# Sequences

# Announcements

# Lists

`['Demo']`

# Working with Lists

```
>>> digits = [1, 8, 2, 8]
```

The number of elements

```
>>> len(digits)
4
```

An element selected by its index

```
>>> digits[3]
8
```

Concatenation and repetition

```
>>> [2, 7] + digits * 2
[2, 7, 1, 8, 2, 8, 1, 8, 2, 8]
```

Nested lists

```
>>> pairs = [[10, 20], [30, 40]]
>>> pairs[1]
[30, 40]
>>> pairs[1][0]
30
```

```
>>> digits = [2//2, 2+2+2+2, 2, 2*2*2]
```

```
>>> getitem(digits, 3)
8
```

```
>>> add([2, 7], mul(digits, 2))
[2, 7, 1, 8, 2, 8, 1, 8, 2, 8]
```

# Containers

## Containers

Built-in operators for testing whether an element appears in a compound value

```
>>> digits = [1, 8, 2, 8]
>>> 1 in digits
True
>>> 8 in digits
True
>>> 5 not in digits
True
>>> not(5 in digits)
True
```

(Demo)

# For Statements

(Demo)

# Sequence Iteration

```
def count(s, value):
    total = 0
    for element in s:



    if element == value:
        total = total + 1
    return total
```

Name bound in the first frame
of the current environment
(not a new frame)

# For Statement Execution Procedure

```
for <name> in <expression>:
    <suite>
```

1. Evaluate the header `<expression>`, which must yield an iterable value (a sequence)

2. For each element in that sequence, in order:

   A. Bind `<name>` to that element in the current frame

   B. Execute the `<suite>`

# Sequence Unpacking in For Statements

> A sequence of
> fixed-length sequences

```
>>> pairs = [[1, 2], [2, 2], [3, 2], [4, 4]]

>>> same_count = 0
```

> A name for each element in a
> fixed-length sequence

Each name is bound to a value, as in
multiple assignment

```
>>> for x, y in pairs:
...     if x == y:
...         same_count = same_count + 1

>>> same_count
2
```
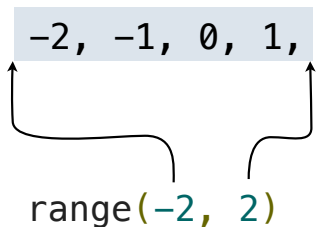
# Ranges

## The Range Type

A range is a sequence of consecutive integers.*

$$..., \ -5, \ -4, \ -3, \ -2, \ -1, \ 0, \ 1, \ 2, \ 3, \ 4, \ 5, \ ...$$

range(-2, 2)

**Length:** ending value − starting value

(Demo)

**Element selection:** starting value + index

```
>>> list(range(-2, 2))
[-2, -1, 0, 1]
```
List constructor

```
>>> list(range(4))
[0, 1, 2, 3]
```
Range with a 0 starting value

* Ranges can actually represent more general integer sequences.

# List Comprehensions

```
>>> letters = ['a', 'b', 'c', 'd', 'e', 'f', 'm', 'n', 'o', 'p']
>>> [letters[i] for i in [3, 4, 6, 8]]
            ['d', 'e', 'm', 'o']
```

# List Comprehensions

[`<map exp> for <name> in <iter exp>` `if <filter exp>`]

Short version: [`<map exp> for <name> in <iter exp>`]

A combined expression that evaluates to a list using this evaluation procedure:

1. Add a new frame with the current frame as its parent

2. Create an empty *result list* that is the value of the expression

3. For each element in the iterable value of `<iter exp>`:

  A. Bind `<name>` to that element in the new frame from step 1

  B. If `<filter exp>` evaluates to a true value, then add the value of `<map exp>` to the result list

# Example: Promoted

# First in Line

Implement **promoted**, which takes a sequence **s** and a one-argument function **f**. It returns a list with the same elements as **s**, but with all elements **e** for which **f(e)** is a true value ordered first. Among those placed first and those placed after, the order stays the same.

```
def promoted(s, f):
    """Return a list with the same elements as s, but with all
    elements e for which f(e) is a true value placed first.

    >>> promoted(range(10), odd)  # odds in front
    [1, 3, 5, 7, 9, 0, 2, 4, 6, 8]
    """
    return [e for e in s if f(e)] + [e for e in s if not f(e)]
```