Where we are:

- ► Functions on lists; powersets (Wednesday)
- ► Application: A language processor (Today)
- ► Propositional forms, logical equivalence [Start Chapter 3] (Monday)

Today:

- ► Finishing up powersets
- ► Case expressions and option types
- ► Big example: A language processor
- ► Introducing the semester project

Which are true?

$\{3\} \in \mathscr{P}(\{1, 2, 3, 4, 5\})$ $3 \in \mathscr{P}(\{1, 2, 3, 4, 5\})$

$\{3\} \subseteq \mathscr{P}(\{1, 2, 3, 4, 5\})$ $3 \subseteq \mathscr{P}(\{1, 2, 3, 4, 5\})$

$a \in A$ iff $\{a\} \in \mathscr{P}(A)$ $a \in A$ iff $\{a\} \subseteq \mathscr{P}(A)$

$a \in A$ iff $a \subseteq \mathscr{P}(A)$ $A \subseteq B$ iff $A \in \mathscr{P}(B)$

Which are true?

$A \subseteq B$ iff $A \subseteq \mathscr{P}(B)$

$\{A\} \subseteq \mathscr{P}(A)$

$A \in \mathscr{P}(A)$

$\{A\} \in \mathscr{P}(A)$

$\mathbb{Z} \in \mathscr{P}(\mathbb{R})$

$\emptyset = \mathscr{P}(\emptyset)$

Note that

- $a \in A$ iff $\{a\} \in \mathscr{P}(A)$

- $A \subseteq B$ iff $A \in \mathscr{P}(B)$

- $A \subseteq B$ iff $\mathscr{P}(A) \subseteq \mathscr{P}(B)$

- $\mathscr{P}(\emptyset) = \{\emptyset\} \neq \emptyset$

Observe

$$
\begin{aligned}
\mathscr{P}(\{1,2,3\}) &= \{ \quad \emptyset \\
&\qquad \{1\},\{2\},\{3\} \qquad\qquad\qquad = \{ \quad \{1\},\{1,2\},\{1,3\},\{1,2,3\} \\
&\qquad \{1,2\},\{1,3\},\{2,3\} \qquad\qquad\qquad \emptyset,\{2\},\{3\},\{2,3\} \qquad\qquad \} \\
&\qquad \{1,2,3\} \qquad\qquad\qquad \} \\[2mm]
&= \mathscr{P}(\{2,3\}) \cup \begin{bmatrix} 1 \text{ added to each set} \\ \text{of } \mathscr{P}(\{2,3\}) \end{bmatrix} = \mathscr{P}(\{2,3\}) \cup \\
&\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \{ \ \{1\} \cup X \mid X \in \mathscr{P}(\{2,3\}) \ \}
\end{aligned}
$$

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

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

Grammar:

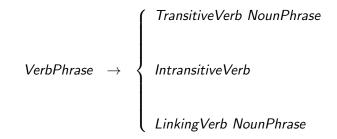$$Sentence \rightarrow NounPhrase\ Predicate\ PrepPhrase_{opt}$$

$$NounPhrase \rightarrow Article\ Adjective_{opt}\ Noun$$

$$Predicate \rightarrow Adverb_{opt}\ VerbPhrase$$

Grammar, continued:

$$VerbPhrase \rightarrow \begin{cases} TransitiveVerb\ NounPhrase \\[2em] IntransitiveVerb \\[2em] LinkingVerb\ NounPhrase \end{cases}$$

$$PrepPhrase \rightarrow Preposition\ NounPhrase$$

Vocabulary:

Nouns: `a the`

Adjectives: `big bright fast beautiful smart red smelly`

Nouns: `man woman dog unicorn ball field flea tree`

Adverbs: `quickly slowly happily dreamily`

Transitive verbs: `chased saw greeted bit loved`

Intransitive verbs: `ran slept sang`

Linking verbs: `was felt seemed`

Prepositions: `in on through with`

For next time:

Pg 82: 2.4.(8-12, 14 & 15)
Extra credit: *Pg 91: 2.B*

Note that "projects" in the book are labeled as chapter-letter, as in "2.B." Find starter code on Schoology, and also pay attention to the assignment notes. See also the code from class for "starter code."

Read 3.(1-4)