INFOACADEMY.NET

PYTHON FUNDAMENTALS

Curs interactiv de python

PREZENTARE

Instructor Python: Popescu Catalin Ionut

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STRUCTURA SEDINTA 1 : INTRODUCERE IN LUMEA PYTHON

- Parte introductiva si administrativa
- Introducere in Lumea Python
- Primele mele programe in Python

PARTE INTRODUCTIVA SI ADMINISTRATIVA

- Ce este Python?
- De ce facem acest curs?
- Structura cursului
- Acesarea cursului
- Examene

CE ESTE PYTHON?

- dezvoltat de Guido van Rossum, primul lansat peste doua decenii în urmă, în 1991
- facilitează o scriere rapida
- folosit pentru aplicații comerciale fiind independent de sistemul de operare

DE CE PYTHON?

- usor de folosit
- aproape de limbajul uman
- scriere mult mai rapida decat in Java si mult mai scurt codul decat in C/C++
- Python este optional obiect-oriented

DE CE PYTHON?

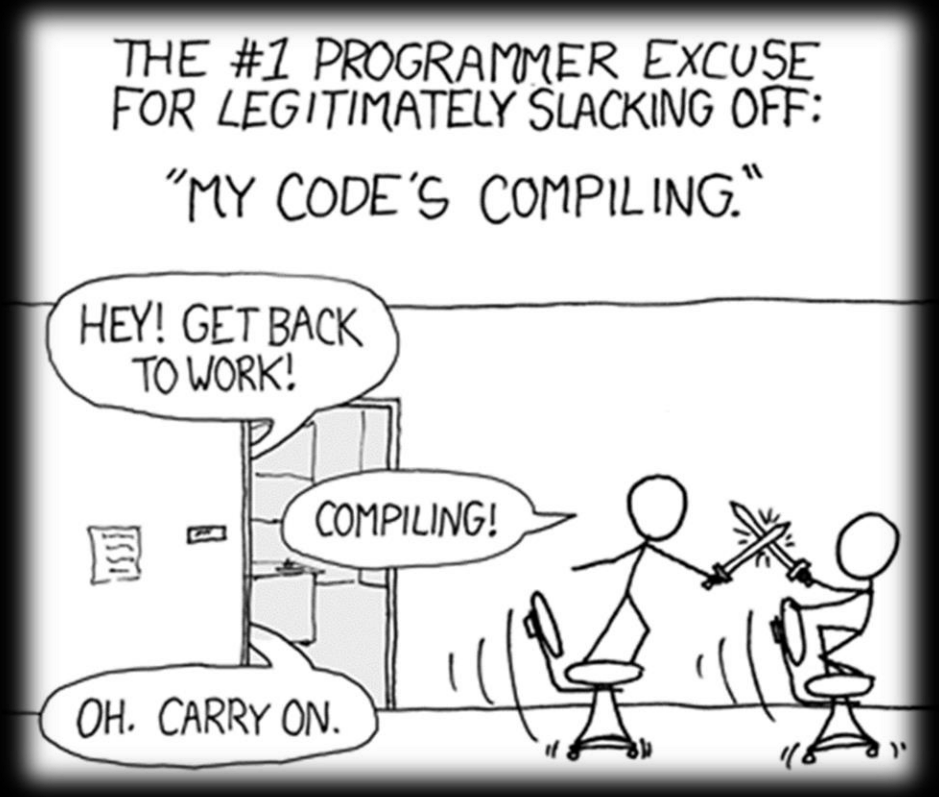
- Multiple integrari in alte limbaje de operare (C, Java, Integrat in Visual Studio)

- comunitate bine dezvoltata

DE CE PYTHON?

Tipuri de limbaj de programare:

- limbaj interpretabil
- limbaj compilabil
- byte-compiled

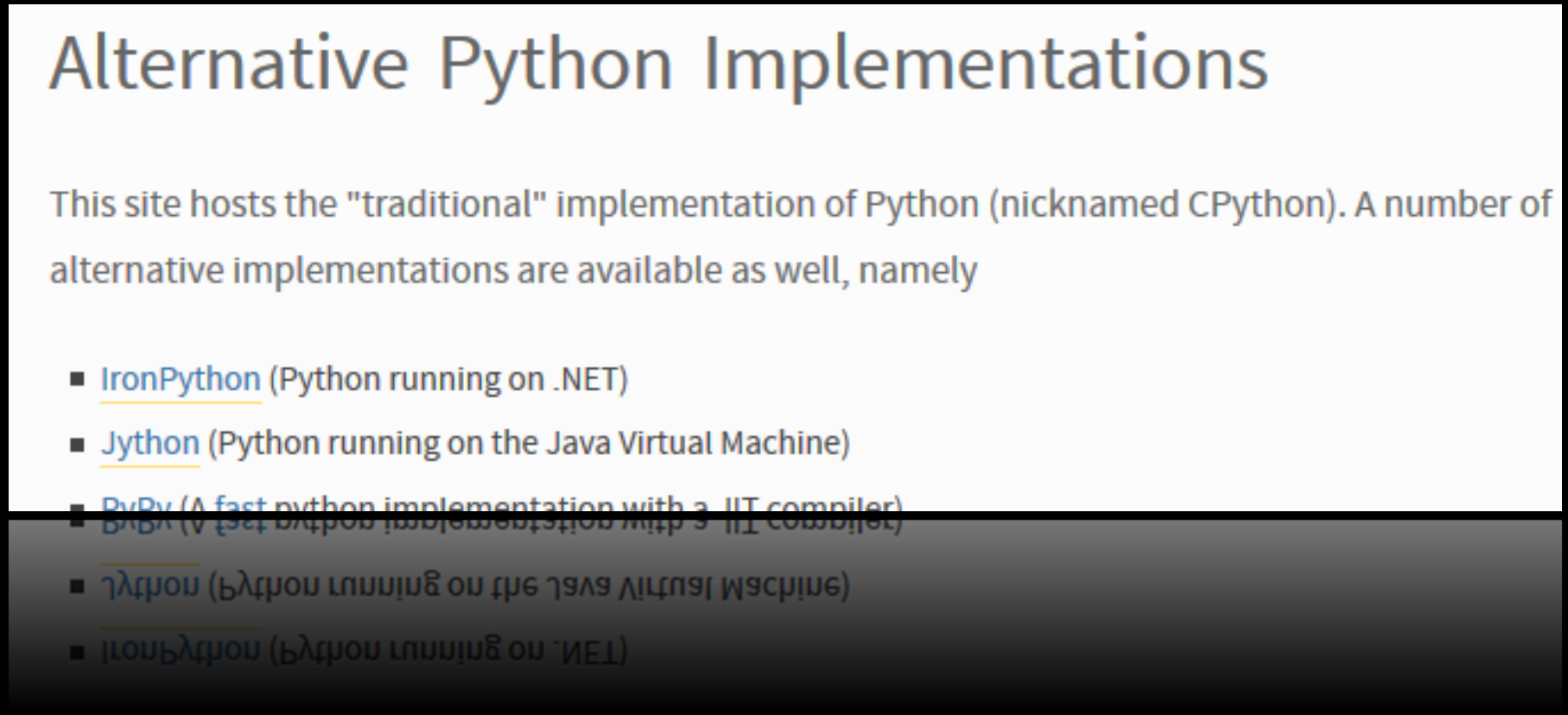


DE CE PYTHON?

- Aplicabilitate:
  - Filme animate (Industrial Light & Magic, Sony Pictures Imageworks, Disney, Pixar)
  - Youtube folosește Python pentru căutarea intre milioanele de filme.
  - Realizarea de căutări pe internet (Google, Infoseek)
  - Script-uri GIS pentru hărți (ESRI)
  - Distribuirea de fișiere diverse pe Internet (BitTorrent)
  - Prognoza meteo (U.S. National Weather Service, NOAA)
  - Test computer hardware (Seagate, Intel, Hewlett-Packard, Micron, KLA)
  - Analiza numerica (NASA, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Fermi)
  - Criptografie și analiza financiara (NSA, Getco)
  - Jocuri și grafica (Activision, Electronic Arts, Infogames, Origin, Corel, Blender, PyGame)
  - Navigarea navetelor spațiale și experimente de control (Jet Propulsion Laboratory)
  - Yahoo maps și cautare în directoare (Yahoo!)
  - Instalarea Linux și mentenanță (Red Hat, Ubuntu etc.)
  - Implementarea de siteuri web (Instagram, Chess.com, Disney, JPL, Zope, Plone, Twisted)
  - Crearea de sisteme de apărare cu rachete (Lockheed Martin)

Click aici pt. mai multe

DE CE PYTHON?


Alternative Python Implementations
This site hosts the "traditional" implementation of Python (nicknamed CPython). A number of alternative implementations are available as well, namely
IronPython (Python running on .NET)
Jython (Python running on the Java Virtual Machine)

DE CE PYTHON?


PyPI - the Python Package Index
The Python Package Index is a repository of software for the Python programming language. There are currently 51127 packages here.
To contact the PyPI admins, please use the Support or Bug reports links.

DE CE FACEM ACEST CURS?

"PYTHON HAS BEEN AN IMPORTANT PART OF GOOGLE SINCE THE BEGINNING, AND REMAINS SO AS THE SYSTEM GROWS AND EVOLVES. TODAY DOZENS OF GOOGLE ENGINEERS USE PYTHON, AND WE'RE LOOKING FOR MORE PEOPLE WITH SKILLS ÎN THIS LANGUAGE."

PETER NORVIG, DIRECTOR OF SEARCH QUALITY, GOOGLE, INC.

Alte citate click aici

DE CE FACEM ACEST CURS?

Multiple joburi pentru Python:

- In strainatate:
  - Link1
  - Link2
- In Romania
  - Link1

PYTHON ENHANCEMENT PROPOSALS

- Cursul nu utilizeaza conceptele PEP8
- Ce este PEP8 ?
  - PEP8 reprezinta Style Guide for Python Code adica un ghid de scriere.
  - Functionalitatea nu se schimba.
  - Clientii de obicei platesc extra pentru un cod PEP8.
  - E mult mai usor de studiat dupa ce cunosti conceptele Python
- Daca doresti dupa acest curs sa te aliniezi la stilul PEP8 acceseaza acest link

STRUCTURA CURS

Sedinta 1 :Introducere in lumea Python

- Parte introductiva si administrativa
- Introducere in Lumea Python
  - Instalare
  - Tipuri de fisiere
  - Tool-uri pentru Python
- Primele mele programe in Python
  - Lucru cu siruri de caractere
  - Lucrul cu numere
  - Variabile
  - Capturarea user input
  - Manipularea sirurilor de caracatere

STRUCTURA CURS

- Sedinta 2 – Bucle Liste Dictionare
- Sedinta 3 – Functii si Clase (oop)
- Sedinta 4 – Clasa Python partea 2, Lucrul cu Fisiere ,Exceptii.
- Sedinta 5 – Module in Python
- Sedinta 6 – Module avansate in python
- Sedinta 7 – Kivy
- Sedinta 8 – Kivy Avansat

EXAMENE

- Examene de capitol - se sustin acasa
  - Nota minima 75%,
  - Sustinere de 5 ori maximum,
  - Fiecare examen este disponibil doar 3 saptamani
  - Intrebarile sunt exclusiv din acel capitol
  - 15-20 de intrebari teoretice sau practice
  - Timpul alocat pentru examen este de 60 minute

EXAMENE

- Examen de MID (partial) -Se sustine dupa primele patru sedinte la academie
  - Se sustine de maximum 2 ori
  - Se poate sustine dupa ce am sustinut in prealabil examenele de capitol 1-4
  - Prima sustinere este la clasa in sedinta a 5a, a doua sustinere daca este cazul intr-o zi de vineri cu o programare in prealabil pe site-ul infocademy.net
  - Nota minima este 75%
  - Timpul alocat pentru examen este de 30 minute
  - Examenul consta in 20 de intrebari ce se regasesc in examenele de capitol 1-4

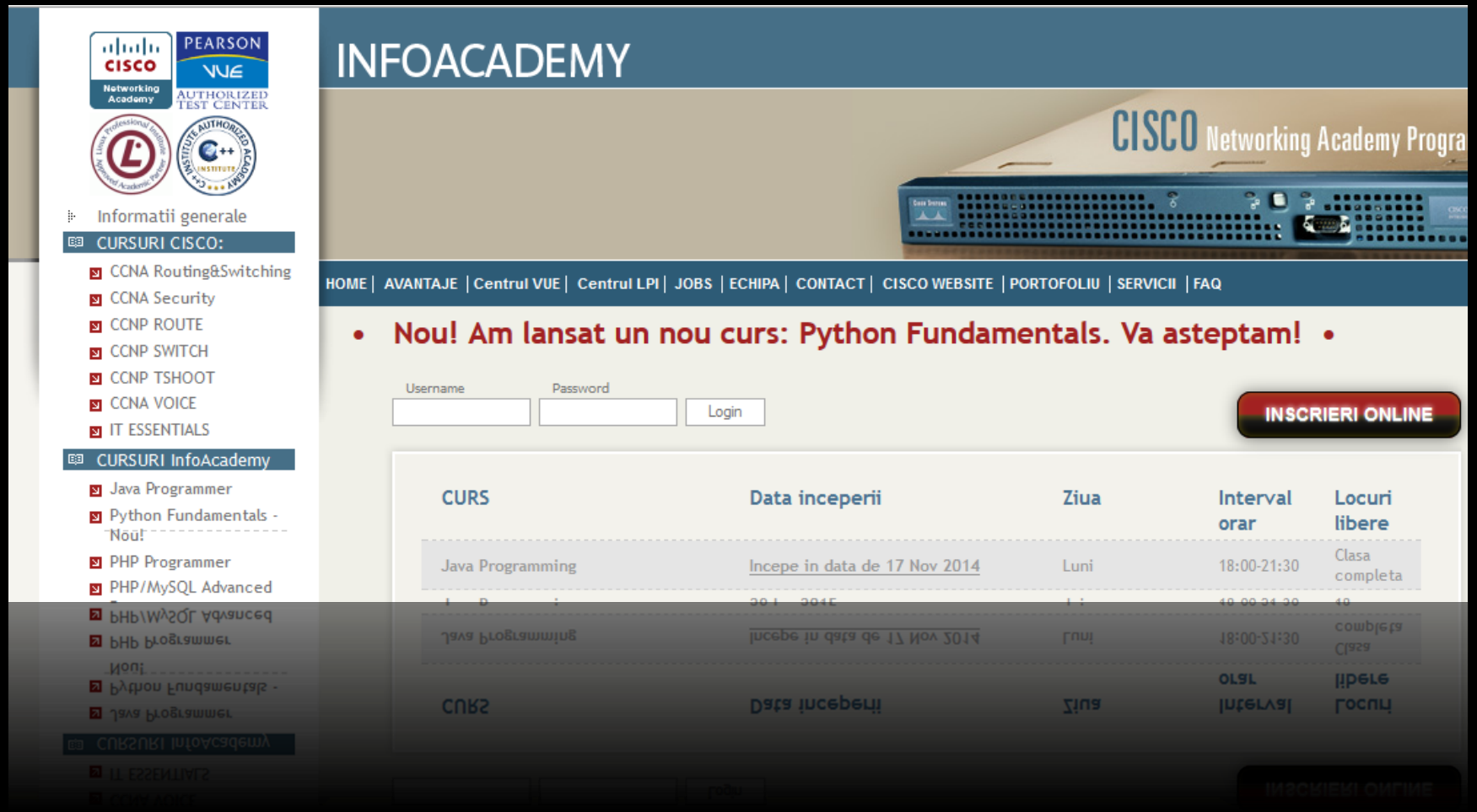
EXAMENE

- Proiect Final (format din doua aplicatii):
  - Prima parte a proiectului este o aplicatie ce consta in extragerea prin telnet a unei comenzi aplicate unui router si cautarea unui sir de caractere dat in output-ul comenzii. Daca acest sir de caractere exista sa trimitem un email catre o casuta de email.
  - A doua parte a proiectului este o aplicatie grafica realizata in kivy.

EXAMENE

- Examen Final
  - Se sustine de maximum 2 ori
  - Se poate sustine dupa ce am sustinut in prealabil examenele de capitol 1-8, predarea proiectului si sustinerea feedback-ului
  - Ambele sustineri (daca este cazul) se pot realiza intr-o zi de vineri cu o programare in prealabil pe site-ul infocademy.net
  - Nota minima este 75%
  - Timpul alocat pentru examen este de 60 minute
  - Examenul consta in 40 de intrebari ce se regasesc in examenele de capitol 1-8

ACCESAREA CURSULUI



INTRODUCERE IN LUMEA PYTHON

INSTALARE

INTRODUCERE IN LUMEA PYTHON

INSTALARE

Should I use Python 2 or Python 3 for my development activity?

What are the differences?

Short version: Python 2.x is legacy, Python 3.x is the present and future of the language

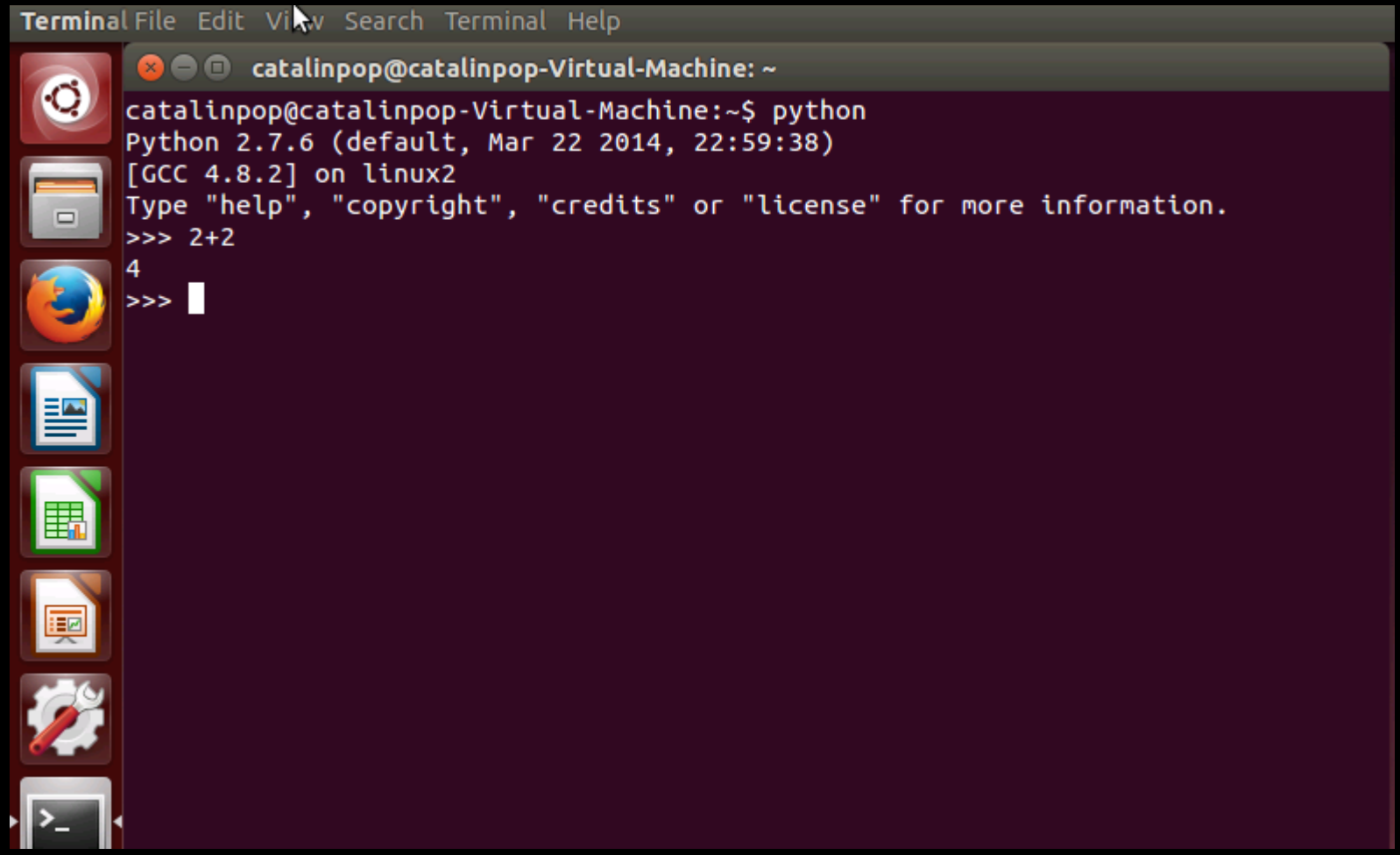
Python 3.0 was released in 2008. The final 2.x version 2.7 release came out in mid-2010, with a state
branch will see no new major releases after that. 3.x is under active development and has already se
and 3.4 in 2014. This means that all recent standard library improvements, for example, are only avai

PYTHON INSTALAT PE :

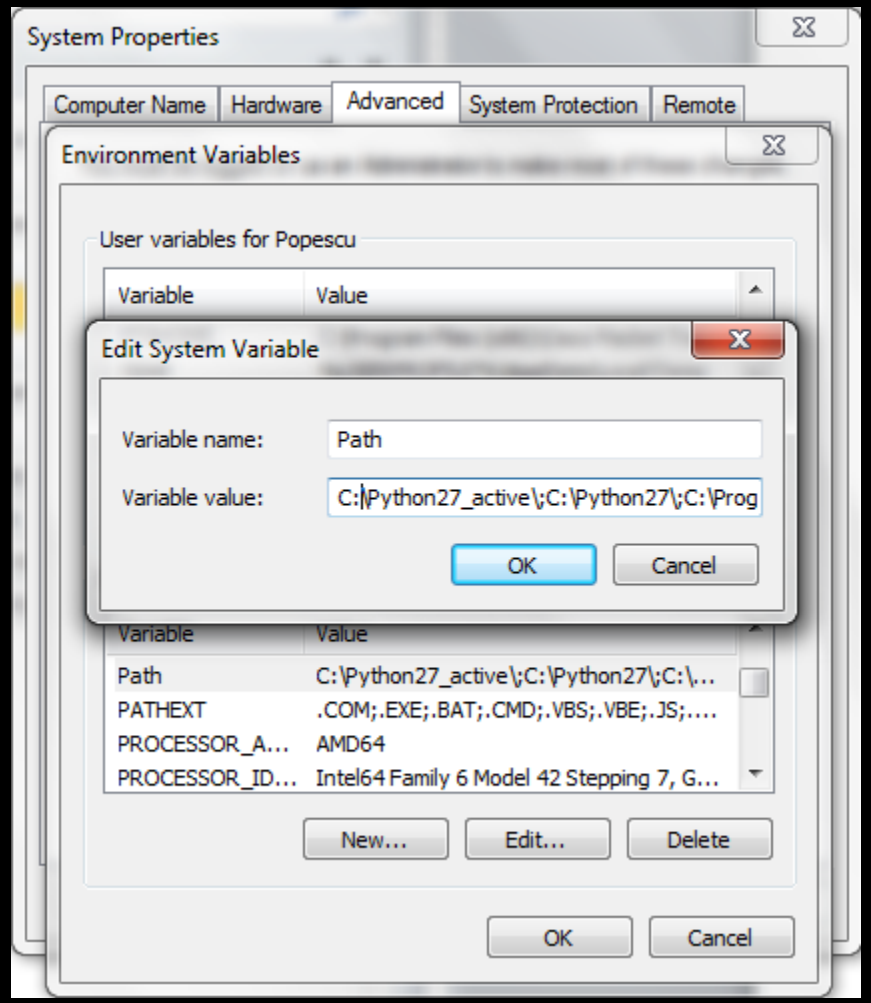
- Windows
- Windows CE sau Pocket PC
- HP-UX
- Linux
- Android
- MAC
- Solaris
- Symbian 60/ Nokia
- QNX
- PlayStation (nu exista inca suport)

PYTHON VERIFICARE INSTALARE

- Linux:
- Windows



PYTHON INSTALARI MULTIPLE



EXECUTABILE IN FISIERUL SURSA

- python.exe
- pythonw.exe

EXTENSII PYTHON

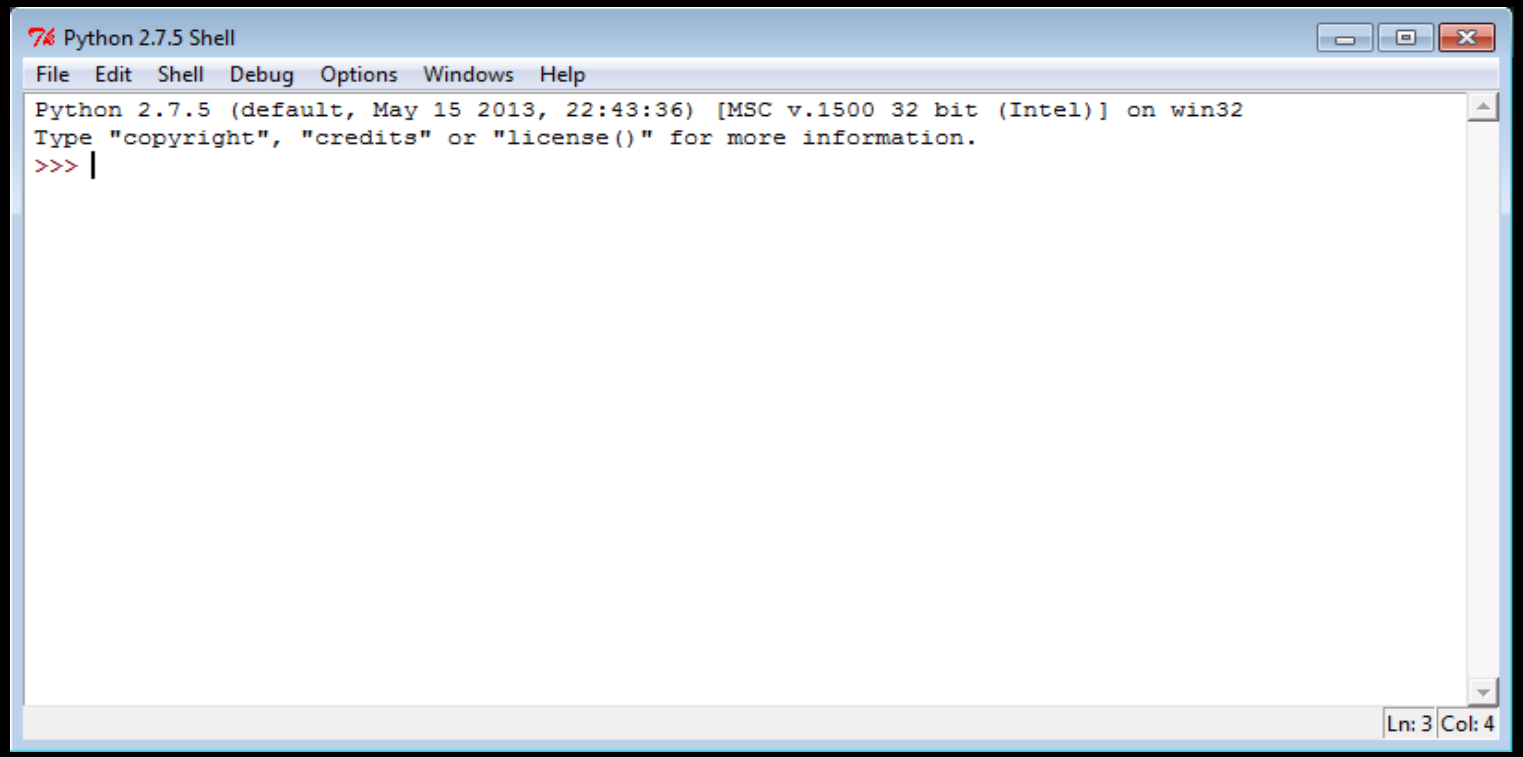
- .py
- .pyc
- .pyo
- .pyd

TOOL-URI PENTRU PYTHON

- IDE (Integrated Development Environment)
- Doua solutii locale:
  - IDLE
  - Eclipse
- Multiple solutii online:
  - http://pythonfiddle.com/

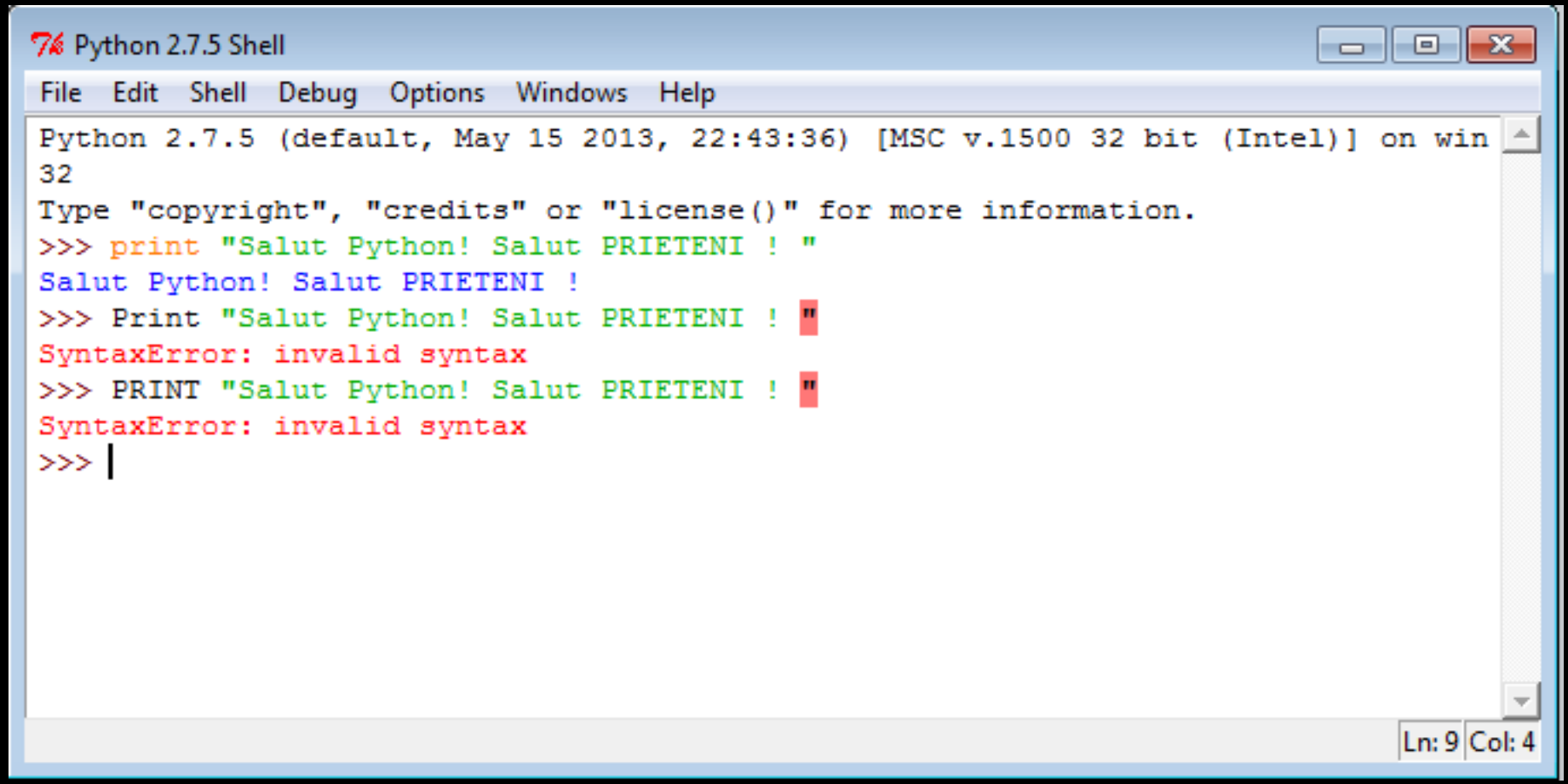
IDLE

- doua moduri: modul Interactiv și modul Script
- Modul Interactiv: cel mai rapid mod de a studia și testa o parte de cod.



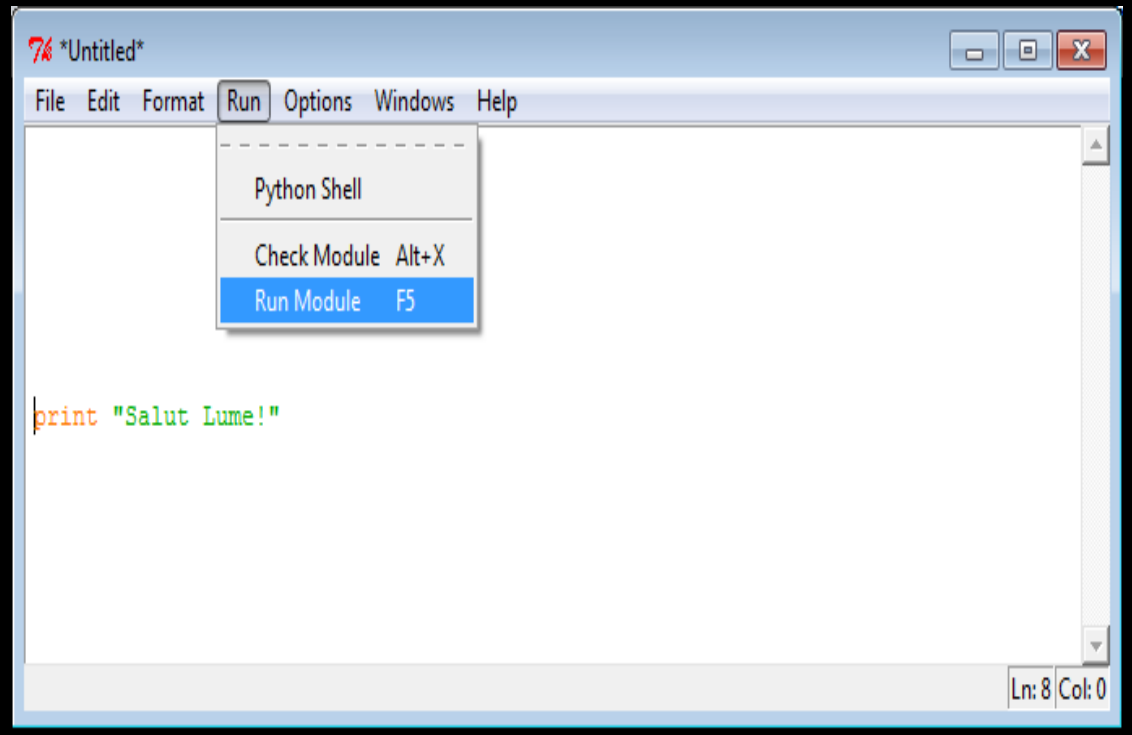
IDLE

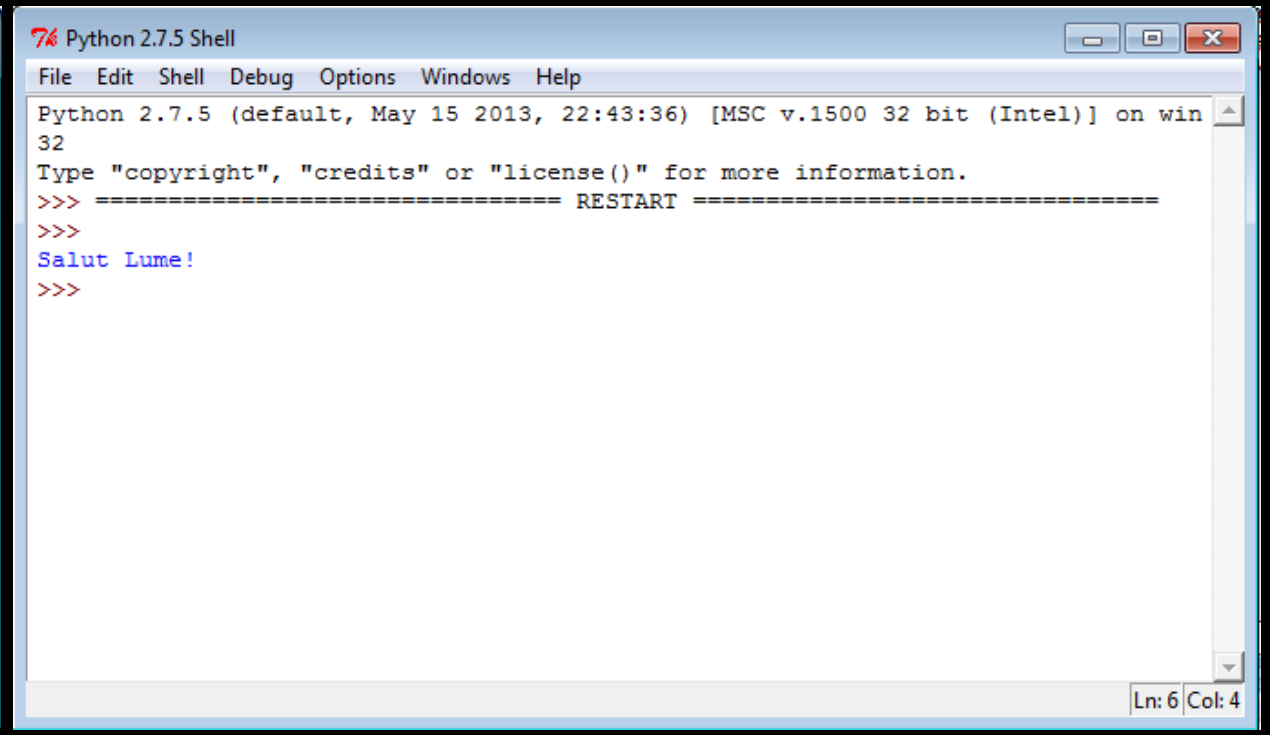
- modul Interactiv



IDLE

- modul script.



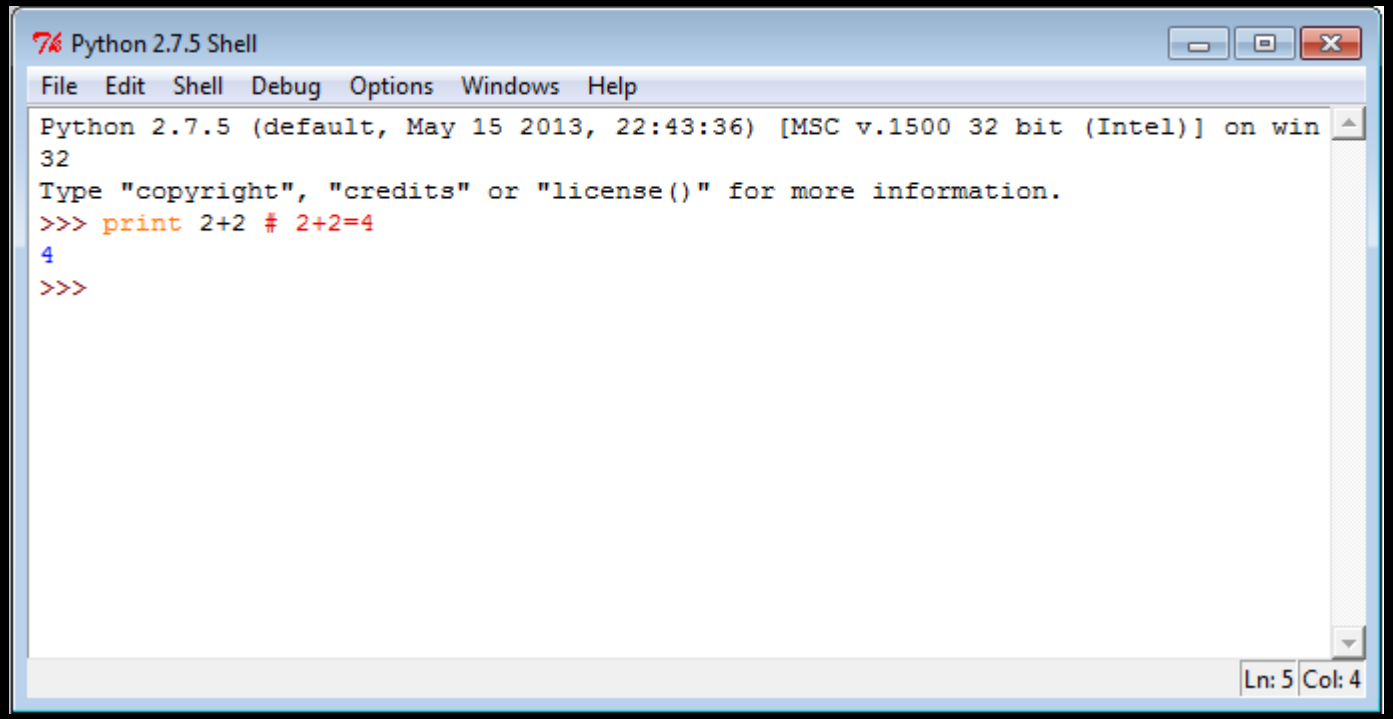


COMENTARIU

Primele 3 linii:

```
# Salut Prieteni
# Demonstreaza comanda print
# Ion Studentul - 12/09/13 – vers 6
```

COMENTARIU


Python 2.7.5 Shell
File Edit Shell Debug Options Windows Help
Python 2.7.5 (default, May 15 2013, 22:43:36) [MSC v.1500 32 bit (Intel)] on win
32
Type "copyright", "credits" or "license()" for more information.
>>> print 2+2 # 2+2=4
4
>>>
Ln: 5 Col: 4

RULAREA UNUI PROGRAM

Este necesara linia:

raw_input("Apasa <Enter> pentru a iesi.")

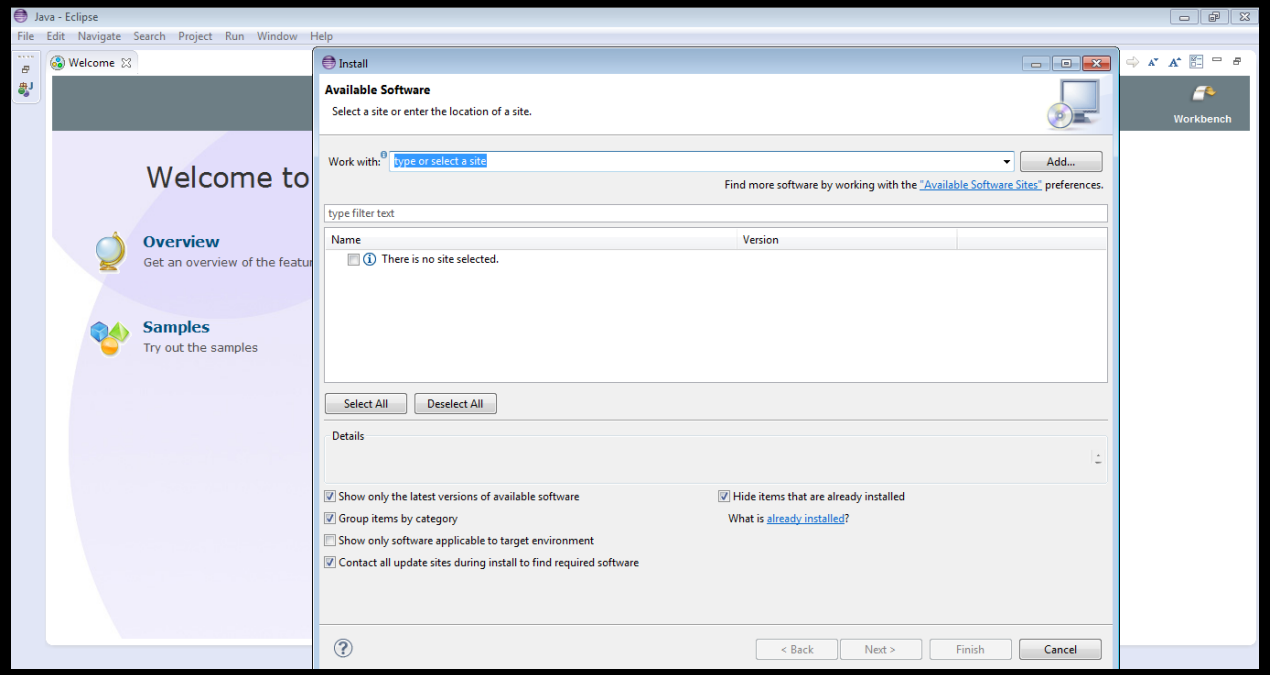
ECLIPSE

- http://www.eclipse.org/downloads/
- varianta standard pentru sistemul de operare de 32 de biți
- Dezarhivați fișierul într-o locație cunoscuta ex. C:\Program Files (x86)\Eclipse
- Deschideți executabilul eclipse.exe

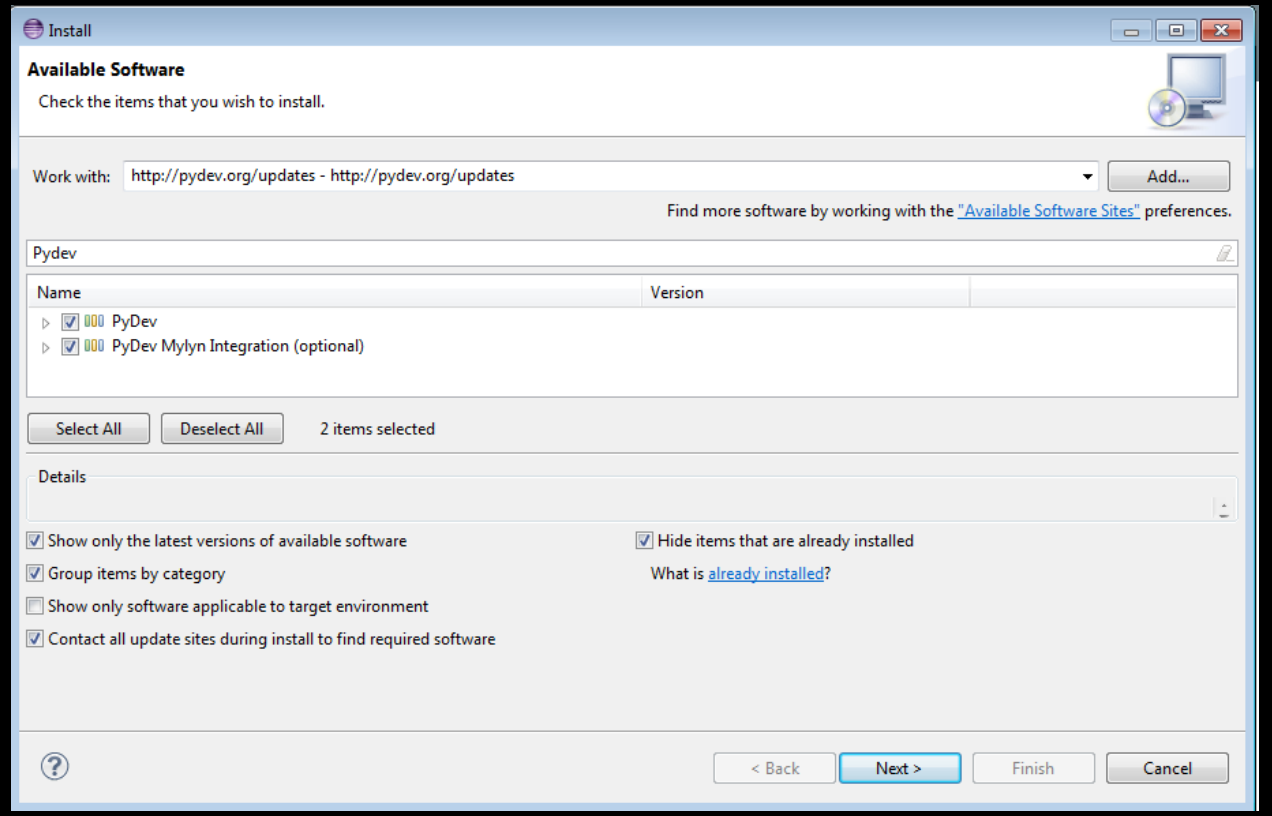
ECLIPSE


eclipse
KEPLER
Workspace Launcher
Select a workspace
Eclipse stores your projects in a folder called a workspace.
Choose a workspace folder to use for this session.
Workspace:
C:\Users\Student\workspace
Browse...
Use this as the default and do not ask again
OK
Cancel

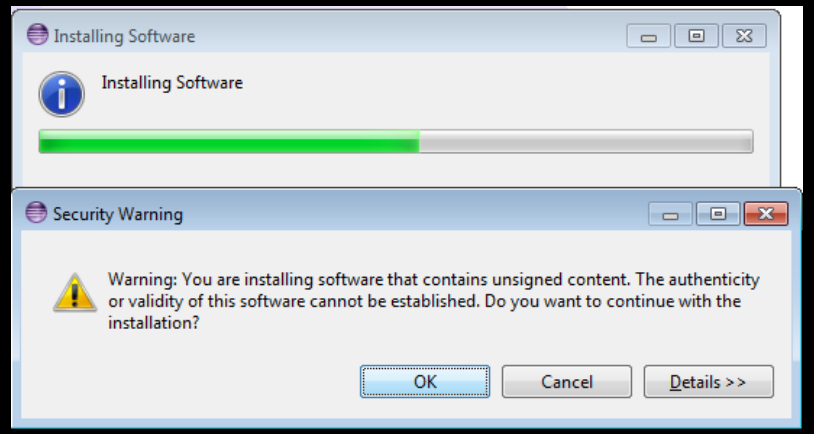
ECLIPSE


Java - Eclipse
File Edit Navigate Search Project Run Window Help
Welcome
Welcome to
Overview
Get an overview of the featu
Samples
Try out the samples
Install
Available Software
Select a site or enter the location of a site.
Work with:
type or select a site
Add...
Find more software by working with the "Available Software Sites" preferences.
type filter text
Name
Version
There is no site selected.
Select All
Deselect All
Details
Show only the latest versions of available software
Group items by category
Show only software applicable to target environment
Contact all update sites during install to find required software
Hide items that are already installed
What is already installed?
< Back
Next >
Finish
Cancel
Workbench

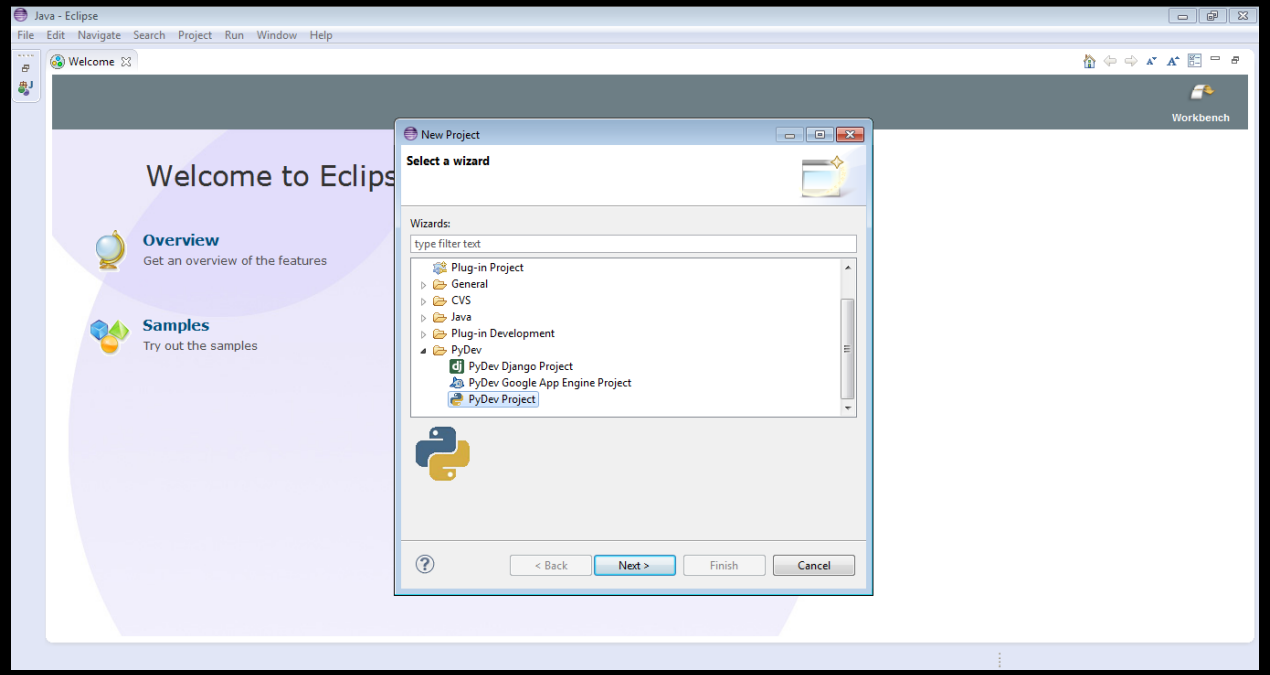
ECLIPSE


Install
Available Software
Check the items that you wish to install.
Work with:
http://pydev.org/updates - http://pydev.org/updates
Add...
Find more software by working with the "Available Software Sites" preferences.
Pydev
Name
Version
PyDev
PyDev Mylyn Integration (optional)
Select All
Deselect All
2 items selected
Details
Show only the latest versions of available software
Group items by category
Show only software applicable to target environment
Contact all update sites during install to find required software
Hide items that are already installed
What is already installed?
< Back
Next >
Finish
Cancel

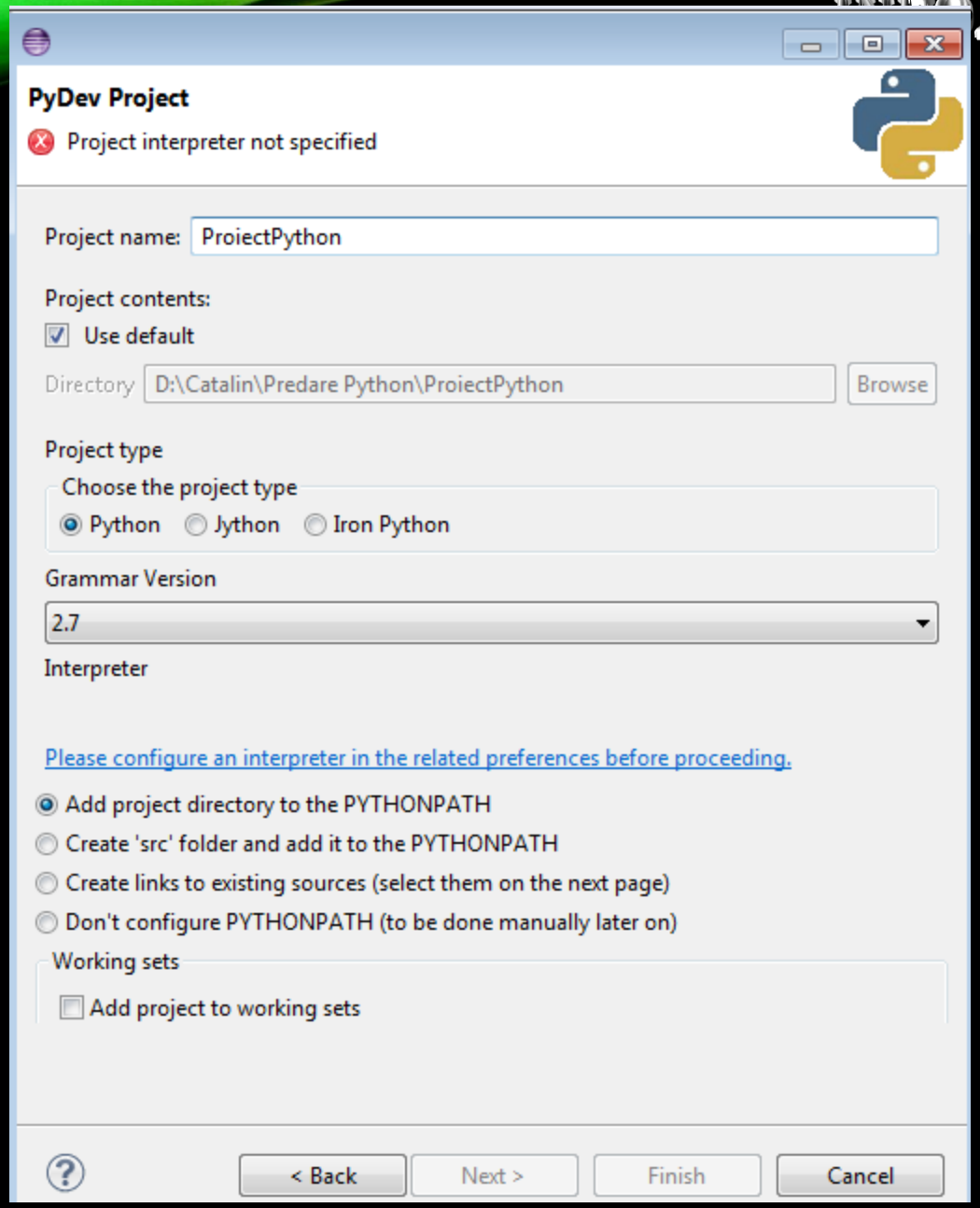
ECLIPSE


Installing Software
Installing Software
Security Warning
Warning: You are installing software that contains unsigned content. The authenticity or validity of this software cannot be established. Do you want to continue with the installation?
OK
Cancel
Details >>

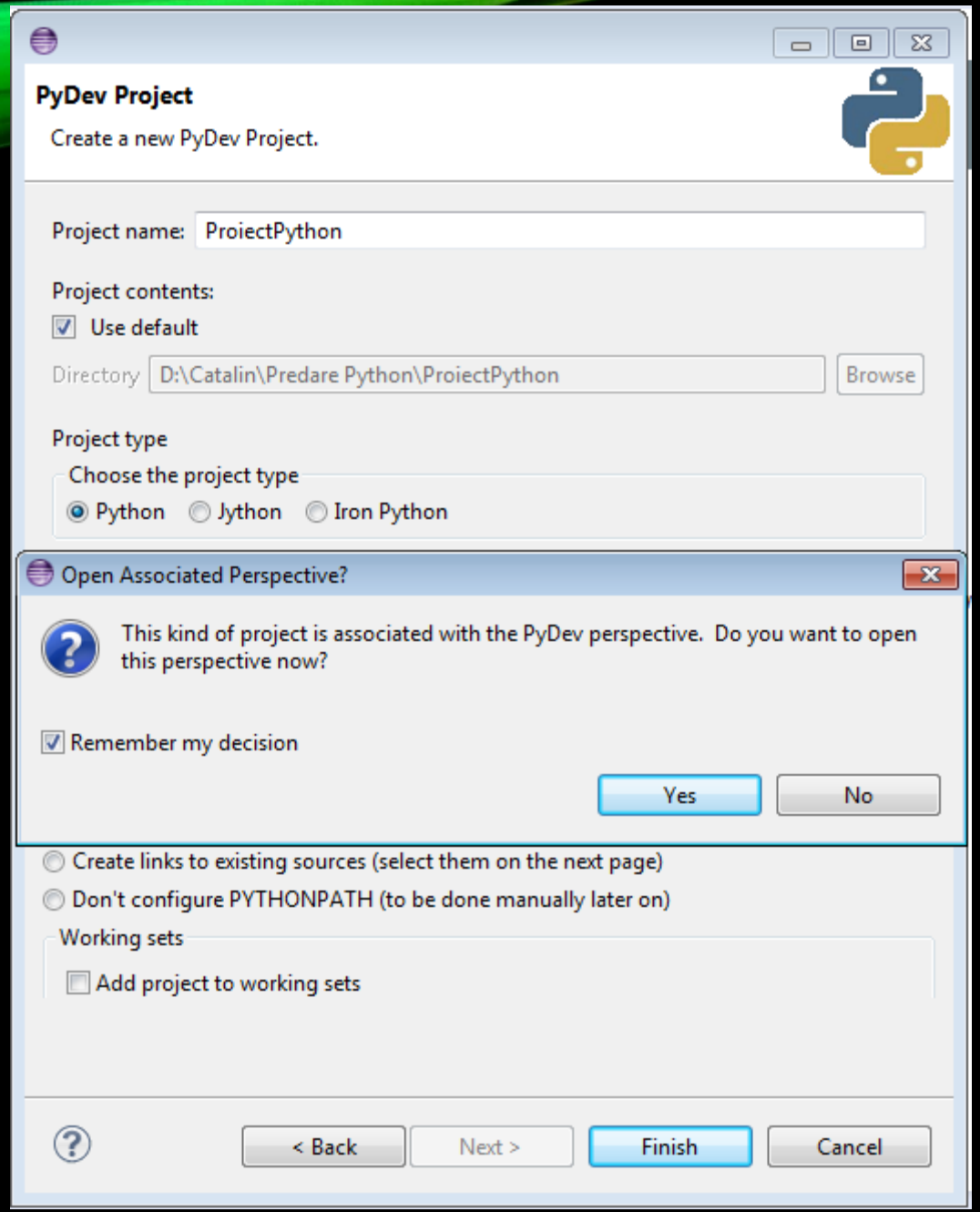
ECLIPSE


Java - Eclipse
File Edit Navigate Search Project Run Window Help
Welcome
Workbench
Welcome to Eclips
Overview
Get an overview of the features
Samples
Try out the samples
New Project
Select a wizard
Wizards:
type filter text
Plug-in Project
General
CVS
Java
Plug-in Development
PyDev
PyDev Django Project
PyDev Google App Engine Project
PyDev Project
< Back
Next >
Finish
Cancel

ECLIPSE


PyDev Project
Project interpreter not specified
Project name: ProiectPython
Project contents:
Use default
Directory D:\Catalin\Predare Python\ProiectPython
Browse
Project type
Choose the project type
Python
Jython
Iron Python
Grammar Version
2.7
Interpreter
Please configure an interpreter in the related preferences before proceeding.
Add project directory to the PYTHONPATH
Create 'src' folder and add it to the PYTHONPATH
Create links to existing sources (select them on the next page)
Don't configure PYTHONPATH (to be done manually later on)
Working sets
Add project to working sets
< Back
Next >
Finish
Cancel

ECLIPSE


PyDev Project
Create a new PyDev Project.
Project name: ProiectPython
Project contents:
Use default
Directory D:\Catalin\Predare Python\ProiectPython
Browse
Project type
Choose the project type
Python Jython Iron Python
Open Associated Perspective?
This kind of project is associated with the PyDev perspective. Do you want to open this perspective now?
Remember my decision
Yes
No
Create links to existing sources (select them on the next page)
Don't configure PYTHONPATH (to be done manually later on)
Working sets
Add project to working sets
< Back
Next >
Finish
Cancel

PRIMELE MELE PROGRAME

LUCRU CU ȘIRURI DE CARACTERE

Reamintire meci

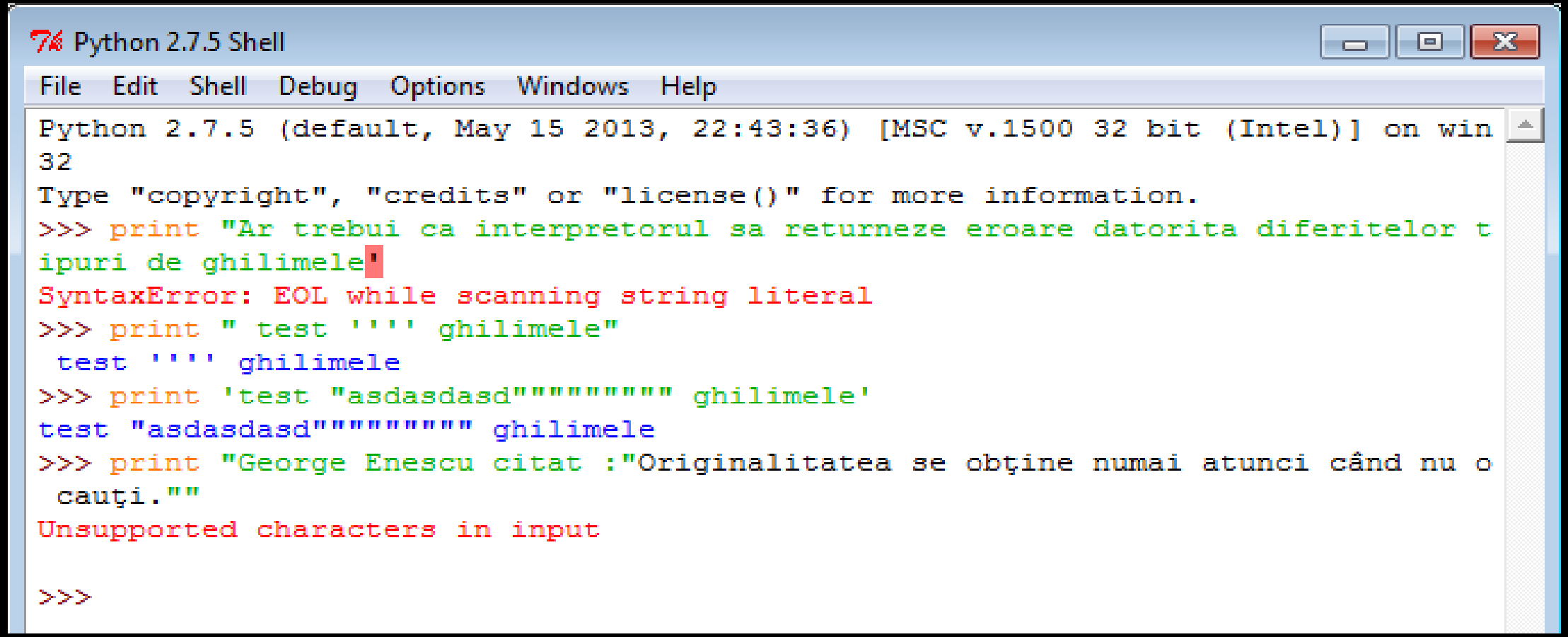
```
1  # Reamintire intalnire cu baietii - Version 1
2  # Demonstreaza utilizarea ghilimelelor in string-uri
3  # Ion Studentul - 1/9/13
4
5  print 'Programul "Meci diseara!" 1.0'
6
7  print \
8  """
9
10
11
12
13
14
15
16
17
18
19 Nu uita sa cumperi bere!
20
21
22 """
23
24 raw_input("Apasa <enter> pt a iesi.")
25
26
```

Console

```
D:\Catalin\Predare Python\carte\cap 1\Reamintire meci.py
Programul "Meci diseara!" 1.0

Nu uita sa cumperi bere!


Apasa <enter> pt a iesi.
```

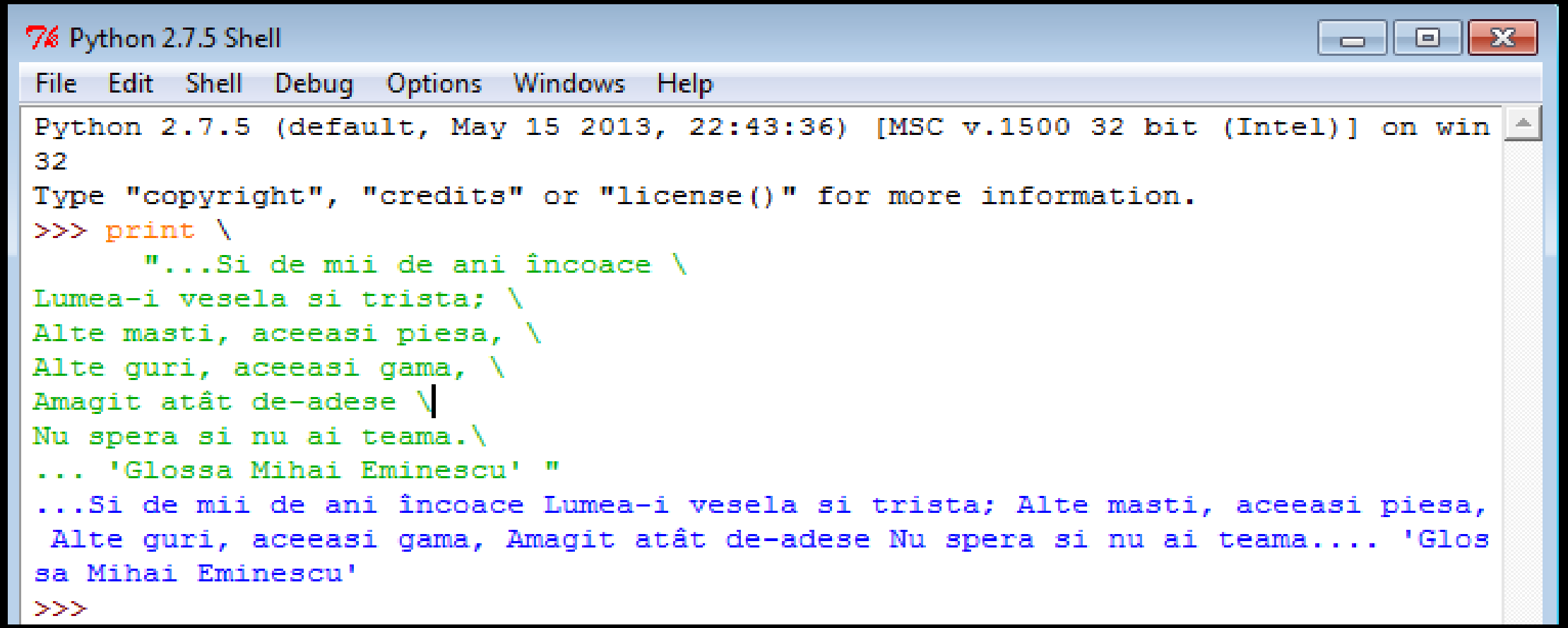
PRIMELE MELE PROGRAME

LUCRU CU ȘIRURI DE CARACTERE



PRIMELE MELE PROGRAME

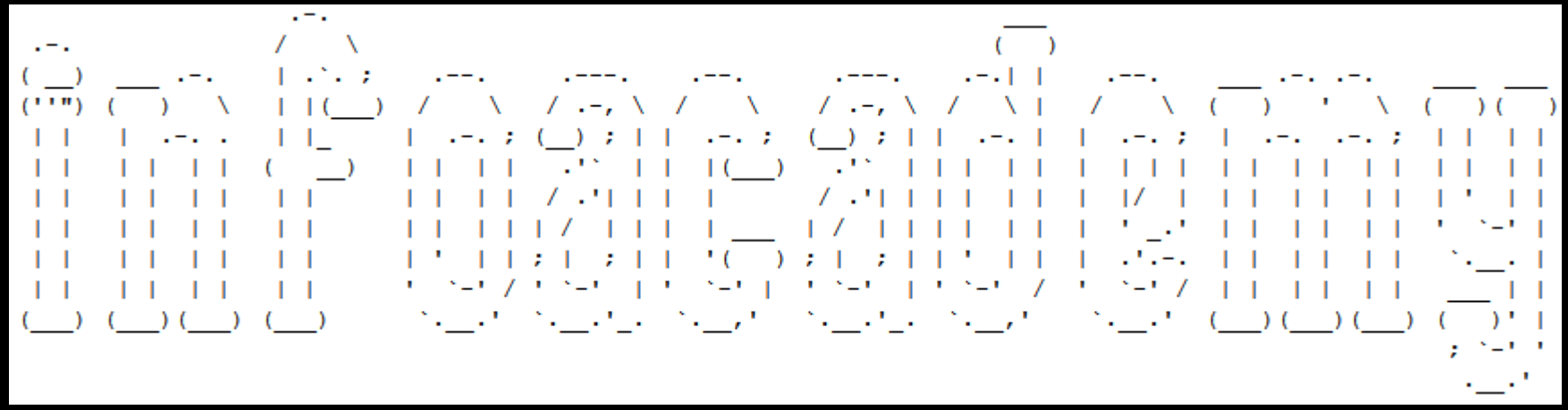
LUCRU CU ȘIRURI DE CARACTERE



PRIMELE MELE PROGRAME

LUCRU CU ȘIRURI DE CARACTERE

- http://www.chris.com/ascii/
- http://patorjk.com/software/taag/
- http://www.network-science.de/ascii/



PRIMELE MELE PROGRAME

LUCRU CU ȘIRURI DE CARACTERE

Concat_si_multiplicarea sirurilor.py - D:\Catalin\Predare Python\carte\cap 1\Concat_si_multiplicarea s...

File Edit Format Run Options Windows Help

```
# Siruri concatenate si repetitive
# Demonstreaza concatenarea si repetitia unui sir de caractere
# Ion Studentul 1/11/13

print "Nu-ti amintesti parola?"+" Nu-i nimic! \nSe poate reseta!"

print " Daca vrei sa resetezi parola suna la :07"+8*"2"+ " sau 07"+8*"4"+" !"
raw_input("\n\nApasa <enter> pt a iesi.")
```

Python 2.7.5 Shell

File Edit Shell Debug Options Windows Help

```
Python 2.7.5 (default, May 15 2013, 22:43:36) [MSC v.1500 32 bit (Intel)] on win
32
Type "copyright", "credits" or "license()" for more information.
>>> ========================== RESTART ==========================
>>>
Nu-ti amintesti parola? Nu-i nimic!
Se poate reseta!
 Daca vrei sa resetezi parola suna la :0722222222 sau 0744444444 !


Apasa <enter> pt a iesi.
```

PRIMELE MELE PROGRAME

LUCRU CU ȘIRURI DE CARACTERE

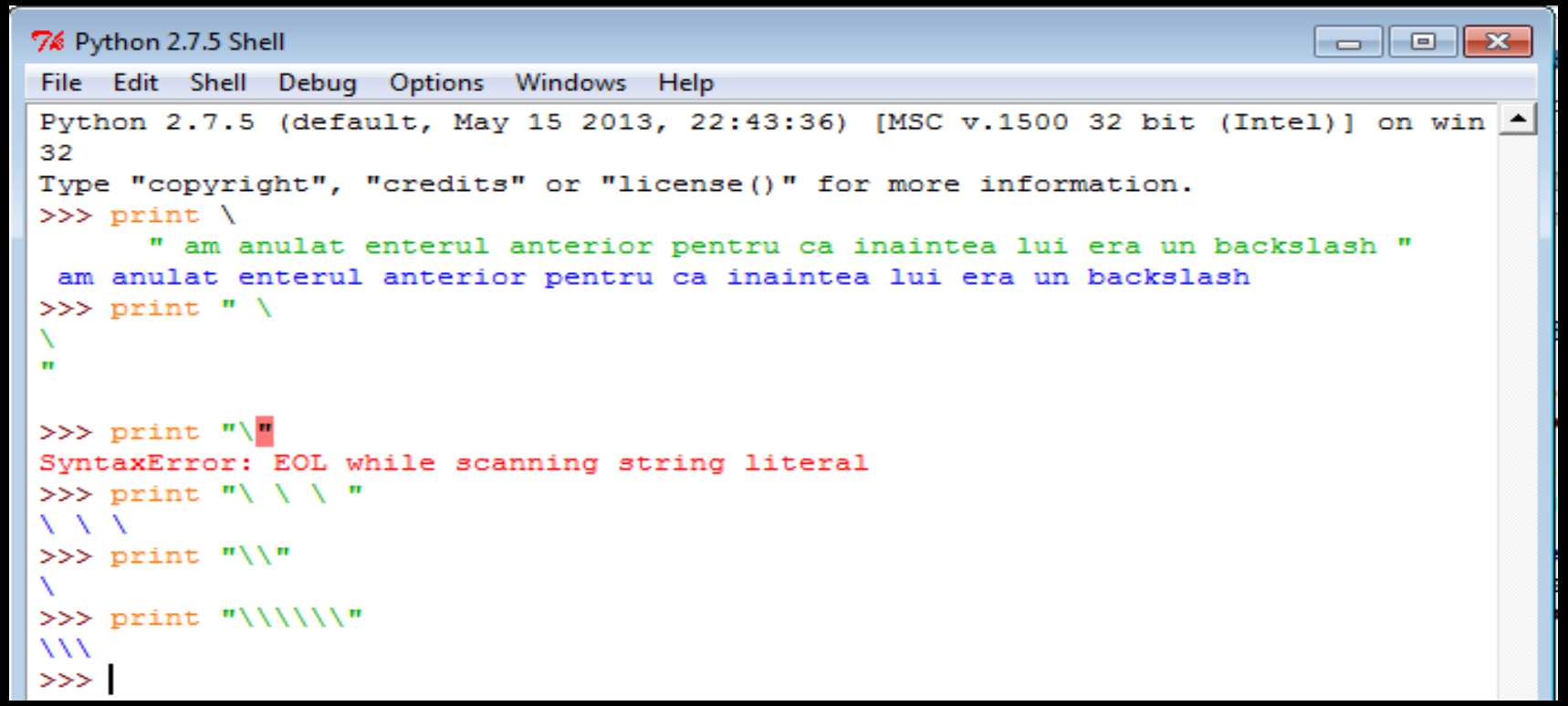
Python 2.7.5 Shell

File Edit Shell Debug Options Windows Help

```
Python 2.7.5 (default, May 15 2013, 22:43:36) [MSC v.1500 32 bit (Intel)] on win
32
Type "copyright", "credits" or "license()" for more information.
>>> print "asdc"-"c"

Traceback (most recent call last):
  File "<pyshell#0>", line 1, in <module>
    print "asdc"-"c"
TypeError: unsupported operand type(s) for -: 'str' and 'str'
>>> print "asdasdasd"/"asd"

Traceback (most recent call last):
  File "<pyshell#1>", line 1, in <module>
    print "asdasdasd"/"asd"
TypeError: unsupported operand type(s) for /: 'str' and 'str'
>>>
```

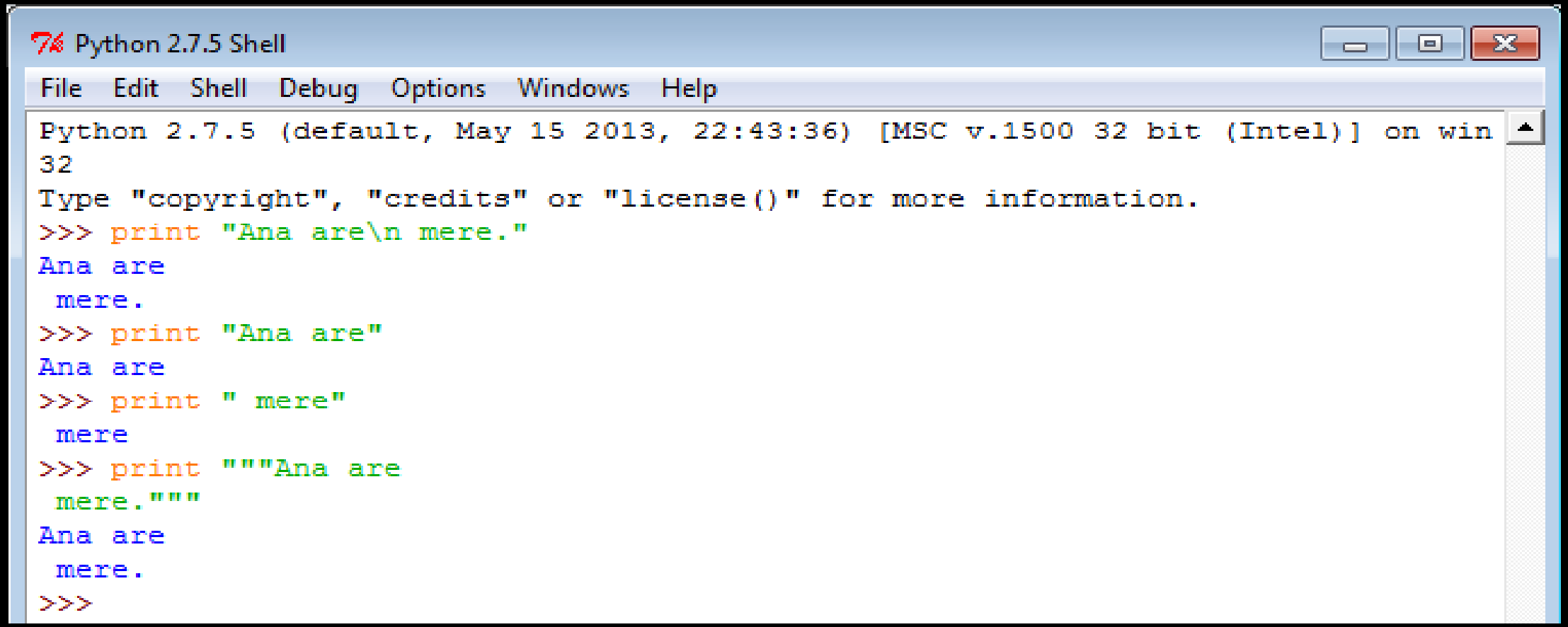
PRIMELE MELE PROGRAME

SECVENȚELE DE EVADARE



PRIMELE MELE PROGRAME

SECVENȚELE DE EVADARE



PRIMELE MELE PROGRAME

SECVENȚELE DE EVADARE

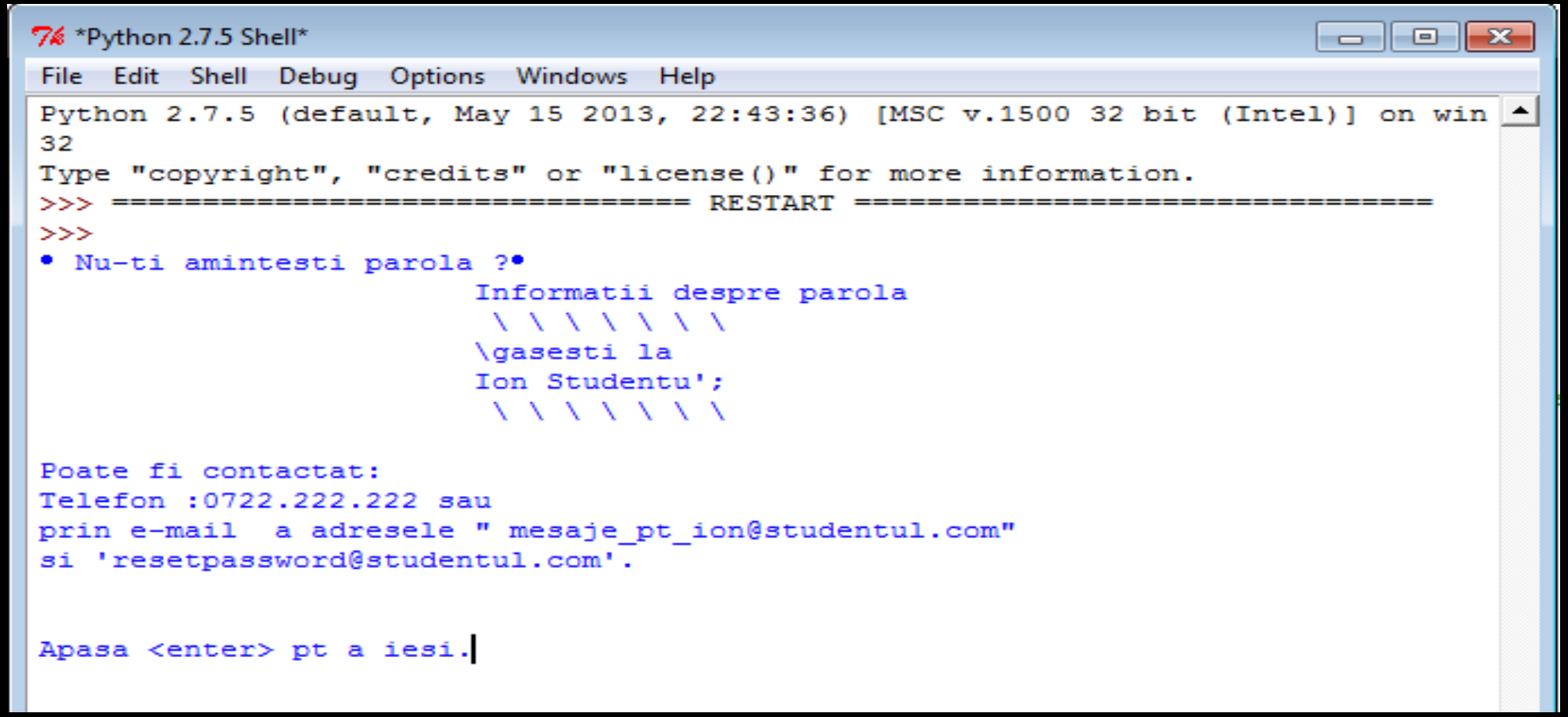
Escape Sequence.py - D:\Catalin\Predare Python\carte\cap 1\Escape Sequence.py

File Edit Format Run Options Windows Help

```
# Informatii parola uitata
# Demonstreaza escape sequences
# Ion Studentul 1/11/13

print "\a Nu-ti amintesti parola ?\a"

print "\t\t\tInformatii despre parola"

print "\t\t\t \\ \\ \\ \\ \\ \\ \\"
print "\t\t\t\gasesti la"
print "\t\t\tIon Studentu';"
print "\t\t\t \\ \\ \\ \\ \\ \\ \\"
print "\nPoate fi contactat:"
print "Telefon :0722.222.222 sau \nprin e-mail  a adresele \" mesaje_pt_ion@studentul.com\" \nsi \'resetpassword@studentul.com\'."
raw_input("\n\nApasa <enter> pt a iesi.")
```

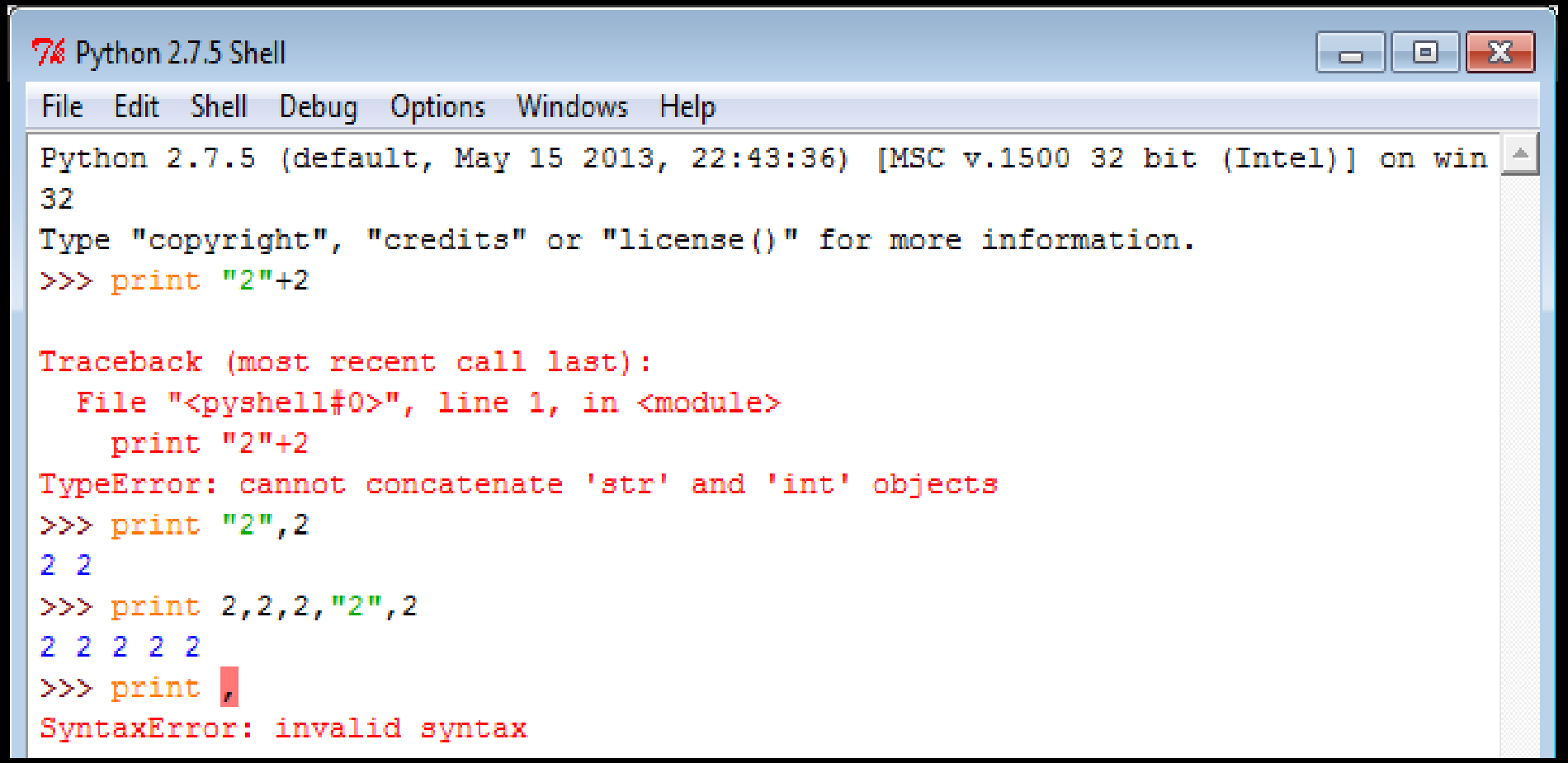
PRIMELE MELE PROGRAME

SECVENȚELE DE EVADARE - RULARE



PRIMELE MELE PROGRAME

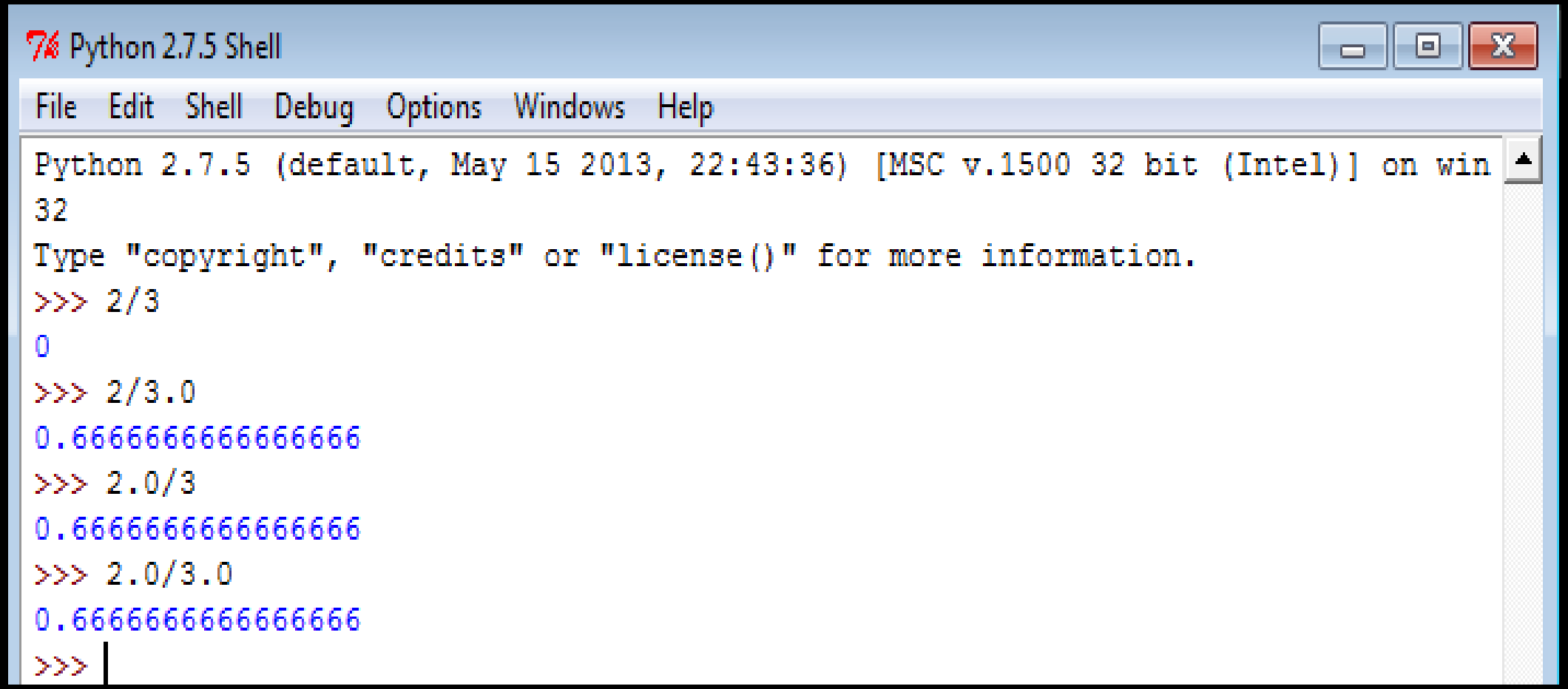
VIRGULA



PRIMELE MELE PROGRAME

LUCRUL CU NUMERE

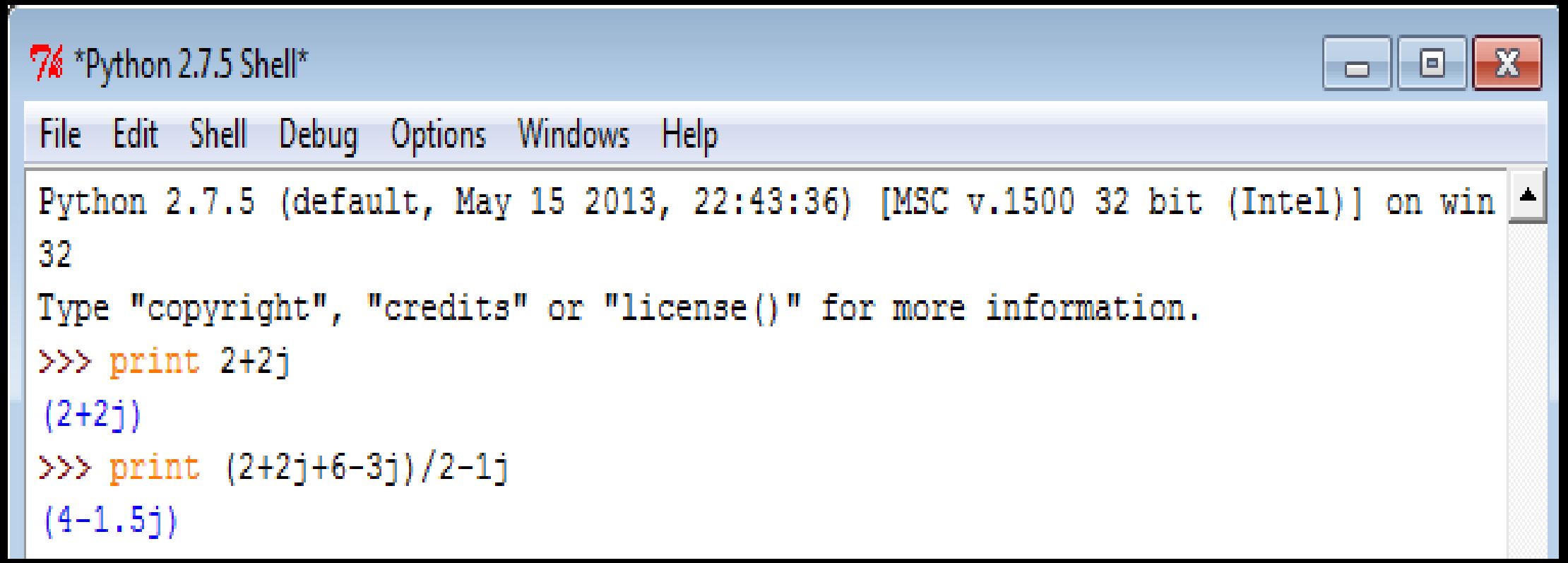
- INTEGER SI FLOAT



PRIMELE MELE PROGRAME

LUCRUL CU NUMERE

- NUMERE COMPLEXE



PRIMELE MELE PROGRAME

```
# Lucrul cu numere
# Demonstreaza lucrul cu numere
# Ion Studentul 1/11/13

print "\n\tTema mateamatica clasa a 4a\n"
print "Rezolva adunarea: 2+2"
print 2+2

print \
"""\nCat canteste o balena de 2000 kg care a nascut un pui de 100 kg."""
print "2000 - 100  = ",
print 2000 - 100

print "\nRezolva imnultirea 333*3? Raspunsul corect este", 333*3,"! "

print "24 / 6 = ",
print 24 / 6 ,
print "(impartire)\n"

print "107 % 4 = ",
print 107 % 4, "Aceasta operatie se numeste modulo!\n"

print \
"""Operatia matematica de mai jos va expriva impartirea cu rest!"""
print "19 / 4 = ",
print 19 / 4
print "Gresit!"

print "Raspunusl corect este :",19.0 / 4

print "\nOperatie mateamatica complexa1: [(2+2)*3]/4 =" ,((2+2)*3)/4,"\n"
print "Operatie mateamatica complexa2: 2*2*2*2 =" ,2 ** 4,"\n"
```

PRIMELE MELE PROGRAME


```
>>>

        Tema matematica clasa a 4a

Rezolva adunarea: 2+2
4

Cat canteste o balena de 2000 kg care a nascut un pui de 100 kg.
2000 - 100  =  1900

Rezolva imnultirea 333*3? Raspunsul corect este 999 !
24 / 6 =  4 (impartire)

107 % 4 =  3 Aceasta operatie se numeste modulo!

Operatia matematica de mai jos aplica impartirea cu rest!
19 / 4 =  4
Gresit!
Raspunusl corect este : 4.75

Operatie matematica complexa1: [(2+2)*3]/4 = 3

Operatie matematica complexa2: 2*2*2*2 = 16
```

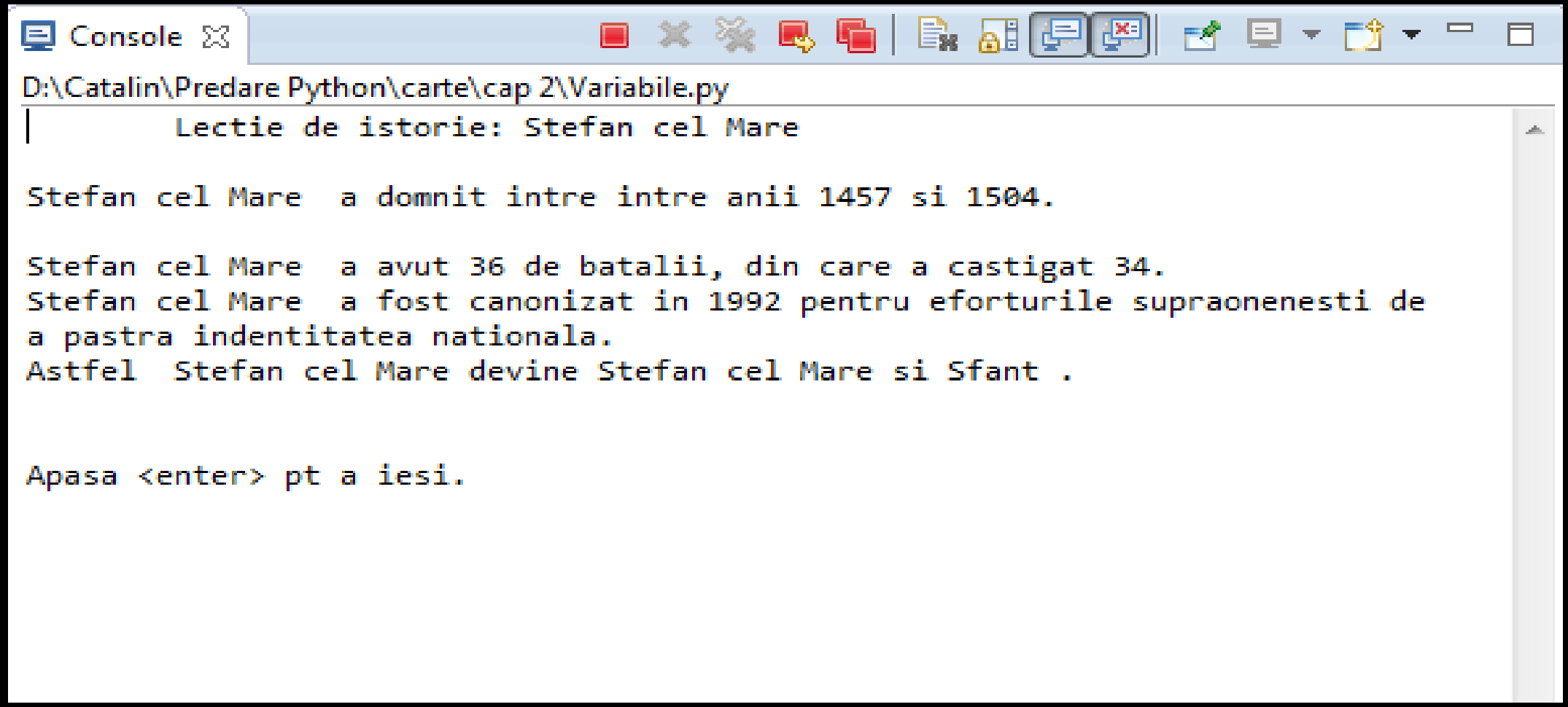
PRIMELE MELE PROGRAME

VARIABILE

```
# Stefan Cel Mare
# Demonstreaza lucrul cu variabile
# Ion Studentul 1/11/13


s = "Stefan cel Mare"
st =s+" și Sfant"

print "\tLectie de istorie: Stefan cel Mare\n"
print s," a domnit intre intre anii 1457 și 1504.\n"

print s, " a avut 36 de batalii, din care a castigat 34."
print s, " a fost canonizat in 1992 pentru eforturile supraonenesti de "
print "a pastra indentitatea nationala."
print "Astfel ", s ,"devine", st , "."


raw_input("\n\nApasa <enter> pt a iesi.")
```

PRIMELE MELE PROGRAME

VARIABILE



PRIMELE MELE PROGRAME

VARIABILE

NUMELE UNEI VARIABILE PAOTE FI FORMAT DIN:

- litere,
- numere,
- underscore ‘_’

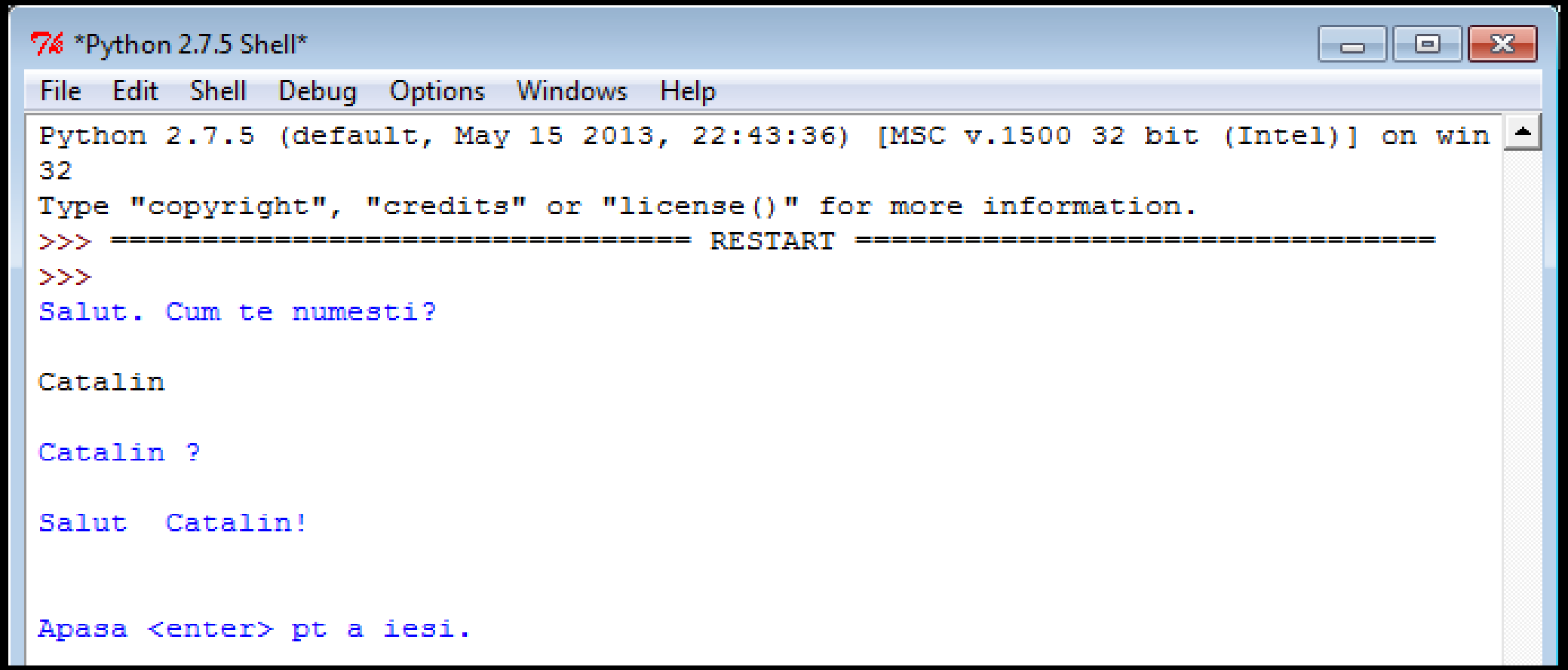
PRIMELE MELE PROGRAME

CAPTURAREA USER INPUT

```
# Salut Personalizat
# Demonstreaza  user input
# Ion Studentul 1/13/03

Nume_Utilizator = raw_input("Salut. Cum te numesti? \n\n")

print "\n",Nume_Utilizator,"?\n"

print "Salut   " + Nume_Utilizator + "!"

raw_input("\n\nApasa <enter> pt a iesi.")
```

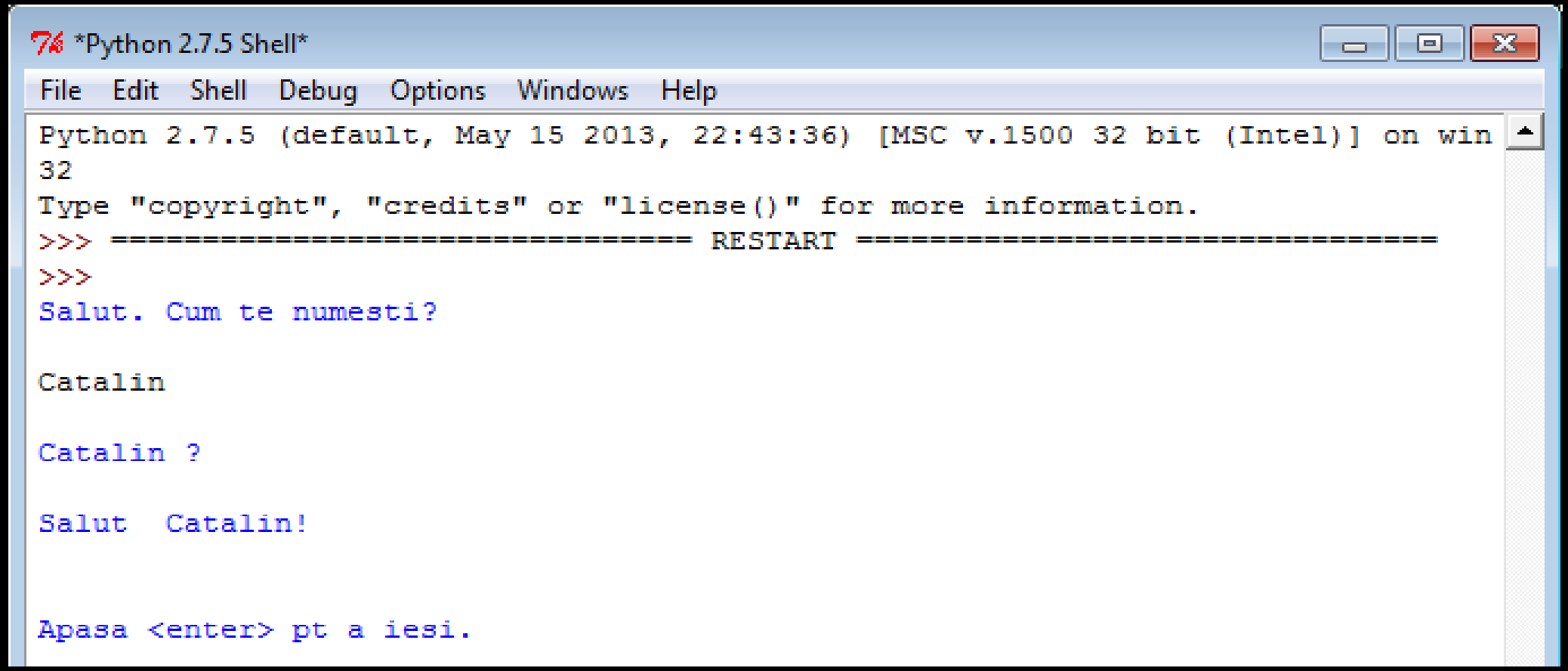
PRIMELE MELE PROGRAME

CAPTURAREA USER INPUT



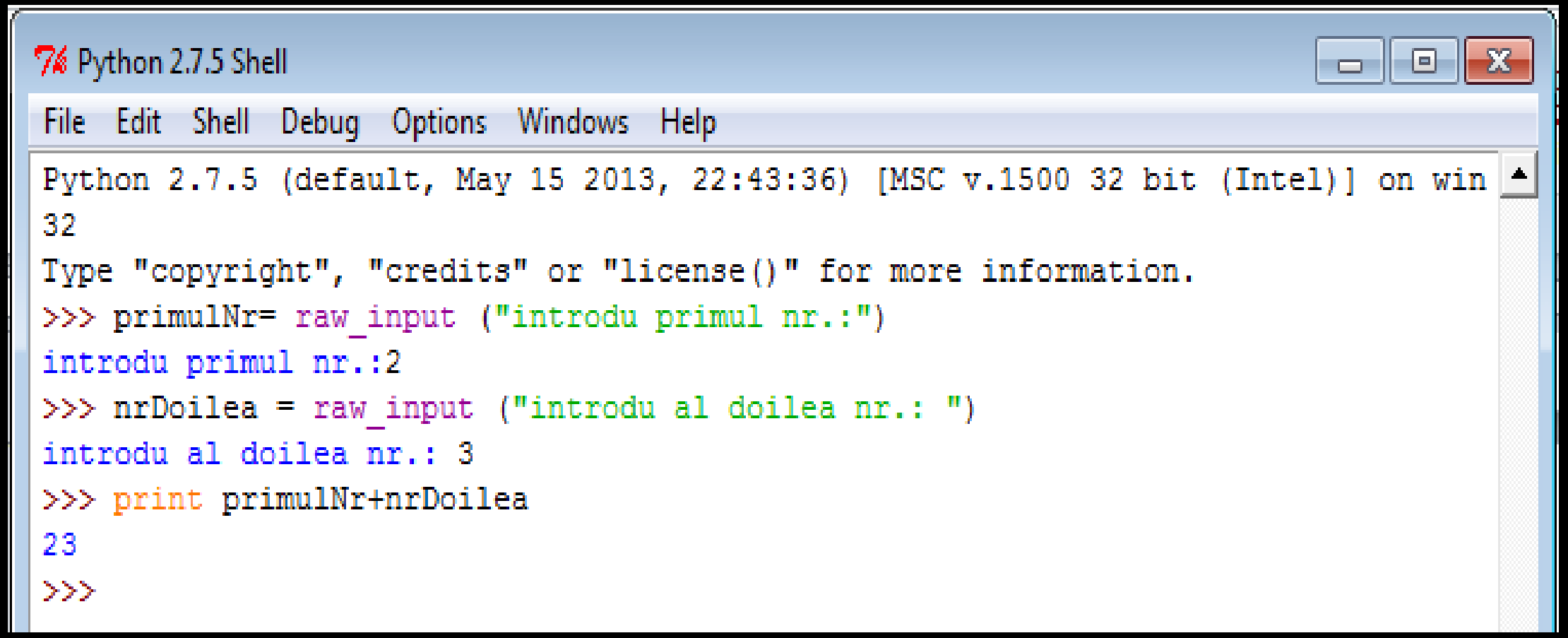
PRIMELE MELE PROGRAME

CAPTURAREA USER INPUT



PRIMELE MELE PROGRAME

CAPTURAREA USER INPUT



MANIPULAREA ȘIRURILOR DE CARACTERE

```
# Manipularea sir caractere
# Demonstreaza  manipularea variabilelor ce contin un sir de caractere
# Ion Studentul 1/13/03

# Citat Presedinte IBM, Thomas Watson, in 1943
citat = "I think there is a world market for maybe five computers."
print "Citat original:"
print citat

print "\nIn litere mari:"
print citat.upper()

print "\nIn litere mici:"
print citat.lower()

print "\nCa titul:"
print citat.title()

print "\nCu o mica schimbare:"
print citat.replace("five", "millions of")

print "\nCitatul original este inca :"
print citat

print "\nVerificare daca variabila este un sir de caractere format numai \
din numere:"
print citat.isdigit()
```

MANIPULAREA ȘIRURILOR DE CARACTERE

```
print "\nVerificare daca variabila este un sir de caractere format numai \
din numere:"
print citat.isdigit()

print "\nVerificare daca variabila este sir de caractere format din \
caractere alpha:"

print citat.isalpha()

citat_modificat= citat.replace(" ","")
citat_modificat= citat.replace(".","")

print "\nVerificare daca variabila este sir de caractere format din caractere alpha:"
print citat_modificat.isalpha()

raw_input("\n\nApasa <enter> pt a iesi.")
```

MANIPULAREA ȘIRURILOR DE CARACTERE

D:\Catalin\Predare Python\carte\cap 2\manipularea_sir_caractere.py

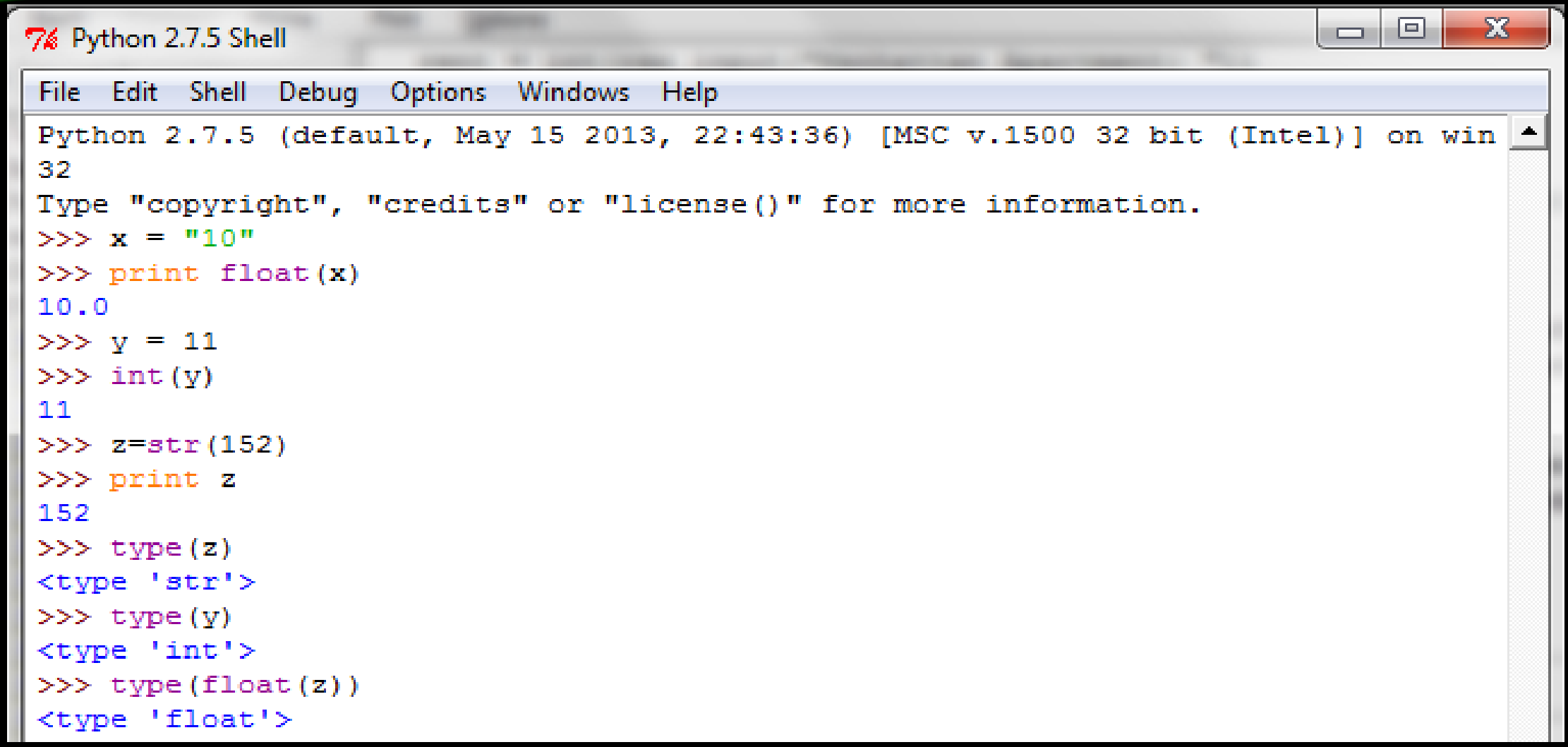
```
Citat original:
I think there is a world market for maybe five computers.

In litere mari:
I THINK THERE IS A WORLD MARKET FOR MAYBE FIVE COMPUTERS.

In litere mici:
i think there is a world market for maybe five computers.

Ca titul:
I Think There Is A World Market For Maybe Five Computers.

Cu o mica schimbare:
I think there is a world market for maybe millions of computers.

Citatul original este inca :
I think there is a world market for maybe five computers.

Verificare daca variabila este un sir de caractere format numai din numere:
False

Verificare daca variabila este sir de caractere format din caractere alpha:
False
I think there is a world market for maybe five computers asta e

Verificare daca variabila este sir de caractere format din caractere alpha:
False


Apasa <enter> pt a iesi.
```

MANIPULAREA ȘIRURILOR DE CARACTERE

D:\Catalin\Predare Python\carte\cap 2\manipularea_sir_caractere.py

```
Citat original:
I think there is a world market for maybe five computers.

In litere mari:
I THINK THERE IS A WORLD MARKET FOR MAYBE FIVE COMPUTERS.

In litere mici:
i think there is a world market for maybe five computers.

Ca titul:
I Think There Is A World Market For Maybe Five Computers.

Cu o mica schimbare:
I think there is a world market for maybe millions of computers.

Citatul original este inca :
I think there is a world market for maybe five computers.

Verificare daca variabila este un sir de caractere format numai din numere:
False

Verificare daca variabila este sir de caractere format din caractere alpha:
False
I think there is a world market for maybe five computers asta e

Verificare daca variabila este sir de caractere format din caractere alpha:
False


Apasa <enter> pt a iesi.
```

MANIPULAREA ȘIRURILOR DE CARACTERE



MANIPULAREA ȘIRURILOR DE CARACTERE

```
>>> x=10
>>> print float(x)
10.0
>>> float(10.0)
10.0
>>> float('10a')

Traceback (most recent call last):
  File "<pyshell#3>", line 1, in <module>
    float('10a')
ValueError: invalid literal for float(): 10a
>>> int(x)
10
>>> int(10.0)
10
>>> int('test')

Traceback (most recent call last):
  File "<pyshell#6>", line 1, in <module>
    int('test')
ValueError: invalid literal for int() with base 10: 'test'
>>> str(x)
'10'
>>> str('string')
'string'
>>> str(10.0)
'10.0'
```