15-112 Fundamentals of Programming

Lecture 5 – Language basics and Functions

جامعة كارنيجي ميلون في قطر
Carnegie Mellon Qatar

Announcements

- First assignment is due today
- Quiz on Thursday on everything we have covered by end of day today.
- Second assignment will be posted tonight
- CA meetings

جامعة كارنيجي ميلون في قطر
Carnegie Mellon Qatar

Today's life lesson

Show respect for everyone who works for a living, regardless of how trivial you think their job is.

جامعة كارنيجي ميلون في قطر
Carnegie Mellon Qatar

Continuing from last class

جامعة كارنيجي ميلون في قطر
Carnegie Mellon Qatar

Functions that act on input

- Some functions perform a tasks on values that you give them
  - printSquare – A function that takes a number and prints its square
  - How will you use this function?

```
printSquare(2)
printSquare(3)
```

  - How will you define this function?

```
def printSquare(x):
    print (x, "**2 =", (x*x))
```

جامعة كارنيجي ميلون في قطر
Carnegie Mellon Qatar

Function definition

def SomeName (Input parameters if any):
    Function Body
    Function Body
    Function Body

جامعة كارنيجي ميلون في قطر
Carnegie Mellon Qatar

Using Functions

- A function has to be defined before it can be used!
- A complete example – funtest.py

```
def printSquare(x):
    print (x, "**2 =", (x*x))

printSquare(2)
printSquare(3)
```


Functions - multiple parameters

- Functions can take several parameters

```
def printSum(x,y):
    print (x, "+", y, "=", x+y)

printSum(2,3)
printSum(3,4)
```

Functions with return values

- Functions can return values

```
def square(x):
    return x*x

print (square(3))
print (square(4))
a = square(3) + square(4)
print (a)
```


More Exercises

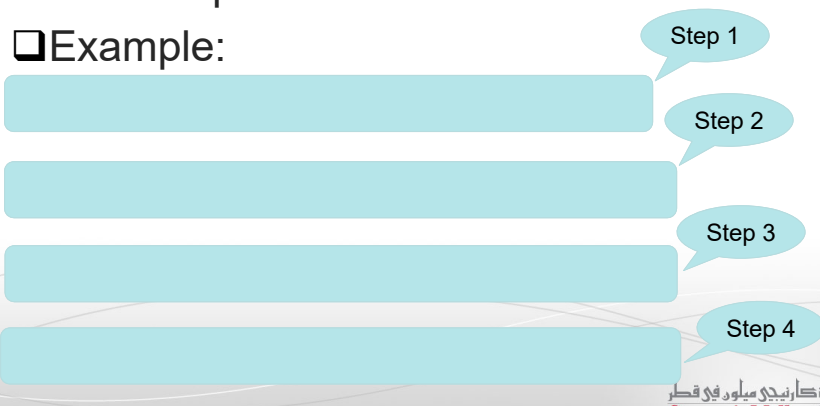
- **isEvenPositiveInt(x)**
- **isLegalTriangle(s1, s2, s3)**

An Example

- Write a program that reads the number of eggs bought by a customer and based on this input, determines how many cartons of eggs the customer would need. We can fit 12 eggs in one carton.
- **rectanglesOverlap(left1, top1, width1, height1, left2, top2, width2, height2)**

Sequential Execution

- All execution of instructions so far has been sequential
- Example:



Conditional Execution

- **Sometimes we want to selectively execute statement**
  - **If your name is same as mine, I should say something.**

```
name = input("Enter your name> ")
print ("Oh Wow! Your name is same as mine“)
```

  - **Is there anything wrong with this?**

Conditional Execution

- **We can fix this by using conditional execution**

```
name = input("Enter your name> ")
    print ("Oh Wow! Your name is same as mine“)
```

Colon

Indented

Conditional Execution

- **Conditional execution finishes when you stop indenting**

```
name = input("Enter your name> ")
if (name == "saquib"):
    print ("Oh Wow! Your name is same as mine“)
    print ("I really like our name“)
print ("Welcome to my program", name)
```

```
>>>
Enter your name> saquib
Oh Wow! Your name is same as mine
I really like our name
Welcome to my program saquib
>>>
```

```
>>>
Enter your name> Bob
Welcome to my program Bob
>>>
```

Conditional Execution

```
number = int( input("Enter a number "))
if number > 0:
    print ("The number is positive“)
print ("Thank you for your number“)
```

```
>>>
Enter a number 34
The number is positive
Thank you for your number
>>>
```

```
>>>
Enter a number -5
Thank you for your number
>>>
```

جامعة كارنيجي ميلون في قطر
Carnegie Mellon Qatar

More on forming conditions

- Conditional Operators
  - and
  - or
  - not

جامعة كارنيجي ميلون في قطر
Carnegie Mellon Qatar

Combining conditions

```
num1 = int(input())
num2 = int(input())
num3 = int(input())
if num1  > num2 and num1 > num3:
    print (num1)
if num2  > num1 and num2 > num3:
    print (num2)
if num3  > num1 and num3 > num2:
    print (num3)
```

جامعة كارنيجي ميلون في قطر
Carnegie Mellon Qatar

If else

- Sometimes we need to execute some alternate statement

```
import math
num = int(input("Enter a number "))
if num >= 0:
    print ("Factorial is",math.factorial(num))
else:
    print ("You have entered an invalid number“)
```

```
>>>
Enter a number 5
Factorial is 120
```

```
>>>
Enter a number 0
You have entered an invalid number
```

If-elif-else

- Sometimes we need to make mutually exclusive choices

```
score = int(input("Enter your score "))
if score >= 90:
    print ("You have an A")
if score >= 80:
    print ("You have an B")
if score >= 70:
    print ("You have an C")
if score >= 60:
    print ("You have an D")
if score < 60:
    print ("You have an R")
print ("Now you know your grade")
```

جامعة كارنيجي ميلون في قطر
Carnegie Mellon Qatar

If-elif-else

- Fixed grades

```
score = int(input("Enter your score "))
if score >= 90:
    print ("You have an A")
elif score >= 80:
    print ("You have an B")
elif score >= 70:
    print ("You have an C")
elif score >= 60:
    print ("You have an D")
else:
    print ("You have an R")
print ("Now you know your grade")
```


Testing

- Get Grade Function

```
def getGrade( score)
    if score >= 90:
        return “A”
    if score >= 80:
        return “B”
    if score >= 70:
        return “C”
    if score >= 60:
        return “D”
    return “R”
```

Testing

- Or

```
def getGrade( score)
    grade = “R”
    if score >= 90:
        grade =  “A”
    elif score >= 80:
        grade = “B”
    elif score >= 70:
        grade =“C”
    elif score >= 60:
        grade = “D”
    return grade
```


Testing the grade function

- How do you test this function to make sure it works properly?

```
assert(getGrade(85)== “B”)
assert(getGrade(80)== “B”)
assert(getGrade(95)== “A”)
assert(getGrade(90)== “A”)
assert(getGrade(75)== “C”)
assert(getGrade(79)== “C”)
assert(getGrade(70)== “C”)
```

Exercise

- Given two circles (center points and radius), return True if the circles intersect and False if they don't

One more

- **nearestBusStop(street)**
  Write the function nearestBusStop(street) that takes a non-negative int street number, and returns the nearest bus stop to the given street, where buses stop every 8th street, including street 0, and ties go to the lower street, so the nearest bus stop to 12th street is 8th street, and the nearest bus stop to 13 street is 16th street.