

Logical Questions with Solutions

1 — Is it a proposition?

Question: "Close the door!"

Answer: No — this is an imperative sentence (a command), and it cannot be classified as a proposition because it cannot be evaluated as true or false.

2 — Is it a proposition?

Question: " $3x + 2 = 11$ "

Answer: This is usually considered an open proposition (its truth value depends on x). Without specifying x , it cannot be determined as true or false.

3 — Translate to symbolic logic

Sentence: "If I study well, then I will succeed, and I will not feel anxious."

Assumptions: D: I study well, S: I succeed, A: I feel anxious

Logical form: $(D \rightarrow S) \wedge \neg A$

4 — Translate to symbolic logic

Sentence: "I will not go outside unless I finish my homework."

Assumptions: O: I go outside, W: I finish my homework

Logical form: $O \rightarrow W$ (equivalently: $\neg W \rightarrow \neg O$)

5 — Translate symbolic form to English

Formula: $\neg p \rightarrow (q \wedge r)$

Definitions: p: I went to bed early, q: I woke up energetic, r: I went to work on time

Translation: If I did not go to bed early, then I woke up energetic and went to work on time.

6 — Translate symbolic form to English

Formula: $s \vee \neg t$

Definitions: s: The restaurant is open, t: It is raining

Translation: The restaurant is open, or it is not raining.

7 — Truth value evaluation

Expression: $(p \vee q) \rightarrow \neg r$

Given: $p = T$, $q = F$, $r = T$

Result: False (F).

8 — When is $p \rightarrow q$ false?

The implication $p \rightarrow q$ is false only when $p = T$ and $q = F$.

9— $\neg(p \vee (q \wedge r))$

$$\begin{array}{c} \neg(p \vee (q \wedge r)) \\ | \\ p \vee (q \wedge r) \\ / \backslash \\ p \quad q \wedge r \\ \quad / \backslash \\ \quad q \quad r \end{array}$$

10— $\neg p \leftrightarrow (q \vee r)$

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$$\begin{array}{c} \wedge \\ \neg p \quad q \vee r \\ / \backslash \\ q \quad r \end{array}$$

11— Prove that $p \vee (p \wedge q)$ is logically equivalent to p

p	q	$(p \wedge q)$	$p \vee (p \wedge q)$
T	T	T	T
T	F	F	T
F	T	F	F
F	F	F	F