

## COMPSCI 101 Principles of Programming

L6 – Getting user input, converting between types, generating random numbers



At the end of this lecture, students should be able to:

- get user input from the keyboard
- generate a random number
- convert between types



From lecture 5

- use dot notation when using string methods with string instances
- wuse string methods: upper(), lower(), strip(), find(), rfind()
- wse the inbuilt functions: min(), max(), round()



phrase = "When in doubt, mumble."	
<pre>pos1 = phrase.find("in")</pre>	
<pre>pos2 = phrase.rfind("mumb")</pre>	
<pre>pos3 = phrase.rfind("ni")</pre>	
total = pos1 + pos2 + pos3	
<pre>print("1. Total:", total)</pre>	1. Total: 19
<pre>phrase_lower = phrase.lower() print("2.", phrase_lower[:3]) smallest = min(32.7, 56.4, 3, -1.1, 56.99, -1.2)</pre>	<ol> <li>10cal: 19</li> <li>whe</li> <li>3. 33</li> <li>4. 32.66</li> </ol>
largest = $max(32.7, 56.4, 3, -1.1, 56.99, -1.2)$	
<pre>numl = 32.657123 print("3.", round(num1)) print("4.", round(num1, 2))</pre>	



We have already seen how the print() function is used to print to the standard output. We would now like our programs to be able to get input from the user from the keyboard (the standard input).

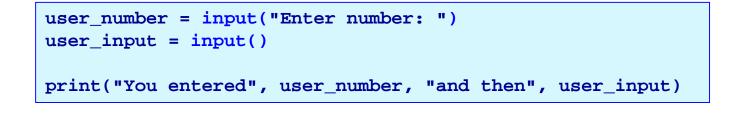
The **input()** function is used to get information from the user. This function displays the prompt, waits for the user to type their information and, as soon as the user presses the 'Enter' key, the input() function returns the information typed by the user (to the variable on the left of the assignment operator).

```
user_name = input("Enter name: ")
colour = input("Enter colour: ")
user_word = input("Enter word: ")
print(user_name, "entered", colour, "and the word", user_word)
Enter name: Adriana
Enter colour: magenta
Enter word: parola
Adriana entered magenta and the word parola
```



The **input()** function can be used with no argument (nothing inside the round brackets) in which case no prompt is displayed.

The input() function always **returns a string**. The end of line character is not returned as part of the returned string.



Enter number: 98 ??? #user enters stuff here You entered 98 and then ???

The user input is shown in a pink colour



Complete the output if the user enters the number 54 when prompted:

```
user_number = input("Enter number: ")
```

```
print(user_number * 2, user_number * 3, user_number * 4)
```

```
Enter number: 54
```



The following code causes an error:

```
1 age = input("Enter age: ")
2 years_to_go = 100 - age
3 print("Big birthday coming up in ", years_to_go, "years!")
```

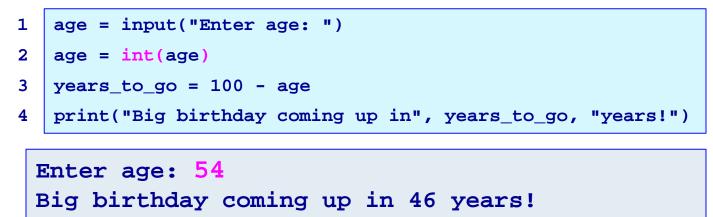
```
Enter age: 54
File "LectureCode.py", line 2, in <module>
    years_to_go = 100 - age
TypeError: unsupported operand type(s) for -: 'int' and 'str'
```

What does this error message mean?



The subtraction operator (-) has no meaning if one of the operands is a string. We want to find a way of converting a string containing just digits into a number.

The int() function converts a string containing characters which are digits into the corresponding integer value.



Note that the code on lines 1 and 2 can be combined into one line:

```
age = int(input("Enter age: "))
```



Other functions which can be used to convert between types:

float()

str()

```
1 cost = input("Enter cost $")
2 cost = float(cost)
3 final_price = cost * 0.92
4 print("Final price $", final_price, sep="")
Enter cost $509.59
Final price $468.8228
```

String concatenation requires that the two operands be strings:

```
1 price = 19.99
2 message = "The price of the item is: $" + str(price)
3 print(message)
The price of the item is $19.99
```



The conversion has to be legal. Below are two illegal attempts to convert values using int():

1 number = int("12 34")

```
File "LectureCode.py", line 1, in <module>
    number = int("12 34")
ValueError: invalid literal for int() with base 10: '12 34'
```

```
1 number = int("12.34")
```

```
File "LectureCode.py", line 1, in <module>
    number = int("12.34")
ValueError: invalid literal for int() with base 10: '12.34'
```

Note that converting a string which contains no decimal point into a float is fine:

```
number = float("12")
print(number)
12.0
```



Quite often, in our programs, we need to generate random numbers, e.g., for games and simulations.

The random module contains a function, **randrange()**, which can be used to generate a random number. In order to use this function we need to import the random module into our program (just as we did when we wanted to use the functions defined in the math module – math.sin(), math.cos(), ...).

Whenever we need to get a random number in a program, the first line of the program will be the following import statement:

import random



The, **randrange() function** requires two values defining the range of the random number to be generated:

• the first number is the lowest number which can be generated and the second number is one past the biggest number to be generated, e.g., random. randrange(5, 10) has an equal chance of generating 5, 6, 7, 8 or 9.

```
import random
dice1 = random.randrange(1, 7)
dice2 = random.randrange(1, 7)
print("You threw", dice1, "and a", dice2)
```

## You threw 4 and a 1



Complete the following program so that it prompts the user for their first name. The program removes a random letter from the first name and prints the resulting name.

```
import random
first_name = input("Enter name: ")
print(first_name)
```

Enter name: Adriana Adriaa Enter name: Jerry Jery





The randrange() function has an optional step argument:

random.randrange(start, end, step)

When the step argument is omitted the default step is 1. The step argument dictates which random numbers are generated within the range (the step is the amount between each random number generated). For example:

```
random.randrange(1, 7, 2) #generates either 1, 3 or 5
random.randrange(1, 7, 3) #generates either 1 or 4
random.randrange(78, 100, 7) #generates either 78, 85, 92, or 99
random.randrange(-30, 100, 30) #generates either -30, 0, 30, 60, or 90
```

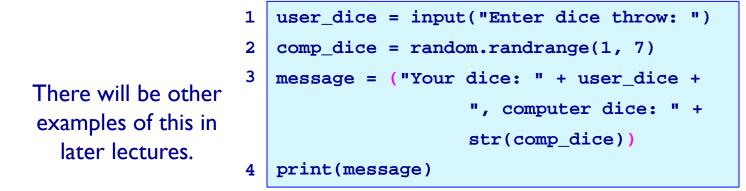


Give the smallest and the largest possible random number which can be generated by the following four statements:

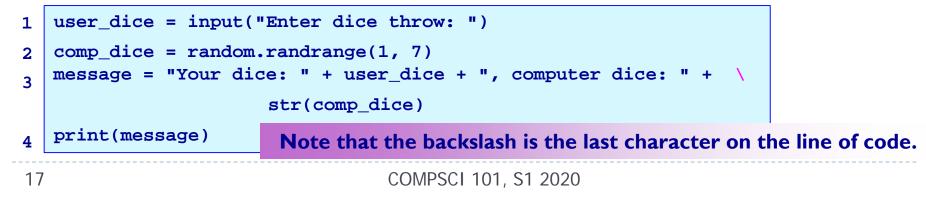
```
import random
print("1.", random.randrange(4, 17, 3))
print("2.", random.randrange(-1, 7, 2))
print("3.", random.randrange(100, 700, 2))
print("4.", random.randrange(50, 100, 10))
```



The preferred way of line continuation (breaking long lines of code over multiple lines) is to use parentheses, brackets and braces.



The backslash character at the end of a line of code in the program also can be used to indicate that the statement continues onto the next line, e.g.,





Complete the following program which prompts the user once for the total of 4 dice throws, the programs calculates the sum of four random dice throws, and outputs the four dice values and the difference between the user guess and the dice throwing simulation sum (see example outputs):

<pre>prompt = 'Enter sum (4 dice): ' dice_sum = 0 the_dice = "("</pre>	Enter sum (4 dice): 12 The dice: (3 4 3 2) Your total: 12 Dice total: 12 You are out by: 0
	Enter sum (4 dice): 15 The dice: (3 1 4 6) Your total: 15 Dice total: 14 You are out by: 1
print("The dice:",	Enter sum (4 dice): 12
<pre>print("Your total:",</pre>	The dice: (6 3 6 4)
<pre>print("You are out by:",</pre>	Your total: 12 Dice total: 19 You are out by: 7



In a Python program:

- the input() function is used to get user input from the keyboard
- a random number can be generated using random.randrange(...)
- we can convert between types using str(), int(), float()

## Examples of Python features used in this lecture

```
dice1 = random.randrange(1, 7)
age = random.randrange(66, 99)
even_number = random.randrange(50, 99, 2)
tens = random.randrange(50, 101, 10)
```

```
user_input = input("Enter age: ")
age = int(user input)
```

```
cost = input("Enter cost $")
cost = float(cost)
```

```
price = 32.45
message = "Final price $" + str(price)
```