

2.25.1 Truth Tree Problems: Tautology, Contradiction, and Logical Equivalence

A. For each pair of sentences, **translate** both into formal language; then build two **truth trees** to show that the two sentences are **logically equivalent**.

1a. We're having truffles, and either grog or grappa.

1b. We're having either truffles and grog or truffles and grappa.

2a. Either we're having truffles or we're having grog and grappa.

2b. We're having either truffles or grog, and either truffles or grappa.

3a. Neko is a cat who likes fish, and one who also likes cream cheese.

3b. Neko is a cat who likes both fish and cream cheese.

4a. Though neither Suki nor Trixie studied for the exam, they both passed it.

4b. Suki passed the exam without studying for it, and so did Trixie.

5a. Either Suki is neither tall nor tall and skinny, or she's neither tall nor skinny.

5b. Suki's not tall.

B. (a) Translate each of the following English sentences into the formal language, using the translation key provided. Then **(b)** use a **truth tree** to figure out which situation makes **all three** formal **sentences true** (‘simultaneously satisfies’ them) and **state the truth value of each sentence letter** in that situation.

P: Neko finished her robot cat	T: Neko can debug the robot cat’s program
Q: Neko let her robot cat loose	U: Lucretia can debug the robot cat’s program
R: Neko tested her robot cat	V: The investors will sign the contract
S: Neko promised the robot cat would be ready.	

- 1) **Neko finished her robot cat and let it loose without testing it.**
- 2) **Although Neko promised the robot cat would be ready, neither she nor Lucretia can debug its program.**
- 3) **Unless either Neko or Lucretia can debug the robot cat’s program, the investors won’t sign the contract.**

Truth value of each **sentence letter**, when all three sentences are true:

P:	Q:	R:	S:
T:	U:	V:	

C. Translate each of the following English sentences into the formal language, and build a **truth tree** for that sentence; then state the **truth value of each sentence letter** in that sentence.

1. Both Suki and Trixie passed the exam, though neither of them studied for it.
2. Lucretia went out without taking an umbrella, but Letitia didn’t.