Design

Announcements

Abstraction

Functional Abstractions

- Square takes one argument.
- Square has the intrinsic name square.
- Square computes the square of a number.
- Square computes the square by calling mul.

```python
def square(x):
    return pow(x, 2)
```

```python
def square(x):
    return mul(x, x-1) + x
```

If the name "square" were bound to a built-in function, `sum_squares` would still work identically.

Yes
No
Yes
No

What does `sum_squares` need to know about `square`?

```python
def square(x):
    return mul(x, x)
```

```python
def sum_squares(x, y):
    return square(x) + square(y)
```

Choosing Names

- Names typically don’t matter for correctness
- But they matter a lot for composition

From: true_false d helper my_int i o
To: rolled_a_one dice take_turn num_rolls

Names should convey the meaning or purpose of the values to which they are bound.

The type of value bound to the name is best documented in a function’s docstring.

Function names typically convey their effect (print), their behavior (triple), or the value returned (db).

Which Values Deserve a Name

- Repeated compound expressions:
  - if sqrt(square(a) + square(b)) > 1:
  - x = x + sqrt(square(a) + square(b))

- Hypotenuse = sqrt(square(a) + square(b))
  - if hypotenuse > 1:
  - x = x + hypotenuse

- Discriminant = square(b) - 4 * a * c
  - x1 = (-b + sqrt(discriminant)) / (2 * a)

More Naming Tips

- Names can be long if they help document your code:
  - average_age = average(age, students)
    is preferable to
  - # Compute average age of students
  - aa = avg(a, st)

- Names can be short if they represent generic quantities: counts, arbitrary functions, arguments to mathematical operations, etc.
  - n, k, i - Usually integers
  - x, y, z - Usually real numbers
  - f, g, h - Usually functions

Practical Guidelines

Function Example: Sounds

WAV Files

The Waveform Audio File Format encodes a sampled sound wave

A triangle wave is the simple wave form with the most pleasing sound