CSE 311 Section 1

Propositional Logic
Administrivia & Introductions
Homework

● Submissions
  ○ LaTeX (highly encouraged)
    ■ overleaf.com
    ■ template and LaTeX guide posted on course website!
  ○ Word Editor that supports mathematical equations
  ○ Handwritten neatly and scanned

● All homeworks will be turned in via Gradescope

● Homeworks typically due on Fridays at 10pm

● You have 6 late days total to use throughout the quarter
  ○ Anything beyond that will result in a deduction on further late assignments

● Only 3 late days max can be used per assignment
Announcements & Reminders

● Sections are Graded
  ○ You will be graded on section participation, so please try to come 😊

● Section Materials
  ○ Handouts will be provided in at each section
  ○ Worksheets and sample solutions will be available on the course calendar later this evening

● HW1
  ○ Due Friday 10/6 @ 10pm
Icebreaker

- Small groups of 4-6ish
- Please share with your group
  - Your name
  - Number of years in department/ at UW
  - What was something fun you did over Summer break?
  - What are you concerned about for 311 / what are you excited about?
- Then, share how you like to eat your potatoes (baked, fried, chips, etc.)
- We’ll go around and see what style of potato is most popular!
Quick Concept Review

- **Propositions** are statements with a boolean truth value!
  - “The AQI of Seattle is 50” is a proposition. We know it’s either true or false.
  - “The AQI of Seattle?” is not. Suddenly it could be hundreds of values.
  - In formal logic, we like to assign a proposition into a variable for later use.

- **Logical connectives** connect propositions to form new propositions!

  \[
  \neg p \\
p \land q \\
p \lor q \\
p \rightarrow q \\
p \leftrightarrow q
  \]
Truth Tables

Gives us a simple way to describe how logical connectives operate

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Implications

Some common formulations:

$p$ implies $q$

whenever $p$ is true $q$ must be true

If $p$ then $q$

$q$ if $p$

$p$ is sufficient for $q$

$p$ only if $q$

$q$ is necessary for $p$

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Problem 1 – Warm Up

Steps:

1. Create propositional variables
2. Replace all propositions with created variables
3. Replace the operators

(a) If I am lifting weights this afternoon, then I do a warm-up exercise.

(b) If I am cold and going to bed or I am two-years old, then I carry a blanket.
Problem 1a – Warm Up

Steps:

1. Create propositional variables
2. Replace all propositions with created variables
3. Replace the operators

a) If I am lifting weights this afternoon, then I do a warm-up exercise.
Problem 1a – Warm Up

Steps:

1. Create propositional variables
2. Replace all propositions with created variables
3. Replace the operators

a) If I am lifting weights this afternoon, then I do a warm-up exercise.

Step 1
p: I am lifting weights this afternoon
q: I do a warm-up exercise
Problem 1a – Warm Up

Steps:

1. Create propositional variables
2. Replace all propositions with created variables
3. Replace the operators

a) If I am lifting weights this afternoon, then I do a warm-up exercise.

   **Step 1**
   \[ p: \text{I am lifting weights this afternoon} \]
   \[ q: \text{I do a warm-up exercise} \]

   **Step 2**
   \[ \text{If } p \text{ then } q \]
Problem 1a – Warm Up

Steps:

1. Create propositional variables
2. Replace all propositions with created variables
3. Replace the operators

a) If I am lifting weights this afternoon, then I do a warm-up exercise.

Step 1
\[ p: \text{I am lifting weights this afternoon} \]
\[ q: \text{I do a warm-up exercise} \]

Step 2
If \( p \) then \( q \)

Step 3
\[ p \rightarrow q \]
Problem 1b
Problem 1b – Warm Up

Steps:

1. Create propositional variables
2. Replace all propositions with created variables
3. Replace the operators

b) If I am cold and going to bed or I am two-years old, then I carry a blanket.

Work on this problem with the people around you, and then we’ll go over it together!
Problem 1b – Warm Up

Steps:

1. Create propositional variables
2. Replace all propositions with created variables
3. Replace the operators

b) If I am cold and going to bed or I am two-years old, then I carry a blanket.
Problem 2
Problem 2 – If I can translate, then...

a) Whenever I walk my dog, I make new friends.

b) I will drink coffee, if Starbucks is open or my coffeemaker works.

c) Being a U.S. citizen and over 18 is sufficient to be eligible to vote.

d) I can go home only if I have finished my homework.

e) Having an internet connection is necessary to log onto zoom.

f) I am a student because I attend university.

Work on parts (a), (c), and (f) with the people around you, and then we’ll go over it together!
Problem 2 – If I can translate, then...

a) Whenever I walk my dog, I make new friends.

1. Create propositional variables
2. Replace all propositions with created variables
3. Replace the operators
Problem 2 – If I can translate, then...

c) Being a U.S. citizen and over 18 is sufficient to be eligible to vote.

1. Create propositional variables
2. Replace all propositions with created variables
3. Replace the operators
Problem 2 – If I can translate, then...

f) I am a student because I attend university.

1. Create propositional variables
2. Replace all propositions with created variables
3. Replace the operators
Problem 5
Problem 5 – Tea Time

Consider the following sentence:

If I am drinking tea then I am eating a cookie, or, if I am eating a cookie then I am drinking tea.

a) Define propositional variables and translate the sentence into an expression in logical notation.

b) Fill out a truth table for your expression.

Work on this problem with the people around you, and then we’ll go over it together!
Problem 5 – Tea Time

If I am drinking tea then I am eating a cookie, or, if I am eating a cookie then I am drinking tea.

a) Define propositional variables and translate the sentence into an expression in logical notation.
Problem 5 – Tea Time

If I am drinking tea then I am eating a cookie, or, if I am eating a cookie then I am drinking tea.

b) Fill out a truth table for your expression.

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That’s All, Folks!

Thanks for coming to section this week! Any questions?