COL1000: Introduction to Programming

Nuts & Bolts of Python — Nested Loops

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Not practicing enough!

Loop Exercises

1. Take two lists, l1 and l2, and check for **each** element of l1 whether it is present in l2

2. Take two lists, l1 and l2, and check for **any** element of l1 whether it is present in l2

3. Take list, say l1, and check if there are duplicates in l1

4. Take list, say l1, and find the number of unique elements in l1

Pascal's Triangle

- An array of Binomial Coefficients in the expansion of $(x + y)^n$
- Row **i** contains: $\binom{n}{0}, \binom{n}{1}, \ldots, \binom{n}{i}$
- Property: $\binom{n}{k} = \binom{n-1}{k-1} + \binom{n-1}{k}$

```
Row 0:          1
Row 1:        1 1
Row 2:      1 2 1
Row 3:    1 3 3 1
Row 4:  1 4 6 4 1
```

Illustrative example of Nested loop

Necessity of at least one while loop

- Newton-Raphson method of root finding:
  - Find roots of the equation $f(x) = 0$
  - Start with a guess x_0
  - At each step: $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$
  - Stop when successive estimates differ less than a tolerance value ϵ