Lecture 3, August 31

Arrays and Other Types

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Announcements

- Office hours are in Weekly Schedule in the top menu bar of data8.org
- Homework 1 is due on Thursday at 5 pm; you get a bonus point for turning it in today by 5 pm.
- Submission instructions are in the post “HW 1 Posted” on Piazza and have also been sent by email.
Call Expressions

name of function \( \text{abs} \) \((-42)\) argument

returns the value 42
Multiple arguments

- Separated by commas:
  - \texttt{max(3, 8, 1)} returns 8

- Some arguments are optional:
  - \texttt{round(5.7682, 3)} returns 5.768, rounding to 3 decimal places
  - \texttt{round(5.7682)} returns 6, rounding to the nearest integer, that is, to 0 decimal places
  - \texttt{round} converts to the nearest integer by default when the optional argument isn’t specified
Modules

- Organized collections of functions or methods

- `math` module contains useful functions for math

- You have to import the module first:
  - `import math`

- Then call a function in it:
  - `math.sqrt(9)` returns 3.0

(Demo)
**Different types of data**

- **float:** decimal number
- **string:** text
- **int:** integer

<table>
<thead>
<tr>
<th>Longitude</th>
<th>Latitude</th>
<th>City</th>
<th>Direction</th>
<th>Survivors</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>54.8</td>
<td>Smolensk</td>
<td>Advance</td>
<td>145000</td>
</tr>
<tr>
<td>33.2</td>
<td>54.9</td>
<td>Dorogobouge</td>
<td>Advance</td>
<td>140000</td>
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<tr>
<td>34.4</td>
<td>55.5</td>
<td>Chjat</td>
<td>Advance</td>
<td>127100</td>
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<tr>
<td>37.6</td>
<td>55.8</td>
<td>Moscou</td>
<td>Advance</td>
<td>100000</td>
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<td>34.3</td>
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<td>Retreat</td>
<td>12000</td>
</tr>
</tbody>
</table>
Ints and Floats

Python has two real number types

- **int**: an integer of any size
- **float**: a fractional number with limited size

An `int` never has a decimal point
A `float` might be printed using scientific notation
Text and Strings

- A string value is a snippet of text of any length
  - 'a'
  - 'Word97a23  *^nonsense'
  - "Who’s on first?"

- The + and * operators work on strings, but not in the way they do with numbers

(Demo)
Arrays

An array is a sequence that can be manipulated easily

- All elements of an array should have the same type
- Arithmetic is applied to each element individually
- Elementwise operations can be done on arrays of the same size

(Demo)
Ranges

A range is an array of consecutive numbers

- `np.arange(end)`: An array of increasing integers from 0 up to `end`
- `np.arange(start, end)`: An array of increasing integers from `start` up to `end`
- `np.arange(start, end, step)`: A range with `step` between consecutive values

The range always includes `start` but excludes `end`

(Demo)