

CIS 122

Types, Types and More Types

Integers

- Whole numbers (positive or negative)
 - 1
 - -7
 - 42
 - -525600
- What about these?
 - +1
 - --7
 - +-+--+42

Integers

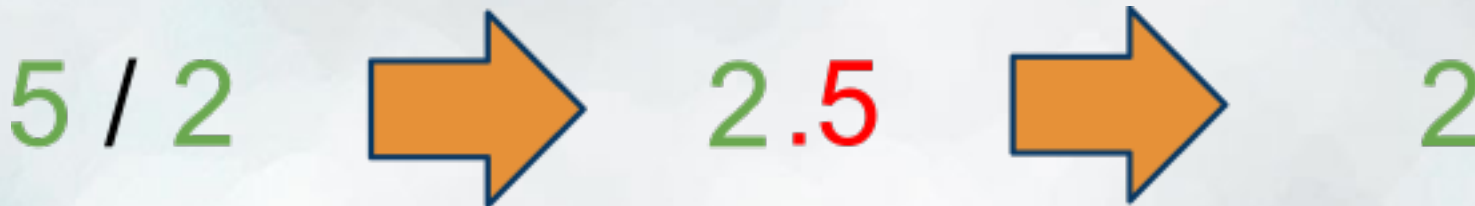
- What can you do with them?
 - add $(2 + 3)$
 - subtract $(5 - 12)$
 - multiply $(4 * 5)$
 - divide $(5 / 3)$
 - exponentiate $(2 ** 4)$
- Spacing is optional
 - $2+3$
 - $2 \quad + \quad 3$
- Avoid leading spaces, though...

Integers

- Integer operations always yield integer results
 - Easy for addition, subtraction, multiplication
 - What about division?

Integers

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- Just chop off the non-integer part!
 - (rounding down)

Integers

- Standard order of operations
 - **P**arentheses
 - **E**xponents
 - **M**ultiplication / **D**ivision
 - **A**ddition / **S**ubtraction
- PEMDAS (Please Excuse My Dear Aunt Sally)
 - A little misleading...
 - Multiplication and Division have the same priority
 - Addition and Subtraction have the same priority
- In ties, evaluate from left to right

Integers - Pop Quiz

- $5 / 2$
- $99 / 100$
- $1 + 2 * 3$
- $(1 + 2) * 3$
- $6 - 3 + 3$
- $8 * 3 / 4$
- $8 * (3 / 4)$

Integers - Pop Quiz

● $5 / 2$ 2

● $99 / 100$ 0

● $1 + 2 * 3$ 7

● $(1 + 2) * 3$ 9

● $6 - 3 + 3$ 6

● $8 * 3 / 4$ 6

● $8 * (3 / 4)$ 0

Floats

- Short for "Floating Point Numbers"
 - Name comes from representation
- Allow us to represent fractional numbers
- Any number with a '.'
 - 1.2
 - 0.0
 - .12345
 - 42.

Floats

- Floats can do just about anything an integer can do
 - $1.1 + 2.3$
 - $0.5 * 10.0$
- What about this one?
 - $0.1 + 0.2$
- Floats are imprecise
 - Don't worry about the details
 - But don't be alarmed if your calculations are a little off

Floats

- What happens when you mix floats and integers?
 - $1 + 2.3$
 - $3.0 * 4$

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- Python converts the result to a float
 - No information lost

Floats

- What happens when you mix floats and integers?
 - $1 + 2.3$
 - $3.0 * 4$
- Python converts the result to a float
 - No information lost
- Great for precisely dividing integers

$$5.0 / 2 \quad \rightarrow \quad 2.5$$

Strings

- What if we want to read and write messages?
- We could just encode everything numerically...
 - Actually, that's what happens under the surface
 - But it would be a pain for us to read
- Use strings

Strings

- Text surrounded by quotes
- Single quotes
 - 'This is a string'
- Double quotes
 - "So is this"
- Triple quotes (three sets of single/double quotes)
 - """This string can span multiple lines"""

Strings

- Strings can even contain quotes (sometimes...)
 - "This 'string' is a valid string"
 - 'This "string" is also valid'
 - "Oops, this "string" cuts off early"
- Everything inside quotes is part of the string
 - "\$ 1-a" (this string contains five characters)
 - " " (this string contains one character)
 - "" (this string contains no characters)

Strings

- What can we do with strings?
- You can add them
 - Adding strings is different than adding ints
 - "Hello" + "World" → "HelloWorld"
- There's a big difference between these expressions
 - 1 + 1
 - '1' + '1'

Strings

- What can we do with strings?
- You can multiply them
 - But not by each other...
- What happens when you multiply a string by an integer?
 - 'Hip Hip Hooray! ' * 3
 - 'What about me?' * 0
 - 'Huh?' * -5
- What if you multiply a string by a float?

Types

- We've seen a few today
 - Integers
 - Floats
 - Strings
- But there are more
 - Booleans
 - Lists
- And you can even make your own
 - Classes
 - We'll get to that much later...