Cass Business School
CITY UNIVERSITY LONDON

Simple data manipulation

Compute the arithmetic expression

Task : Python can be used to calculate the arithmetic expression. For example, the position of an object falling from sky currently at velocity 5 m/s after 0.6 seconds. The distance can be calculated from the equation, y(t) = v0t-0.5gt2.

It can be computed directly in Python:

Step 1: type *0.5*0.6 - 0.5*9.81*0.6**2*

Step 2: hit enter and then, the answer will be displayed below

In Python, the four standard arithmetic operator are written as +, -, * and /. The exponentiation employs a double asterisk notation, e.g. 0.62 = 0.6**2.

Cass Business School
CITY UNIVERSITY LONDON

Naming data variables

Input:	Output:
v0 = 5 g = 9.81 t = 6	
v0 = 6	
y = v0*t - 0.5*g*t**2	
print y	-140.58
print v0	6

Cass Business School
CITY UNIVERSITY LONDON

Naming data variables

Rules for variable names:

1. The name must begin with a letter
2. The name can contain only letters, numbers, and the underscore character. No punctuation marks, spaces, or other special characters are allowed in the name.
3. The name cannot be a keyword in Python, e.g. *if*, *for*, *print*, *float*, *while*.
4. Names in Python are case sensitive.

Naming data variables

Invalid name	Reason
1a = 6	The first letter cannot be a number.
end balance = 1000	Space is not allowed.
print = 100	print is a key word.
Q = 7 X = q + 10	Python is case sensitive. It should be X = Q + 10

Cass Business School
CITY UNIVERSITY LONDON

Adding comments

Whatever instructions we give to the computer, it would be more informative to provide some comments in a natural human language to explain the idea behind the statements. This helps the programmer to recall the details of the code later in time, or other programmers to understand her work. Comments start with # character, and everything after this character on a line is ignored when the program is run.

```
# Program for computing the height of a ball in vertical motion
v0 = 5      # initial velocity
g = 9.81    # acceleration of gravity
t = 6       # time

y = v0*t - 0.5*g*t**2  # vertical position

print y
```


Printing format

In the previous slide the output was shown on the screen with a command print y. Instead of just printing the numerical values, suppose we now want to write a more informative text, typically some thing like

At t=0.6 s, the height of the ball is 1.23 m.

It can be produced by the statement:

print "At t=%g s, the height of the ball is %.2f m." % (t,y)

The print statement will print everything enclosed in quotes. % in quotes indicates the place to insert the values. g is the format in decimal or scientific notation and .2**f** format stands for 2 decimal **floating**-point number.

Cass Business School
CITY UNIVERSITY LONDON

Printing format

```
v0 = 5      # initial velocity
g = 9.81    # acceleration of gravity
t = 6       # time

y = v0*t - 0.5*g*t**2  # vertical position

print "At t=%g s, the height of the ball is %.2f m." % (t,y)
```


Aside :
How to save your work, and continue from a different window

Step 1: From the Python Shell window, click file > New Window

Step 2: Making your code in the new window created

Step 3: From the new window, click file > save as > choose save as type (*py)

Step 4: From the new window, click run > Run Module or press <F5> to run the program

Step 5: Output will be displayed in the main Python Shell window

Printing format (cont'd.)

Here is a list of some import print format specifications:

```
%s          a string
%d          an integer
%0xd        an integer padded with x leading zeros
%f          decimal notation with six decimals
%e          compact scientific notation, e in the exponent
%E          compact scientific notation, E in the exponent
%g          compact decimal or scientific notation (with e)
%G          compact decimal or scientific notation (with E)
%xz         format z right-adjusted in a field of width x
%-xz        format z left-adjusted  in a field of width x
%.yz        format z with y decimals
%x.yz       format z with y decimals in a field of width x
%%          the percentage sign (%) itself
```

Cass Business School
CITY UNIVERSITY LONDON

Type conversion

type(object) can return the type of an object. The data type can be changed from integer to float by using *float(object)*. Similarly *int(object)* will change the data to an integer type.

Type conversion exercise :

float(7/8) vs. float(7)/8

In the first case the integer division is computed first; the result is 0. Then, 0 is changed from integer to float number (0.0). In the second case 7.0/8 is evaluated.