Simple I/O with Python

0.1 Simple Input/Output

Input and output statements are used to read (input) data values from the input device (e.g., the keyboard) and write (output) data values to an output device (mainly to the computer screen). The flowchart symbol is shown in Figure 1.

![Flowchart data input/output symbol.](image)

**Figure 1**: Flowchart data input/output symbol.

0.1.1 Output

In Python, the output statement is used for the output of a list of variables and literals; it is written with the keyword `print`. The output statement writes the value of one or more variables to the output device. The variables do not change their values. The general form of the output statement is:

```
print ⟨ data_list ⟩
```

In the following line of Python code, the `print` statement is used to output four data items that include the value of variables `x` and `y`:

```
print "value of x= ", x, "value of y = ", y
```

0.1.2 Input

The `input` function in Python reads a value of a variable from the input device (e.g., the keyboard). This input implies an assignment statement for the variable because the variable changes its value to the new value that is read from the input device.
A text string is typically included to prompt the user for input of a data value. For example in interactive mode, the following lines of code read the value of variable \( q \):

```python
>>> q = input("Enter the value of q: ")
Enter the value of q: 45.32
>>> q
45.32
```

To read several values and assign them to corresponding variables, the general form of the input of uses the \texttt{raw_input} and \texttt{split} functions (Python 2.7). Function \texttt{split} is used to separate the values inputted.

\[
\langle \text{var\_list} \rangle = \text{raw\_input()}.\text{split()}
\]

The following example in interactive mode reads two values separated by a space, assigns these to variables \( x \) and \( y \), then converts each to the appropriate type.

```python
>>> x, y = raw_input().split()
12 36.8
>>> x = int(x)
>>> x
12
>>> y = float(y)
>>> y
36.8
```

\section{Computing Area and Circumference}

For this example, a computational model is developed that computes the area and circumference of a circle. The input value of the radius is read from the keyboard and the results written to the screen.

\subsection{Specification}

The specification of the problem can be described as a high-level algorithm in informal pseudo-code notation:

\begin{enumerate}
\item Read the value of the radius of a circle, from the input device.
\item Compute the area of the circle.
\end{enumerate}
3. Compute the circumference of the circle.

4. Output or display the value of the area of the circle to the output device.

5. Output or display the value of the circumference of the circle to the output device.

1.2 Algorithm with the Mathematical Model

A detailed description of the algorithm and the corresponding mathematical model follows:

1. Read the value of the radius $r$ of a circle, from the input device.

2. Establish the constant $\pi$ with value 3.14159.

3. Compute the area of the circle, $area = \pi r^2$.

4. Compute the circumference of the circle $cir = 2 \pi r$.

5. Print or display the value of $area$ of the circle to the output device.

6. Print or display the value of $cir$ of the circle to the output device.

The following lines of pseudo-code completely define the algorithm.

\[
\begin{align*}
\text{read } & r \\
\pi & = 3.1416 \\
area & = \pi r^2 \\
cir & = 2 \pi r \\
display & \text{"Area = ", area, ", Circumference = ", cir}
\end{align*}
\]

Listing 1 shows the Python program that implements the computational model; this program stored in file areacir.py.

Listing ???.1: Python program for computing the area and circumference.

```python
1 # Program : areacir.py
2 # Description : Read value of the radius of a circle, 
3 # compute the area and circumference, display value of 
4 # of these on the output console. 
5 # Author : Jose M Garrido, May 27 2014.
6
7 from math import *
8
9 print "Compute area and circumference of a circle"
```

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10 r = input("Enter value of radius: ")
11 print "Value of radius: ", r
12 area = pi * r ** 2
13 cir = 2.0 * pi * r
14 print "Value of area: ", area
15 print "Value of circumference: ", cir

The following listing shows the shell Linux commands that start the Python interpreter with the file areacir.py.

$ python areacir.py
Compute area and circumference of a circle
Enter value of radius: 3.15
Value of radius: 3.15
Value of area: 31.1724531052
Value of circumference: 19.7920337176

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