CS 17700
Functions

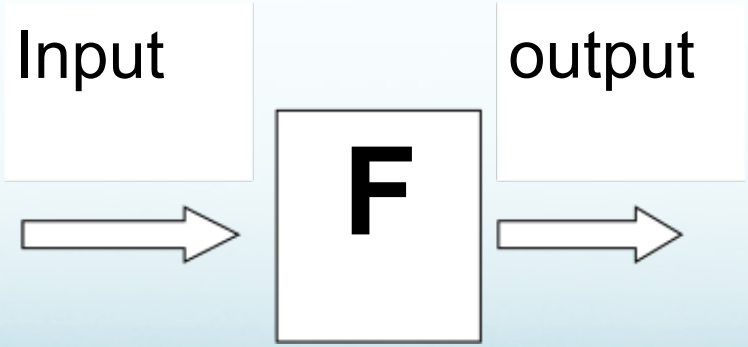
Week 5

Functions

- Previously, we have used function: range, eval, sqrt, etc.
- Functions allow grouping statements together under a (function name) that can be executed by calling the function
- Functions are a collection of instructions that perform a task as:
  - Printing your name and course
  - Calculating the average of a set of numbers
  - Editing a picture or video

Functions

- Like in algebra, a function is a kind of "box" into which you put one value and out comes another. We represent ("denote") a function by a name (in math we use f or F).



Why to use a function?

- If we define a function to perform a task, then we will write it **once** but we can use it (or call it) **many times.**
- Functions can make a program easier to read and debug.
- Functions can make a program shorter as their use can eliminate repetitive code.
- Functions allow that future changes need to be only made in one place.
- Dividing a program into functions allows one to debug parts one at a time.
- Well-designed functions are often useful in other programs and can allow the reuse of code.

How to write functions?

```
def functionName():
    statement #1
    statement #2
  ...
```

- Indentation is very important in Python, it marks the beginni of function body
- Python will give errors if your function is not properly indent

It is a programming practice to define a function that is called ma to call the other functions in our program

Example

```
def SayHello():
   print("Hello world!")

   print("--From Python")

SayHello()
```

Note: 1. Don't forget the colon(:)

2. Align the statements in one function

Functions: Arguments

- A function may or may not receive one or more argument

No Argument

```
def Greet():
    print("Hello Jack")

def main():
    Greet()
```

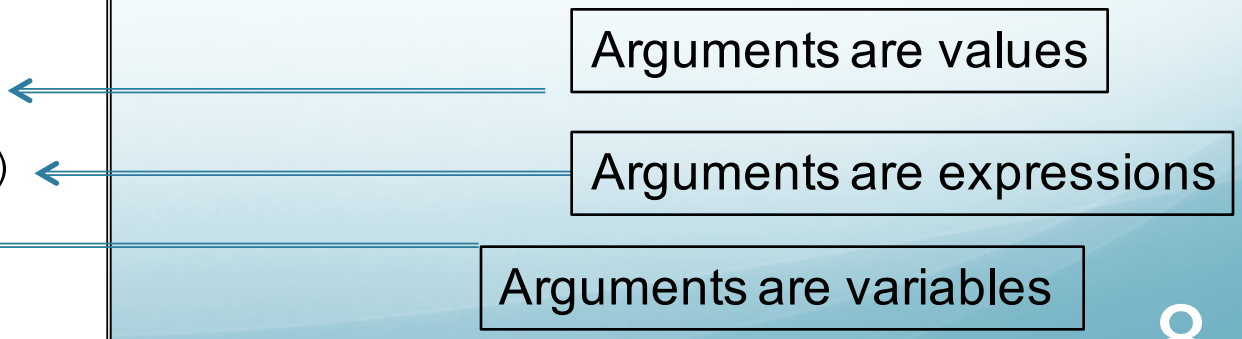
One Argument

```
def GreetWithArg(message):
    print(message)

def main():
    msg = "Hello Jack"
    GreetWithArg(msg)
```

Functions: Arguments

- A function argument can be:
  1. A value
  2. Expression
  3. A variable

```
def Sum(a, b):
    total = a + b
    print(total)

def main():
    x = 5
    y = 10
    Sum(4, 10)
    Sum(x+2, y-3)
    Sum(x,y)
```



Function: Arguments

- On function call, Python assigns the value of the argument to the variable declared in function
- When the argument passed to a function is the value of a variable, the name of that variable is irrelevant to the function

```
def Sum(a, b):
    total = a + b
    print(total)

def main():
    x = 5
    y = 10
    Sum(x, y)
```

- The value of **x** and **y** were put into **a** and **b** respectively via function call.
- **x** and **y** are called: local variables to function main
- **a** and **b** are called: local variables to function Sum

Function: Arguments

- The name of argument passed to functions may or may not match the name of the variable used in the function

```
def Sum(a, b):
    total = a + b
    print(total)

def main():
    a = 5
    b = 10
    Sum(a, b)
```

a: local variable to Sum

a | 5

b: local variable to Sum

b | 10

- The value of **a** and **b** that **are local to function main** were put into the local variables **a** and **b** respectively via function call.

Functions: Returned Values

- Functions may return values (example: the result of a computation).
- Returned values can be :
  1. Printed
  2. Used in assignment statement
  3. Used in expression

```
def Average(a, b):
    return (a+b)/2

def main():
    print (Average(10,2))
    avg = Average(3, 4)
    Total = Average(4,3) * 0.95
```

Functions with Multiple Returned Values

- Functions in Python may return multiple values

```
def getabc():
    a = "Hello"
    b = "World"
    c = "!"
    return a,b,c
def main():
    s1, s2, s3 = getabc()
```

Example

```
def Sum(a, b, c):
    return (a+b+c)

def Greet(name, GPA):
    print("Hello", name)
    print("You have a GPA of ", GPA)

def Div(a, b):
    return a/b

def Mul(a, b):
    return a*b

def main()
    x = 3
    y = 4
    z = 2
    myStr = “Mike”
    Total = Sum(x,y,z)
    print (Greet(myStr))
    Result = Sum(x,y,z)+ Mul(x,y) – Div(y, z)
```

Functions that Modify Variables (1)

- What is the output of the following program:

```
def Bonus(grade):
    grade = grade + 10

def main():
    myGrade = 75
    print (myGrade)
    Bonus(myGrade)
    print (myGrade)

main()
```

Output: 75
75

Why?

Functions that Modify Variables (1)

- **myGrade** is an argument passed to function Bonus.
- **myGrade** is a numeric data type, also called immutable, that is a function cannot modify its value. In this case, only the value of myGrade matters.
- The function call will put the value of **myGrade** into **grade**
- **grade** is only known **'locally'** to the function Bonus
- If you want to export the value from function Bonus back to main, function Bonus **MUST** use a **return** statement
- Then you can use the function call in an assignment statement

Bonus function now returns a value

```
def Bonus(grade):
    grade = grade + 10
    return grade

def main():
    myGrade = 75
    print(myGrade)
    myGrade = Bonus (myGrade)
    print(myGrade)

main()
```

Output: 75
85

Functions that Modify Variables (2)

- What is the output of the following program:

```
def Bonus(gradeList):
    for i in range(len(gradeList)):
        gradeList[i] = gradeList[i] +
10

def main():
    myGrades = [75, 90,80]
    print (myGrades)
    Bonus(myGrades)
    print (myGrades)

main()
```

Output: [75, 90, 80]
[85, 100, 90]

Why?

Functions that Modify Variables (2)

- **myGrades** is an argument passed to function Bonus.
- **myGrades** is list, in Python, lists are mutable, that is a function can modify its value.
- **gradesList** is only known **'locally'** to the function Bonus.
- The function call will work on the actual contents of **myGrades** under the name **gradesList**

Functions with more than one return statement

```
def Bonus(grade):
    grade = grade + 10
    return grade
    grade = grade + 10
    return grade


def main():
    myGrade = 75
    print(myGrade)
    myGrade = Bonus (myGrade)
    print(myGrade)

main()
```

Output: 75
85

A function call terminates once a return statement is encountered.

What can go wrong?

- **If your parrot is dead, consider this:**
  - Did you use the exact same names (case, spelling)?
  - All the lines in the block must be indented, and *indented* the same amount.
  - Variables in the command area don't exist in your functions, and variables in your functions don't exist in the command area.
  - The computer can't read your mind.
    - It will only do exactly what you tell it to do.
    - In fact, programs always "work," but maybe not how you intended!

split() function

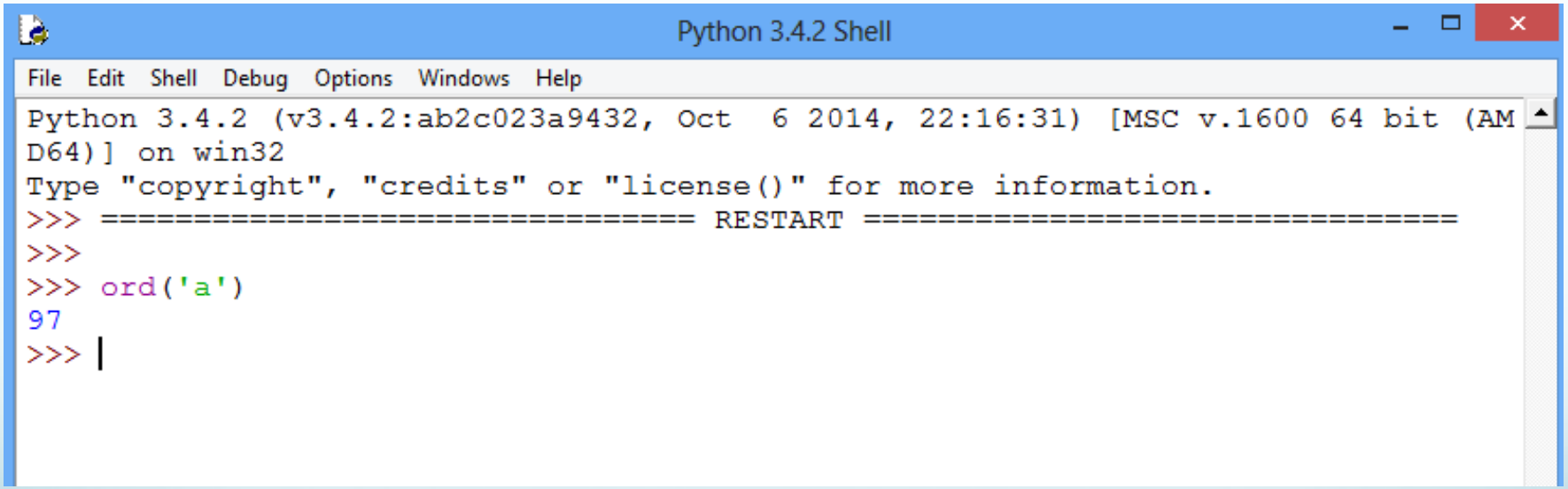
- str.split([*delimiter*]): Return a list of the words in the string, using *delimiter* as the dlimiter string, i.e. '1<>2<>3'.split('<>') returns ['1', '2', '3']
- If *delimiter* is not specified or is None, whitespace will be considered as delimiter, i.e. ' 1 2 3'.split() returns ['1', '2', '3']

What is ASCII ?

- **ASCII** (American Standard Code for Information Interchange) is the most common format for text files in computers and on the Internet. In an **ASCII** file, each alphabetic, numeric, or special character is represented with a 7-bit binary number (a string of seven 0s or 1s). 128 possible characters are defined.

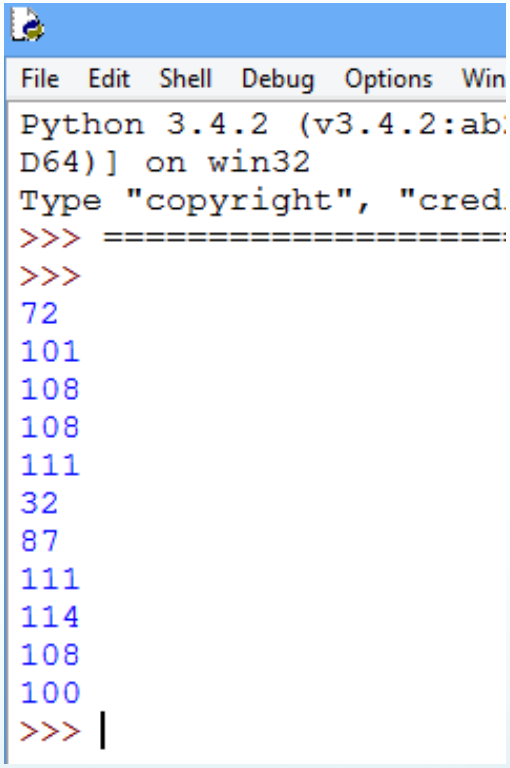
ord() function

- Some times it is require to convert a string to ASCII value and **ord('single-char')** inbuilt function will give python this capability.



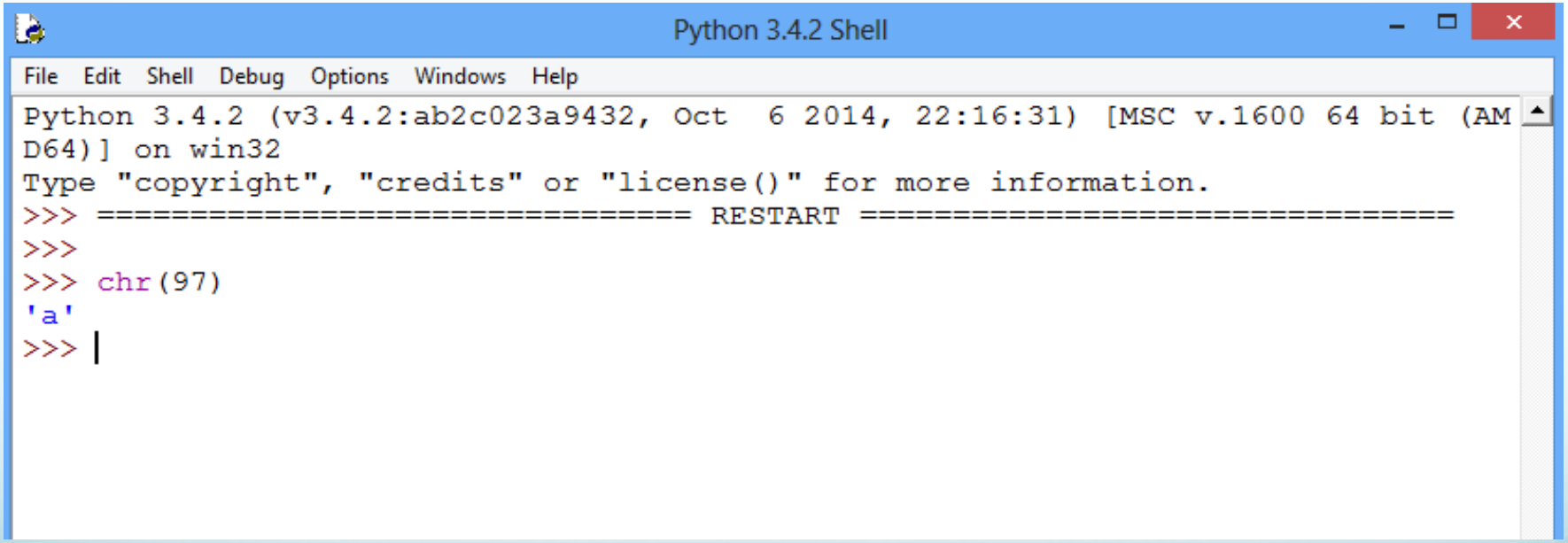
Example

```
string='Hello World'
for i in string:
    print(ord(i))
```



chr() function

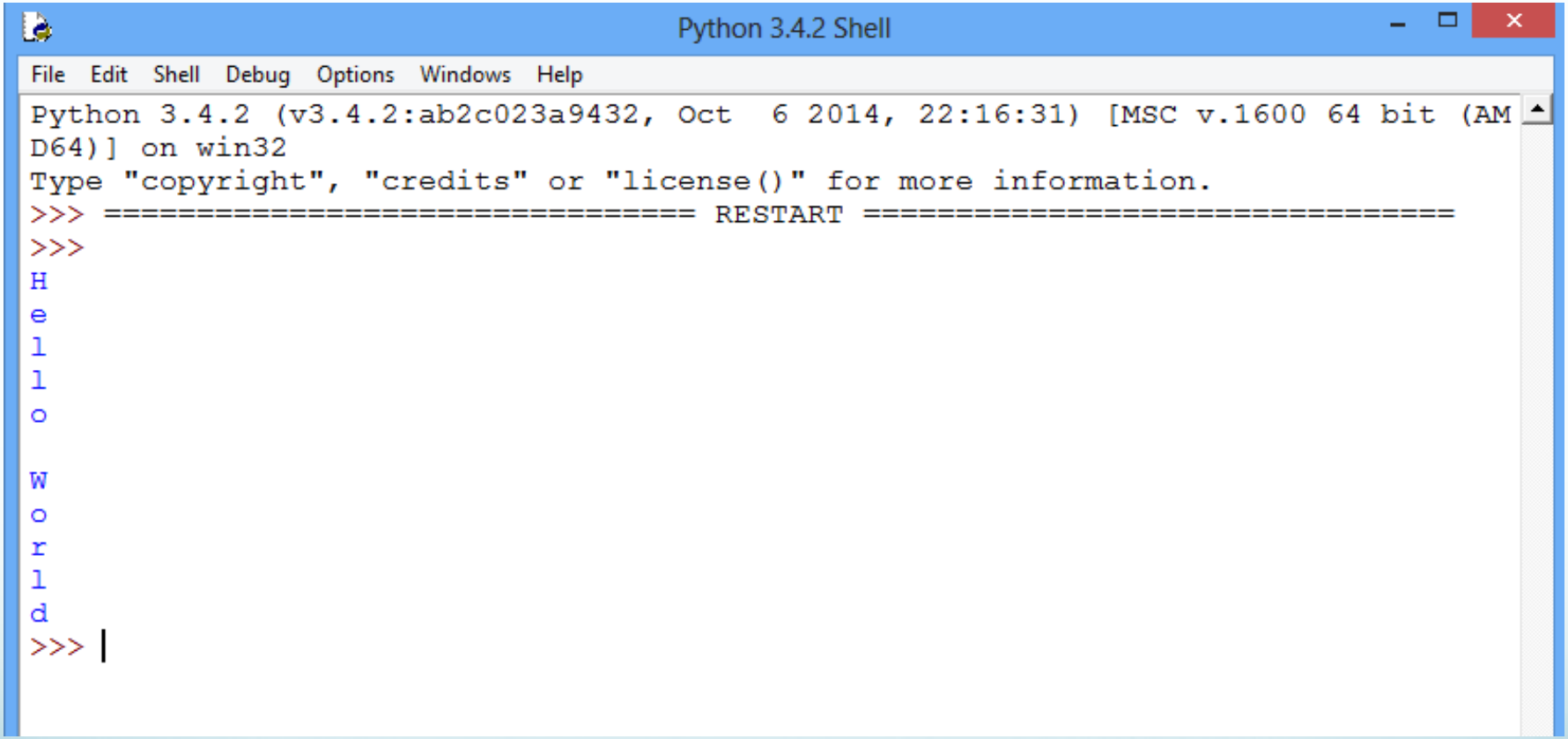
- Some times it requires to convert an ASCII value to its corresponding character and **chr(ASCII value)** in-built function will give python this capability.



Example

```
list_ascii=[72, 101, 108, 108, 111, 32, 87, 111, 114,
108, 100]

for i in list_ascii:

    print(chr(i))
```

Output of previous example



Other String functions

- s.capitalize() – Copy of s with only the first character capitalized
- s.title() – Copy of s; first character of each word capitalized
- s.center(width) – Center s in a field of given width
- s.count(sub) – Count the number of occurrences of sub in s
- s.find(sub) – Find the first position where sub occurs in s

Other String functions(con't)

- s.join(list) – Concatenate list of strings into one large string using s as separator
- s.ljust(width) – Like center, but s is left-justified
- s.lower() – Copy of s in all lowercase letters
- s.lstrip() – Copy of s with leading whitespace removed
- s.replace(oldsub, newsub) – Replace occurrences of oldsub in s with newsub

Other String functions(con't)

- s.rfind(sub) – Like find, but returns the right-most position
- s.rjust(width) – Like center, but s is right-justified
- s.rstrip() – Copy of s with trailing whitespace removed
- s.split() – Split s into a list of substrings
- s.upper() – Copy of s; all characters converted to uppercase

QUESTIONS???