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.

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:
\[ p \text{ implies } q \]
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 \( p \)