List and Strings

MARCH 7TH

Problem

- A positive integer *n* is *perfect* if the sum of its factors (excluding itself) is equal to *n*.

  Example: 6 is perfect because 1 + 2 + 3 = 6.

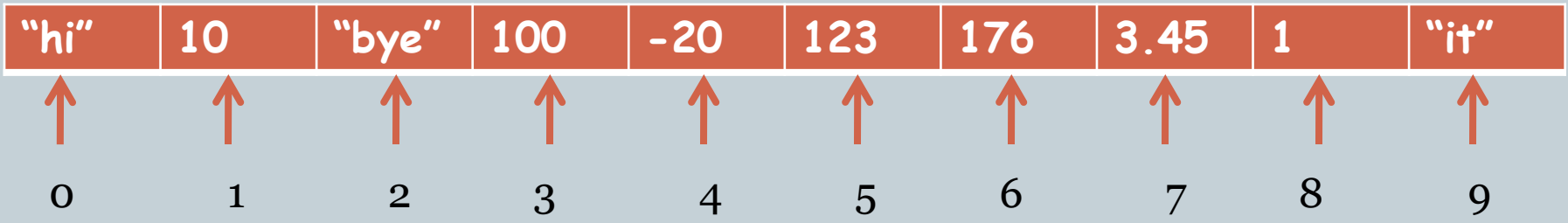
- Write a program that finds all perfect numbers between 1 and 10,000.

Operations that work on strings and lists

1. x in s, x not in s
2. s + t, s*n, n*s
3. s[i], s[i:j], s[i:j:k]
4. len(s), min(s), max(s)
5. s.index(i), s.count(i)

Accessing parts of lists and strings

L = ["hi", 10, "bye", 100, -20, 123, 176, 3.45, 1, "it"]



- L[2:5] is ["bye", 100, -20]
- L[:2] is ["hi", 10]
- L[4:4] is []
- L[4] = -20
- L[:len(L):2] = ["hi", "bye", -20, 176, 1]
- L[2:5][1] = 100
- L[1:5][:2] = [10, "bye"]

The len, min, and max functions

- len(s) is the length of s (which may be a string or a list)
- min(s) (max(s)) is the smallest (largest) element in s
  - If s is a list of numbers (integers and floats) these functions return the smallest (largest) number
  - If s is a list of strings, these functions return the *lexicographically* smallest (largest) string
  - If s is a string, these functions return the lexicographically smallest (largest) character in the string
  - If s is a list that contains a mixture of numeric and non-numeric objects, then the result is not specified by the language and you should not rely on such a result.

The “search” functions

- s.index(i) returns the index of the first occurrence of i in s
- s.count(i) returns the number of occurrences of i in s

```
>>> L = [1, 3, 6] * 4
>>> L
[1, 3, 6, 1, 3, 6, 1, 3, 6, 1, 3, 6]
>>> L.index(3)
1
>>> L.count(3)
4
>>> L.index(0)
Traceback (most recent call last):
  File "<string>", line 1, in <fragment>
ValueError: 0 is not in list
>>> L.count(0)
0
```

Useful string operations

1. str.find(s)
2. str.isalnum(), str.isalpha(), str.isdigit(), str.islower(), str.isupper(), etc.
3. str.upper(), str.lower()
4. str.split()
5. str.replace(old, new)

The find function

```
>>> s = "hello, how are you?"
>>> s.find("how")
7
>>> s.find("e")
1
>>> s.find("how", 2, 9)
-1
>>> s.find("how", 2, 10)
7
```

The split function

- s.split() returns a list obtained by splitting s into substrings obtained by deleting whitespaces.

Example:

```
>>> s
'hello, how are you?'
>>> s.split()
['hello,', 'how', 'are', 'you?']
```

The replace function

- s.replace(old, new) returns a string obtained by replacing all occurrences of the old string by the new string

Example:

```
>>> s
'hello, how are you?'
>>> s.replace(",", " ")
'hello  how are you?'
>>> s.replace("how", "who")
'hello, who are you?'
```

Problem

Write a program that builds a dictionary of words by processing a given text.

- Definition of a word: Any contiguous sequence of characters that
  - starts at the beginning of a line or is immediately preceded by a whitespace or punctuation mark and
  - ends at the end of a line or is immediately followed by a whitespace or punctuation mark.