Data Types and Conversions, Input from the Keyboard

CS303E: Elements of Computers and Programming

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As of Friday, 6/8, 4p.

What is a Data Type?

- The type of value stored by a variable
- Two general categories:
  - String: represents text
    - For now, only use for input/output
    - More later this semester
  - Numerical
    - Breaks down into many other types
    - Types have different internal representations

Numerical Data Types

- `int`: whole numbers
  - Stored in 4 bytes (32 bits)
  - Can represent whole numbers -2^31 though 2^31-1
  - Computations are exact
- `float`: decimal point numbers
  - Large range, but fixed precision
  - Not exact (remember, all data is 0s and 1s!)
    - Example: .1+.2 = .30000000000000004
- `long`: whole numbers larger or smaller than `int`
  - Specify by adding "L" to the end

Data Types: Differences

- Integers should be your default
  - Integer arithmetic is faster and more precise
- Most arithmetic operators behave as you would expect for all data types
  - Except integer division (gozinta)---result is an integer
    - Example: `result = 5/2`
    - longs are integers, so they behave this way too
  - float division behaves as you expect:
    - Example: `result = 5.0/2.0`

Data Types: Automatic Conversion

- `int` to `float`:
  - `int op float = float`
  - Examples:

    5.0/2

    16-(3/2)

    16-(3.0/2)

    But what about: 3.5 + 6/4?
- `int` to `long`:
  - Large integers are converted to `long`

    Example: 5^31

Data Types: Examples of Automatic Conversion

6.0+2

7-.25

3/2

3.0/2

5**31

5.0**31

5L+3

5.0/2+3

3.0 + 5/2

4/5 – 2

4.0/5 – 2

4/5 – 2.0

Data Types: Explicit Conversion

- Python provides functions to do this:

```
float(<put number here>)
int(<put number here>) #truncates!
long(<put number here>)
```

- If you would rather round to the nearest whole number use `round()`
  - Also takes the number as the argument

Data Types: Examples of Explicit Conversion

What is the output?

```
float(3)
int(3.9)
int(101.566)
long(3.9)
```

IDLE: Average of three test scores.

iClicker Question: Data Types

What is the output of the following code?

```
result = 5.0 + 11/2
print result
```

A. 10.5
B. 10.0
C. 8
D. 8.0

Keyboard Input

- Read data from the user during program execution
- Two ways:
  - input(): reads numbers
  - raw_input(): reads strings
- How they work:
  - wait for the user to enter a value
  - read what has been typed when the user hits the *Enter* or *Return* key

Keyboard Input: input()

```
input(<put prompt string here>)
```

- Prompts the user to enter a number
- Assigns entered number to a variable

Example:

```
score1 = input("Please enter the first
  exam score: ")
```

IDLE: Modify average program to prompt the user

Keboard Input: raw_input()

`raw_input(<put prompt here>)`

- Prompts the user to enter a string
- Assigns entered string to a variable

Example:

```
name = raw_input("What's your full name?")
print name
```

What happens if you give a number to `raw_input()`?

What happens if you give a string to `input()`?

iClicker Question: Keyboard Input

Which data type does `input()` expect?

A. `string`
B. `int`
C. `float`
D. `int`, `float`, or `long`