

Python for Physicist

Lecture Note - 2

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Operators

- ▶ Relational Operator:
 - ▶ Equal: =
 - ▶ Equivalent: ==
 - ▶ Not equal: !=, <>
 - ▶ Greater than: >
 - ▶ Less than: <
 - ▶ Greater equal: >=
 - ▶ Less equal: <=
- ▶ Logical Operator:
 - ▶ OR
 - ▶ AND
 - ▶ NOT
- ▶ For details:

http://www.tutorialspoint.com/python/python_basic_operators.htm

Controlling Program

► Control Statements

► if statement:

```
if (x > 0):  
    print x, ' is positive'
```

► if-elif-else statement:

```
if (x > 0):  
    print x, ' is positive'  
elif (x < 0):  
    print x, ' is negative'  
else:  
    print x, ' is neutral'
```

Controlling Program by Loop

- ▶ Constructing loop

- ▶ For - loop:

```
for i in range(10):  
    print i
```

- ▶ While - loop:

```
while i < 10:  
    print i  
    i += 1
```

- ▶ Break and Continue: Two useful statement.

- ▶ Break will discontinue the loop i.e. exit from the loop.
 - ▶ Continue will continue the loop without reading the rest of the statement(s) in a loop.

Simple Physics Problem

- ▶ Problem:
 - ▶ If a ball falls from a tower (Height = H) freely, what would the height (h) after a time t .
- ▶ Analysis:
 - ▶ Similar to the earlier problem. Note that the height must not be negative
- ▶ The Python code:

```
H = float(input('Input the height of the tower: '))
t = float(input('Input the duration of travel: '))
s = 0.5 * 9.81 * t**2
if(H - s < 0):

    print 'Time or height is not sufficient!'
else:

    print 'Height: ', H - s, ' after time: ', t
```

Simple Physics Exercise

► Exercise 1:

- For a satellite, orbiting around the earth with a time period, T , we know that

- $h = \left(\frac{GMT^2}{4\pi^2} \right)^{\frac{1}{3}} - R$

- Where $G = 6.67 \times 10^{-11} m^3 kg^{-1} s^{-2}$, $M = 5.97 \times 10^{24} kg$ and $R = 6371 km$
- Write a program to calculate the altitude of a satellite for the input time period.
- Improve the code in the sense that the velocity of the satellite does not have the relativistic effect.