

More functions etc. examples

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More examples

conversion to/from Roman numerals

- Based on [CSE 231 project “Shannon’s Throback”](#)
- The rules:
 - (I,V,X,L,C,D,M) \leftrightarrow (1,5,10,50,100,500,1000)
 - *subtraction rule*: I, X, or C preceding the next two elements correspond to subtraction (e.g. IV=4, XC=90)
- [string methods](#) are useful, especially `in`, `s.count()`, `s.replace()` are useful
- so is *integer division* and *modulo* operations, `//` and `%`
- we should write tests first, e.g.

```
rom = ["I", "II", "III", "IV", "V", "VI", "VII", "VIII", "IX",  
       "X", "XI", "XIV", "XV", "LX", "XC", "XCXLI", "CCC"]  
int = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 60, 90, 131, 300]  
for i in range(len(rom)):  
    print(rom_to_int(rom[i])==int[i])
```

- we can try to write this as a gigantic `if` statement, or we can try to make the rules more compact
- which direction is easier?

compute sine/cosine

- [CSE project](#)
- power series approximation:

$$\begin{aligned}\sin(x) &= x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots \\ &= \sum_{k=0} (-1)^k \frac{x^{2k+1}}{(2k+1)!}\end{aligned}$$

$$\begin{aligned}\cos(x) &= 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots \\ &= \sum_{k=0} (-1)^k \frac{x^{2k}}{(2k)!}\end{aligned}$$

- stop when the absolute value of the next term is $< 10^{-8}$ (1e-8 in computer notation)
- divide x by π , take the remainder (modulo: %)
- write tests first (what are some easy cases, using `math.pi`?)
- use `math.factorial`? use the factorial function we already wrote? augment terms as we go along?
- after we write the two functions, can we combine them?
- extra credit/puzzle: what do we get if we interpolate between these two functions?

letter-scrambling

- [CSE project](#)
- scramble words within a text
- start with some simpler cases
 - reverse every word in a line
 - again, [string methods](#) – especially `str.split()`
 - now read from a file
- test cases? easier with just a few lines
- harder: preserve punctuation at the end of the word
- harder: shuffle
- `from numpy.random import shuffle`
- split words and join them: `list(), ''.join()`
- [test case](#)

```
f = open("../misc/darwin.txt")
for line in f:
    print(line)
```

```
## It is interesting to contemplate a tangled bank, clothed with many plants of many kinds, with birds :
```