

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.

$$(p \wedge q) \rightarrow r$$

- (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 ($\oplus$) and inclusive or ($\vee$) 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

p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T