Section 01: Propositional Logic Translation

1. **Warm-Up**

Translate the English sentences below into symbolic logic.

(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.

2. **If I can translate, then...**

For each of the following more obscure English ways to write an implication, define atomic propositions and write a symbolic representation of the sentence.

(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.

3. **I can rewrite these formulas in English, only if...**

Given propositions and a logical formula, write two potential English translations. The meanings of the sentences will be the same (They represent the same formula!), but they can still look quite different.

(a) $p$: The sun is out
    $q$: We have class outside

    $p \rightarrow q$

(b) $p$: the book has been out for a week.
    $q$: I don’t have homework.
    $r$: I have finished reading the book.

    $(p \land q) \rightarrow r$

(c) $p$: I have read the manual
    $q$: I operate the machine

    $q \rightarrow p$
4. Translation

For each of the following, define propositional variables and translate the sentences into logical notation.

(a) I will remember to send you the address only if you send me an e-mail message.

(b) If berries are ripe along the trail, hiking is safe if and only if grizzly bears have not been seen in the area.

(c) Unless I am trying to type something, my cat is either eating or sleeping.

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.

6. Exclusive Or

Exclusive or (⊕) and inclusive or (∨) both can be translated as “or” in English. For each of the following ambiguous phrases, decide which type of “or” is likely meant and why.

(a) Experience with C or Java is required.

(b) Lunch includes soup or salad.

(c) Publish or perish.

(d) To enter the country, you need a passport or voter registration card.

\[ p \rightarrow q \]

Implication:

\[ p \] 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 \[ p \]