

5.3.1. Semantic Problems: Names, Predicates, and Models

A. For each of the formal sentences below, decide if that sentence is **true** or **false** in the following model.

D: {2, 3}

A: 2

B: 3

G: {2}

H: {3}

I: {2, 3}

J: { }

1. $(GA \wedge HA)$

2. $((GA \wedge HA) \vee (GB \wedge HB))$

3. $((GA \vee HA) \rightarrow JA)$

4. $(JA \rightarrow (GA \vee HA))$

5. $(GA \rightarrow IA)$

6. $(GA \leftrightarrow IA)$

7. $(HA \leftrightarrow JA)$

B. Translate the following English argument into the formal language; then decide, for each of the models below, whether that model is a **validity counterexample** for the argument.

Argument:

1. Jack isn't a fat cat, but Neko is.

∴ Jack isn't a cat, but Neko is.

Translation Table:

A: Jack

B: Neko

G: __ is fat

H: __ is a cat

Model A

D: { **Neko, Jack** }

A: **Jack** **B:** **Neko**

G: { **Neko** } **H:** { **Jack** }

Model B

D: { **Neko, Jack** }

A: **Jack** **B:** **Neko**

G: { **Neko** } **H:** { **Jack, Neko** }

Model C

D: { **Neko, Jack** }

A: **Jack** **B:** **Neko**

G: { **Jack, Neko** } **H:** { **Jack** }

Model D

D: { **Neko, Jack** }

A: **Jack** **B:** **Neko**

G: { **Jack, Neko** } **H:** { **Jack, Neko** }

C. Translate the following English argument into the formal language; then decide, for each of the models below, whether that model is a **validity counterexample** for the argument.

Argument:

1. Either Neko is a cat who both eats fish and picks locks, or either Rex or Jack left the refrigerator unlocked.
 2. Jack didn't leave the refrigerator unlocked.
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- ∴ Neko is a lock-picking fish-eater.

Translation Table:

A: Neko
B: Rex
C: Jack
G: __ is a cat
H: __ eats fish
I: __ picks locks
J: __ left the refrigerator unlocked

Model A

D: { **Neko, Rex, Jack** }

A: **Neko** **B:** **Rex** **C:** **Jack**
G: { **Neko, Jack** } **I:** { **Rex** }
H: { **Rex** } **J:** { **Neko, Rex** }

Model B

D: { **Neko, Rex, Jack** }

A: **Neko** **B:** **Rex** **C:** **Jack**
G: { **Neko, Jack** } **I:** { **Neko, Jack** }
H: { **Neko, Rex, Jack** } **J:** { }

Model C

D: { **Neko, Rex, Jack** }

A: **Neko** **B:** **Rex** **C:** **Jack**
G: { **Neko, Jack** } **I:** { **Jack** }
H: { **Neko, Jack** } **J:** { **Neko, Rex** }

Model D

D: { **Neko, Rex, Jack** }

A: **Neko** **B:** **Rex** **C:** **Jack**
G: { **Neko, Jack** } **I:** { **Neko, Rex, Jack** }
H: { **Neko, Jack** } **J:** { **Rex** }