Sequences

Announcements

Lists

```
['Demo']
```

List Indexing

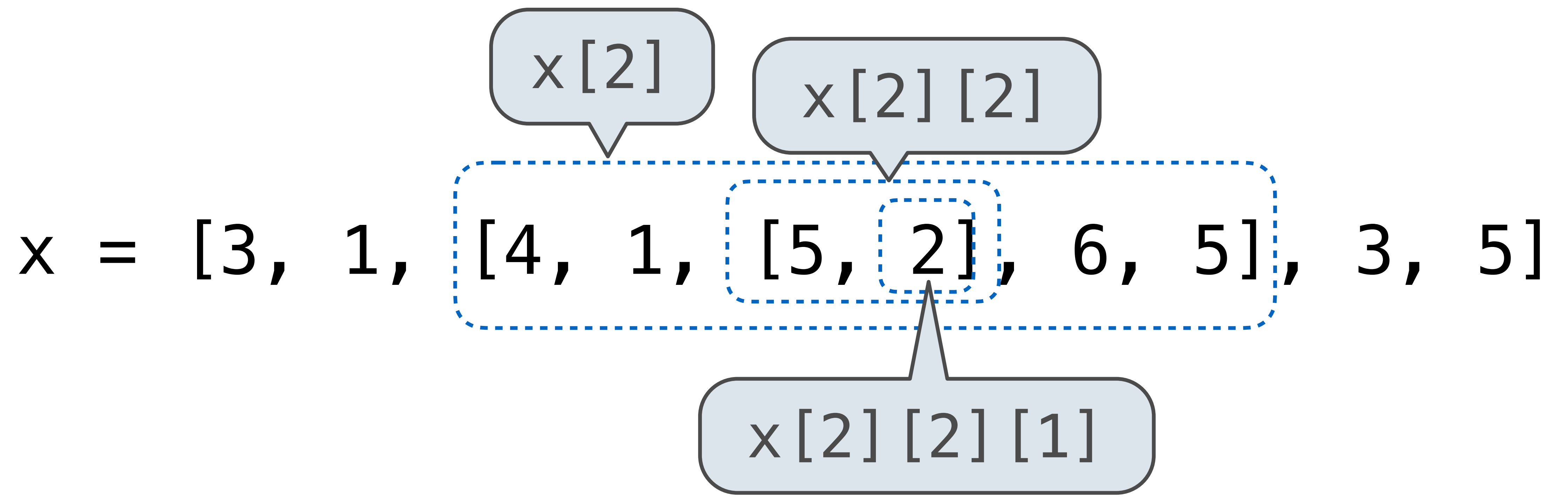
```
            digits = [8, 0, 8, 1]

             Index    0   1   2   3

Index (negative)   -4  -3  -2  -1
```

```
>>> digits[2]
8

>>> digits[-1]
1
```



```
x = [3, 1, [4, 1, [5, 2], 6, 5], 3, 5]
```

Write an expression to get the 2: x[2][2][1]

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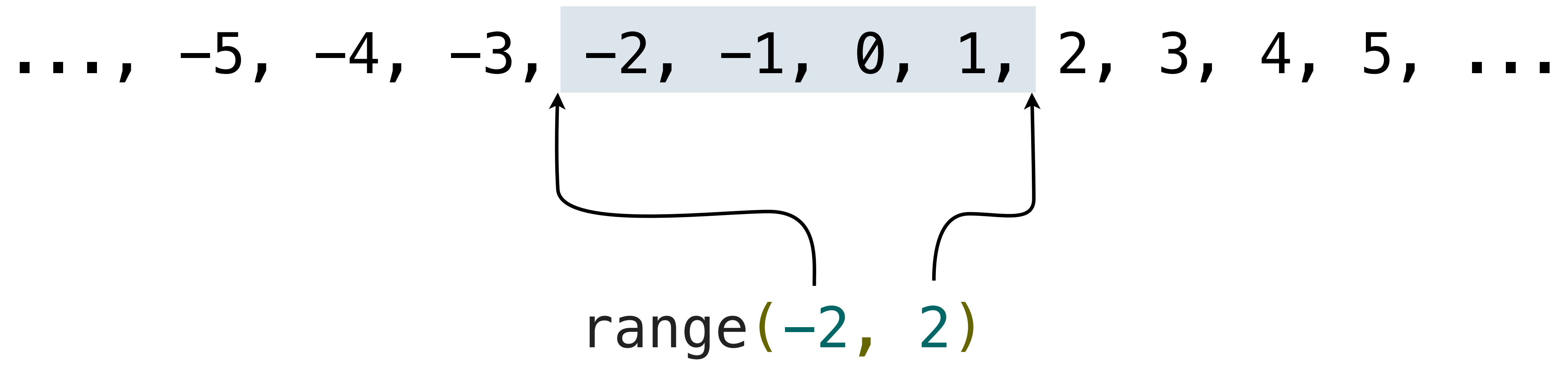
For Loops

(Demo)

Ranges

The Range Type

A range is a sequence of consecutive integers.*



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

(Demo)

List Comprehensions

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

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

Example: Evens

```
def evens(n: int) -> list[int]:
    """Return a list of the first n even numbers.

    >>> evens(0)
    []
    >>> evens(3)
    [0, 2, 4]
    """
    return [2 * x for x in range(n)]
```

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Example: Two Lists

Given these two related lists of the same length:

```
xs = list(range(-10, 11))
ys = [x*x - 2*x + 1 for x in xs]
```

Write a list comprehension that evaluates to:

A list of all the x values (from xs) for which the corresponding y (from ys) is below 10.

```
>>> list(xs)
[-10,  -9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4,  5,  6,  7,  8,  9, 10]
>>> ys
[121, 100, 81, 64, 49, 36, 25, 16,  9,  4, 1, 0, 1, 4, 9, 16, 25, 36, 49, 64, 81]
>>> xs_where_y_is_below_10
[-2, -1, 0, 1, 2, 3, 4]
```

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)]
```

Lists, Slices, & Recursion

A List is a First Element and the Rest of the List

For any list **s,** the expression **s[1:]** is called a *slice* from index 1 to the end (or 1 onward)

- The value of s[1:] is a list whose length is one less than the length of s
- It contains all of the elements of s except s[0]
- Slicing s doesn't affect s

```
>>> s = [2, 3, 6, 4]
>>> s[1:]
[3, 6, 4]
>>> s
[2, 3, 6, 4]
```

In a list **s,** the first element is **s[0]** and the rest of the elements are **s[1:].**

Recursion Example: Reverse

```
def reverse(s):
    """Return s in reverse order.

    >>> reverse([4, 6, 2])
    [2, 6, 4]
    """
    if not s:
        return []
    return reverse(s[1:]) + [s[0]]
```

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