

Chapter 2 outline:

- ▶ Mathematical sequences and Python lists (**today**)
- ▶ Recurrence relations and recursive functions (Friday)
- ▶ Functions on lists (next week Monday)
- ▶ Arrays, vectors, and intervals (next week Wednesday)
- ▶ (Test on Chapters 1 & 2, Mon Sept 23)

Today:

- ▶ Finish powersets
- ▶ Definition of sequence
- ▶ Basics of Python lists
- ▶ Operations on Python lists

Note that

▶ $a \in A$ iff $\{a\} \in \mathcal{P}(A)$

▶ $A \subseteq B$ iff $A \in \mathcal{P}(B)$

▶ $A \subseteq B$ iff $\mathcal{P}(A) \subseteq \mathcal{P}(B)$

▶ $\mathcal{P}(\emptyset) = \{\emptyset\} \neq \emptyset$

Observe

$$\begin{aligned}\mathcal{P}(\{1, 2, 3\}) &= \{ \emptyset \\ &\quad \{1\}, \{2\}, \{3\} \\ &\quad \{1, 2\}, \{1, 3\}, \{2, 3\} \\ &\quad \{1, 2, 3\} \} \\ &= \{ \{1\}, \{1, 2\}, \{1, 3\}, \{1, 2, 3\} \\ &\quad \emptyset, \{2\}, \{3\}, \{2, 3\} \} \\ &= \mathcal{P}(\{2, 3\}) \cup \left[\begin{array}{l} \text{1 added to each set} \\ \text{of } \mathcal{P}(\{2, 3\}) \end{array} \right] = \mathcal{P}(\{2, 3\}) \cup \\ &\quad \{ \{1\} \cup X \mid X \in \mathcal{P}(\{2, 3\}) \} \end{aligned}$$

If $a \in A$, then $\mathcal{P}(A) = \mathcal{P}(A - \{a\}) \cup \{ \{a\} \cup X \mid X \in \mathcal{P}(A - \{a\}) \}$

What is $|\mathcal{P}(X)|$ in terms of $|X|$?

$[24_1, 47_2, 53_3, 18_4, 201_5]$

$[98_{101}, 99_{102}, 88_{103}, 84_{104}, 99_{106}]$

$[2_\alpha, 3_\beta, 5_\gamma, 7_\delta, 11_\epsilon, 13_\zeta, 17_\eta]$

$[\bullet_0, \heartsuit_1, \star_2, \bullet_3, \spadesuit_4, \spadesuit_5]$

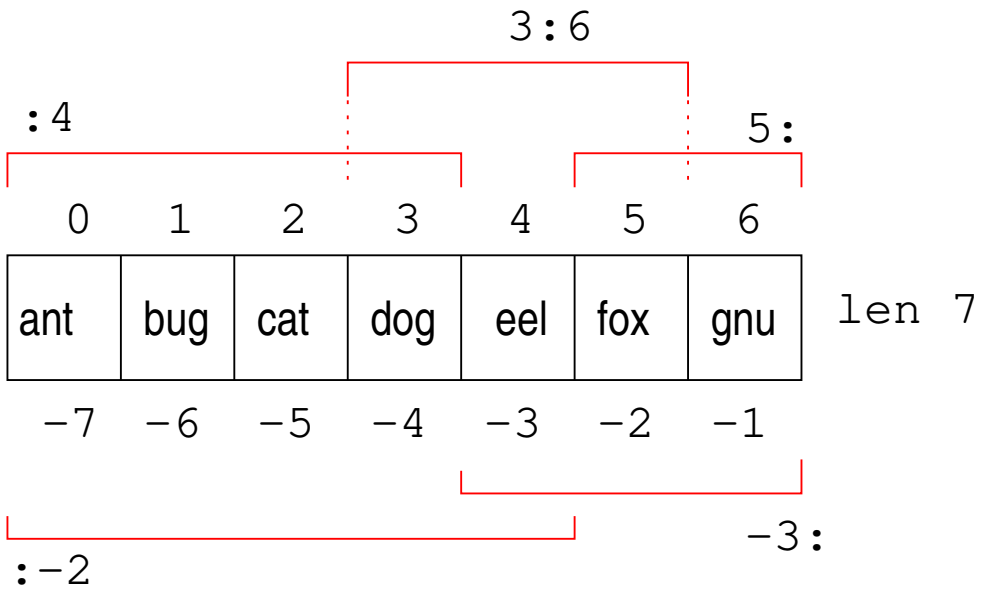
$[1_0, 2_1, 4_2, 8_3, \dots (2^i)_i, \dots]$

$$[5 + i] = [5, 6, 7, 8, 9, \dots]$$

$$[(-1)^i] = [1, -1, 1, -1, 1, \dots]$$

$$\left[\frac{1}{2^i}\right] = \left[1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \dots\right]$$

$$[i^2] = [0, 1, 4, 9, 16, \dots]$$



For next time:

Pg 69–70: 2.(3, 4, 5, 7, 8, 10)

Read 2.2

Take quiz