CPSC 421/501

- Welcome

- Course page: Navigate from
  www.cs.ubc.ca/~jf/courses

- Instructor: Joel Friedman, jf@cs.ubc.ca

- Piazza page
  piazza.com/ubc.ca/winter-term12019/cpsc421

- Grade:
  \[ \text{Grade} \leq 55\% (f) + 35\% \max(m,f) + 10\% \max(h,m,f) \]

  \[ f,m,h = \text{final, midterm, homework} \]

  \[ \text{Grade} \leq 80\% \text{ (formula for CPSC 421)} \]

  \[ + 20\% \text{ (essay)} \]

- Homework, Office Hours: Details TBA
Course Content: What is "P vs. NP", how to perhaps solve, and how not to solve, P vs. NP

Old, mid 1900's view:

Chapter 1 - Regular languages
Chapter 2 - Context-free languages
Chapter 3 and on - Turing machines

For first week or so, begin with handout on course webpage:

(0) Decision Problems and Languages Ch.6 [Sip]
(1) Self-referencing "Paradoxes" and theorem proofs
(2) Cantor's Theorem and Uncountable Sets

Ch.0: Languages
Decision Problems: yes/no

primality: Given n \in \mathbb{N} =\{1,2,3,\ldots}\, \text{, is } n \text{ prime?}

3-colourability: Given a graph, is it 3-colourable?

vacation email: Given a string, does the word "vacation" occur as a substring

PRIMES = \{\}
- **Alphabet** is a finite, non-empty set

- A word/string is a finite sequence in the alphabet

\[ A = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}, \text{ string over } A \]

\( (3, 4, 7, 9, 2) = 34792 \)

- A language over \( A \) is a subset of all strings over \( A \)

\[
\text{Primes: } \mathbb{D} = \{0, 1, \ldots, 9\}, \quad \mathbb{D}^* = \{\text{all strings over } A\}
\]

\[
\text{PRIMES} = \{ s \in \mathbb{D}^* \mid s \text{ represents a prime number} \}
\]

- 421, 2, 3, 5, 7, 127 \( \in \text{PRIMES} \)

- 221, 320, 420 \( \notin \text{PRIMES} \)

- Is 0421 \( \in \text{PRIME} \)?
What does \( \text{PRIMES} = \{ s \in \mathbb{D}^* \mid s \text{ represents a prime number} \} \) really mean? Need to be more precise.

=  

Possibility 1:

\[
\text{PRIMES}_1 = \{ s = s_1 s_2 \ldots s_k \mid s_i \in \mathbb{D}, s
\]

\[
s_1 10^{k-1} + s_2 10^{k-2} + \ldots + s_k 10^0
\]

is prime \}

\[
\text{PRIMES}_2 = \{ \langle n \rangle \mid n \in \mathbb{N}, n \text{ is prime} \}
\]

= "description of \( n \)"

= graph of \( n \) computer: \( \langle \text{graph} \rangle \)???
Descriptions of 127:

\( (127)_{\text{base } 2} = 1111111 \)

\( (127)_{\text{Hex}} = 7F \)

\( (127)_{\text{English}} = \text{one hundred and twenty-seven} \)

\( (127)_{\text{French}} = \text{cent vingt-sept} \)

\( (127)_{\text{Klingon}} = \text{we'vatlh wejmahl Soch} \)

\( (127)_{10} = 127 \)