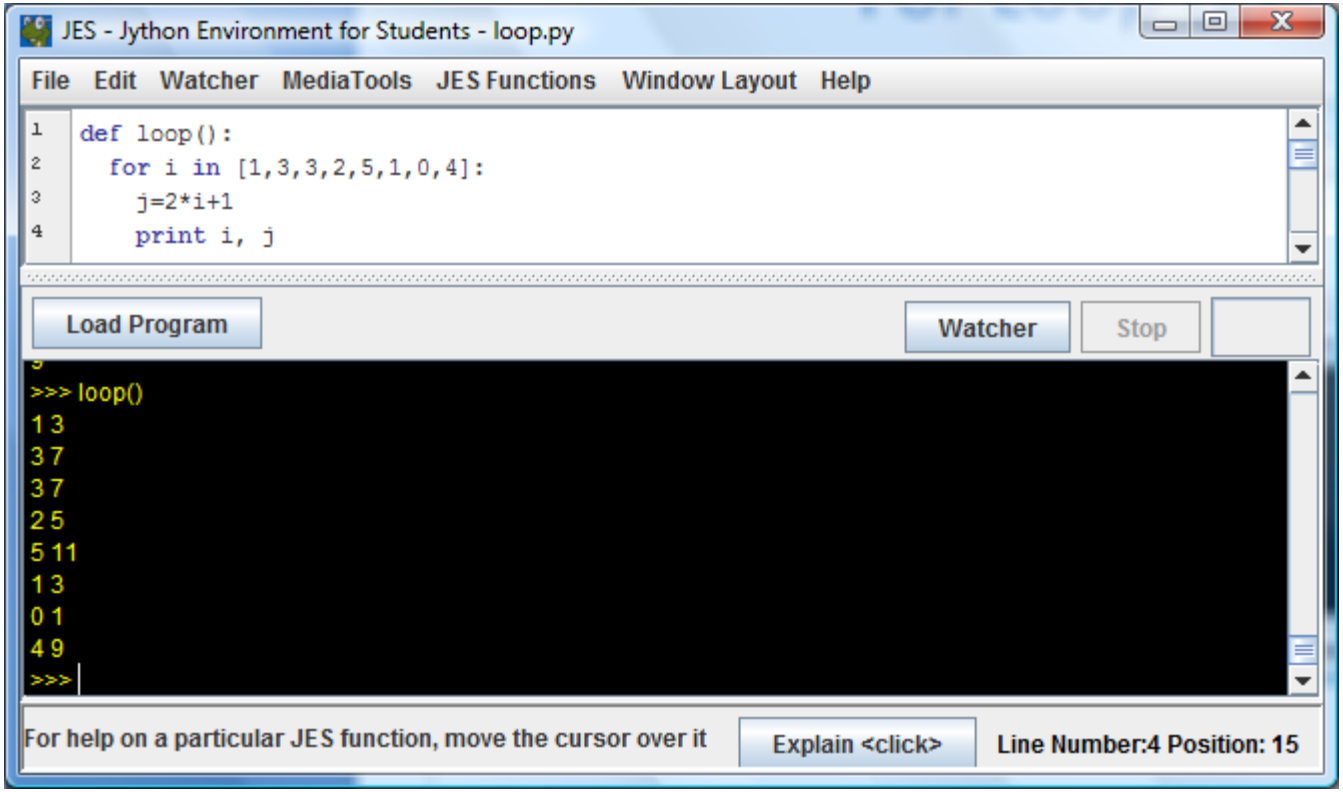
Loops

- Loops are programming structures that allow us to repeat some statements as many times as required.
- For loops are suitable when you need to repeat something for a known number of times.
- While loops are used when we need to repeat something until a certain condition is met.

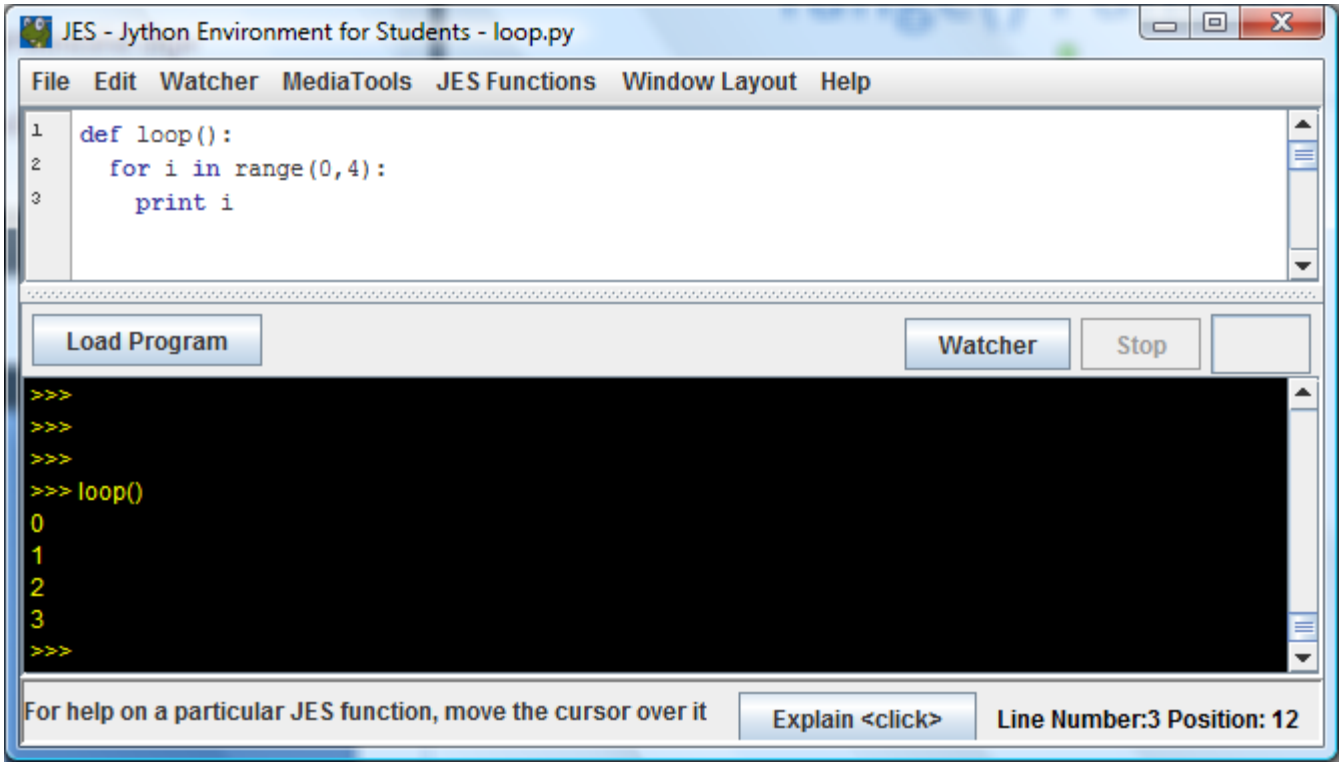
for Loop (1)


JES - Jython Environment for Students - loop.py
File Edit Watcher MediaTools JES Functions Window Layout Help
def loop():
for i in [1,3,3,2,5,1,0,4]:
print i
Load Program
Watcher
Stop
>>>
>>> loop()
1
3
3
2
5
1
0
4
>>>
For help on a particular JES function, move the cursor over it
Explain <click>
Line Number:1 Position: 12

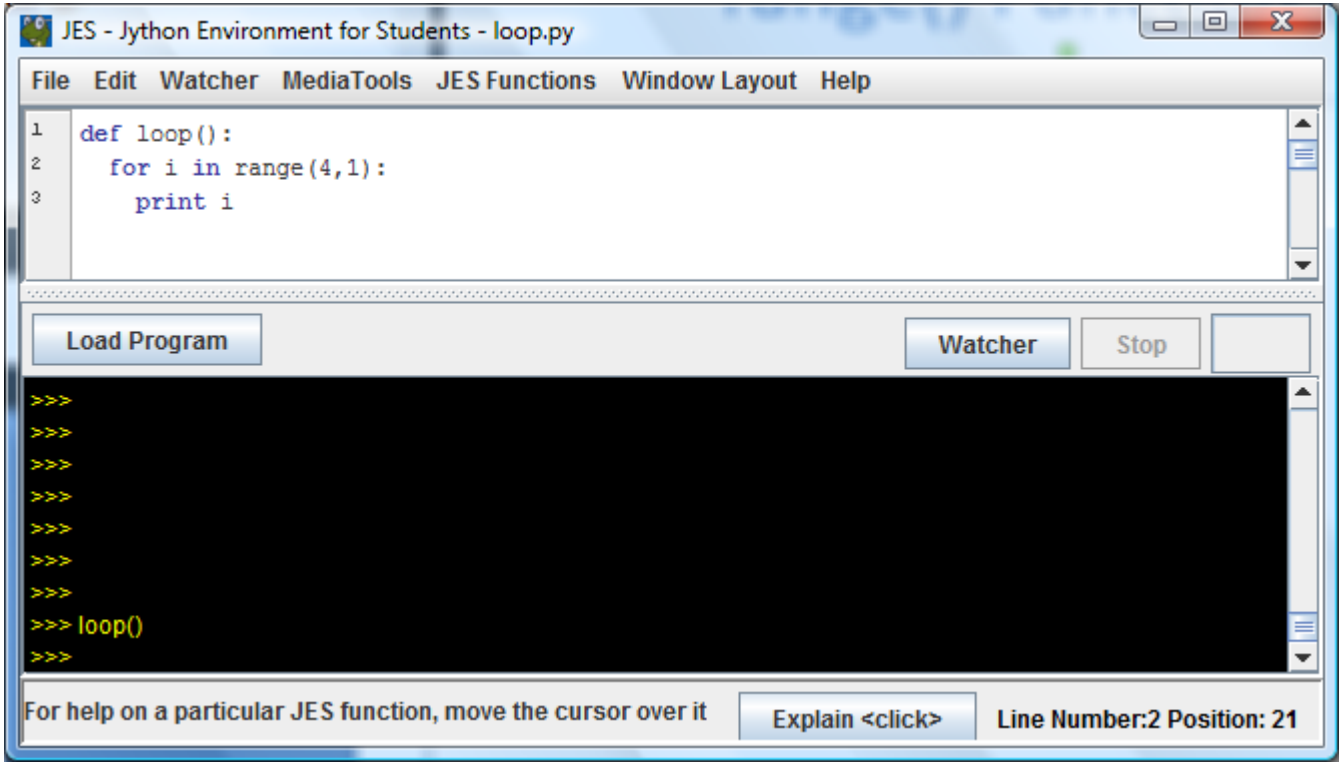
for Loop (2)


JES - Jython Environment for Students - loop.py
File Edit Watcher MediaTools JES Functions Window Layout Help
def loop():
for i in [1,3,3,2,5,1,0,4]:
j=2*i+1
print i, j
Load Program
Watcher
Stop
>>> loop()
1 3
3 7
3 7
2 5
5 11
1 3
0 1
4 9
>>>
For help on a particular JES function, move the cursor over it
Explain <click>
Line Number:4 Position: 15

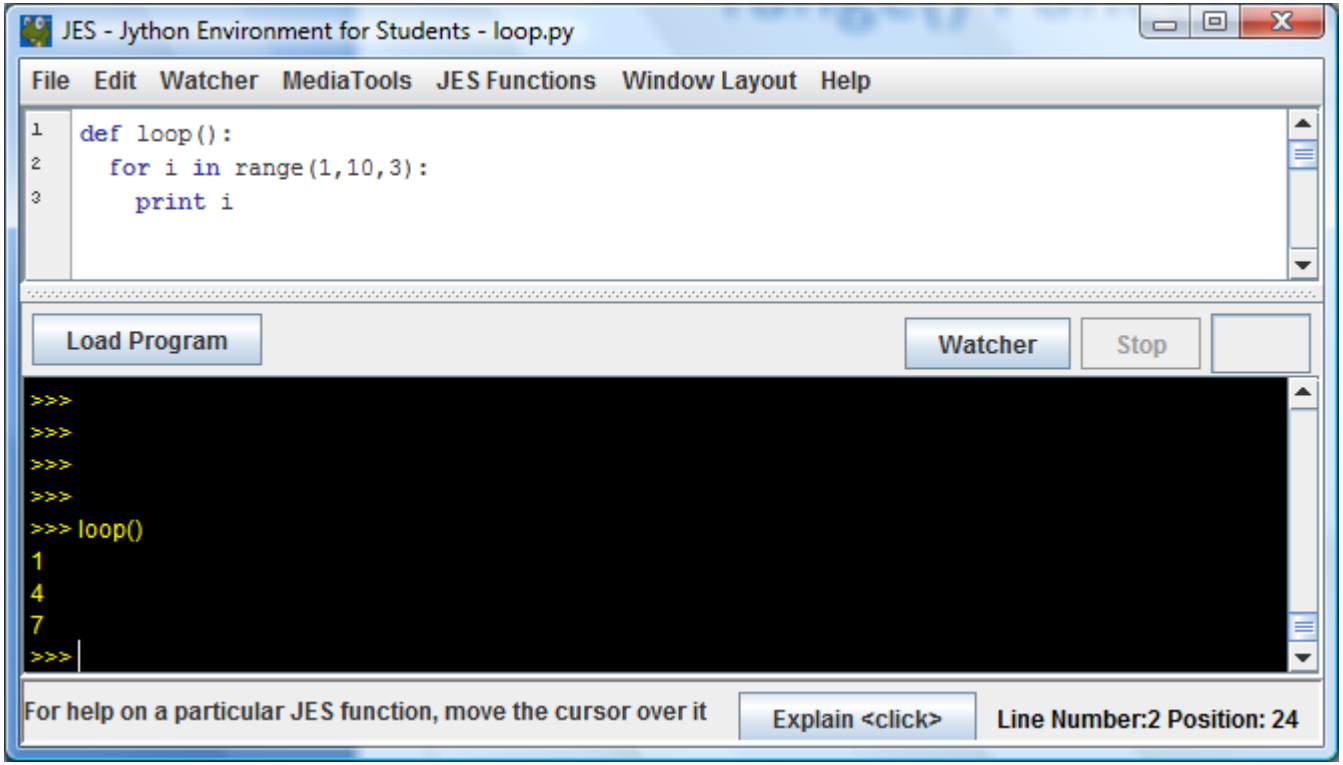
range() Function (1)



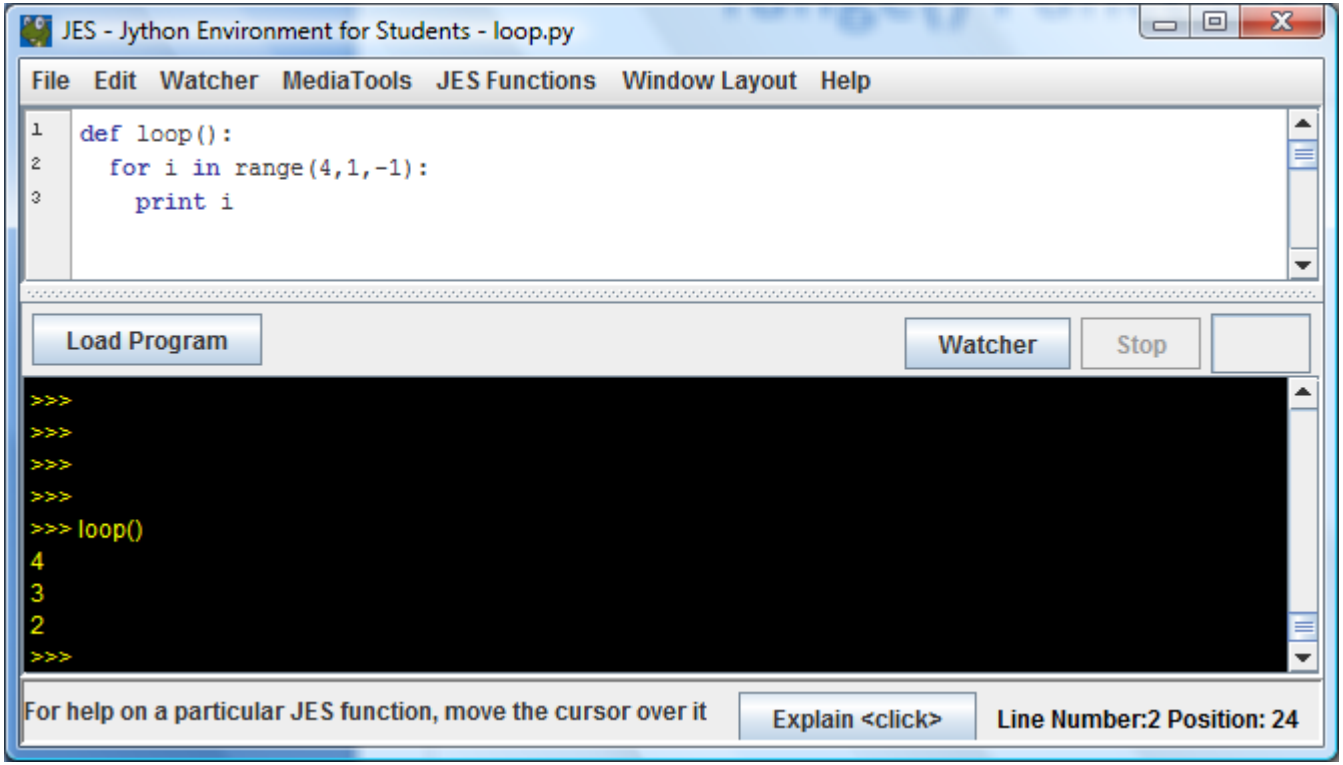
range() Function (2)



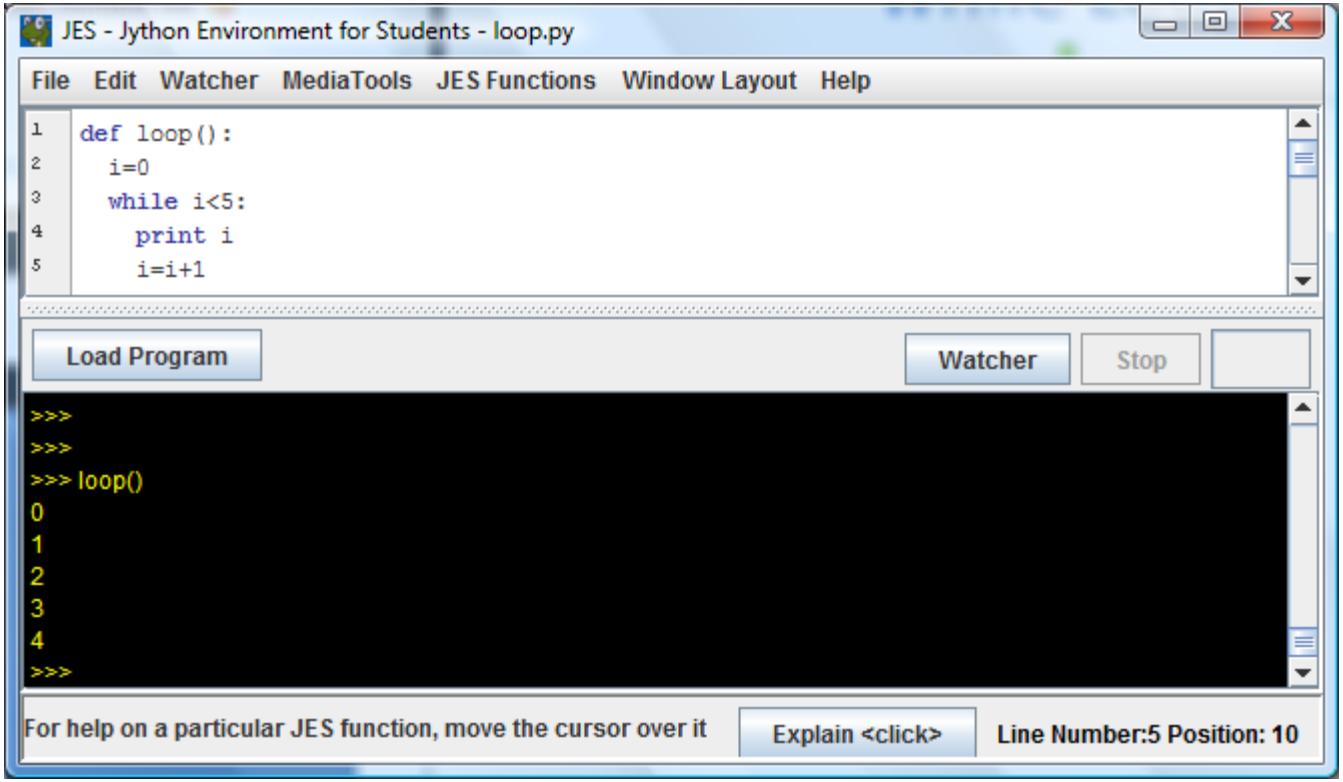
range() Function (3)



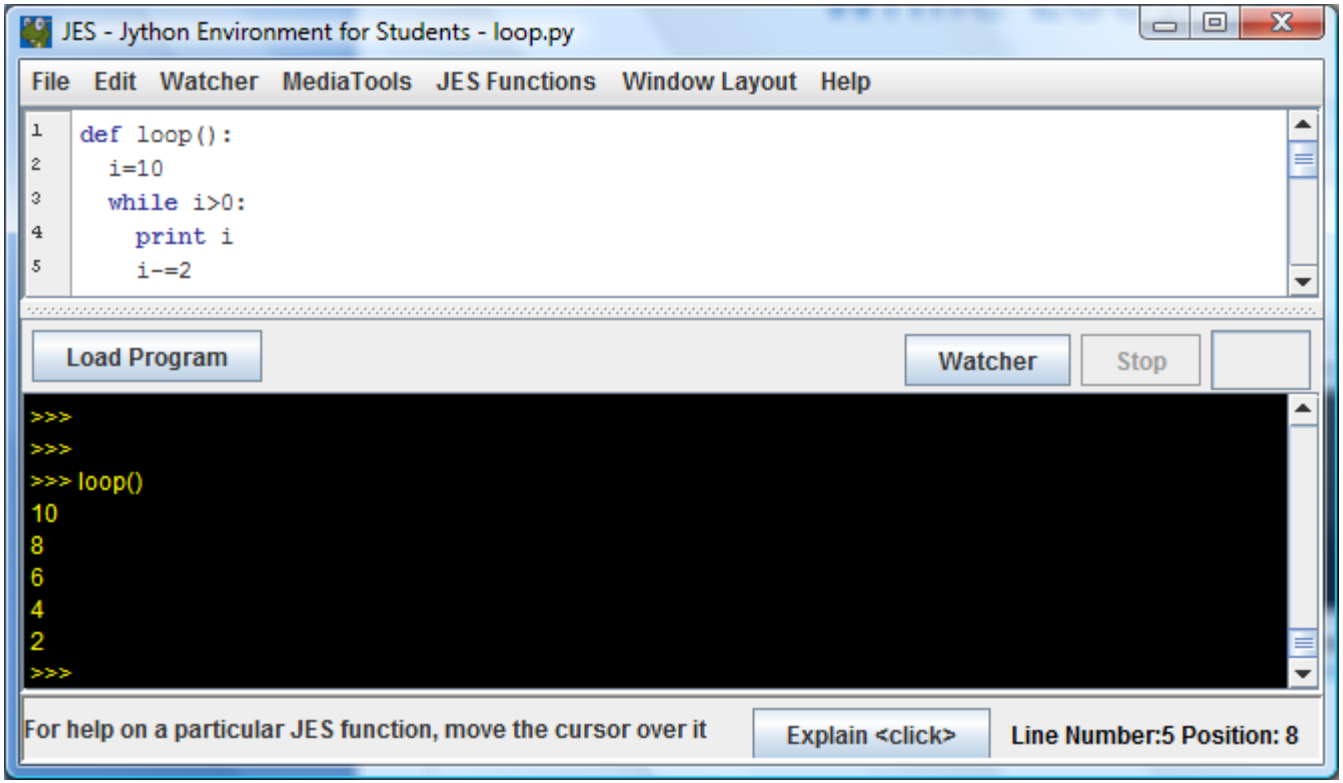
range() Function (4)



while Loop (1)


JES - Jython Environment for Students - loop.py
File Edit Watcher MediaTools JES Functions Window Layout Help
def loop():
i=0
while i<5:
print i
i=i+1
Load Program
Watcher
Stop
>>>
>>>
>>> loop()
0
1
2
3
4
>>>
For help on a particular JES function, move the cursor over it
Explain <click>
Line Number:5 Position: 10

while Loop (2)


JES - Jython Environment for Students - loop.py
File Edit Watcher MediaTools JES Functions Window Layout Help
def loop():
i=10
while i>0:
print i
i-=2
Load Program
Watcher
Stop
>>>
>>>
>>> loop()
10
8
6
4
2
>>>
For help on a particular JES function, move the cursor over it
Explain <click>
Line Number:5 Position: 8

Nested Loops

JES - Jython Environment for Students - loop.py

File Edit Watcher MediaTools JES Functions Window Layout Help

```
1 def loop():
2   for boy in ['Mike','Luke','Dan']:
3     for girl in ['Jill','Jen']:
4       print boy, 'is dating', girl
```

Load Program | Watcher | Stop

```
>>>
>>> loop()
Mike is dating Jill
Mike is dating Jen
Luke is dating Jill
Luke is dating Jen
Dan is dating Jill
Dan is dating Jen
>>>
```

For help on a particular JES function, move the cursor over it | Explain <click> | Line Number:3 Position: 32

Loop Exercise (1)

- Write a function named **sum()** that asks user to enter a number N and then calculates and prints out the sum of values from 1 to N.

- Example run:

```
Give me a value for N: 5
Sum of values 1 to N is 15
```

Loop Exercise (2)

- Write a function named **list_sum()** that defines two same size lists named list1 and list2 with values [1, 3, 2, 3, 4] and [0, 1, 2, 0, 3] respectively. The function should create and print out a third list named list3 whose elements are the sum of same position elements in list1 and list2.
- Example run:

```
list3= [1, 4, 4, 3, 7]
```