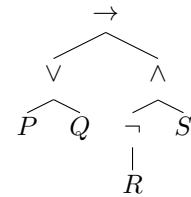


## Quiz 22/10 Answers

COGS 526

1. [1pt] Draw the construction tree of the formula  $((P \vee Q) \rightarrow (\neg R \wedge S))$ .



2. [1pt] Put the sentence into symbolic argument form: **Shane is not an officer, since neither he nor Omar is an officer.**

(a) **Atomic Propositions:**

- $S$ : Shane is an officer.
- $O$ : Omar is an officer.

- (b) **Premises and Conclusion:** The word “since” indicates that the phrase following it is the premise, and the phrase preceding it is the conclusion.

- **Premise (P):** “neither he nor Omar is an officer”

$$\neg S \wedge \neg O$$

- **Conclusion (C):** “Shane is not an officer”

$$\neg S$$

(c) **Symbolic Argument Form:**

$$\frac{\neg S \wedge \neg O}{\therefore \neg S}$$

3. [2pt] Given the argument  $\neg(P \wedge Q), \neg P \therefore \neg Q$ , what is the procedure to test its validity using truth tables? Illustrate your answer by constructing the truth table for this argument and determining whether it is valid or not.

The validity of an argument is determined by checking whether in the cases where all the premises are true, the conclusion is also true. An argument is invalid if there is at least one interpretation in the truth table where all premises are true, but the conclusion is false. If there is no such case, then the argument is valid.

(a) **Premises and Conclusion (C):**

- Premise<sub>1</sub> =  $\neg(P \wedge Q)$
- Premise<sub>2</sub> =  $\neg P$
- Conclusion =  $\neg Q$

(b) **Evaluate Validity:** Make a truth table and check if there is a case where Premise<sub>1</sub> =  $T$  and Premise<sub>2</sub> =  $T$ , but Conclusion =  $F$ .

(c) **The Truth Table:**

Atomic		Auxiliary	Premises		Conclusion
P	Q	$P \wedge Q$	$\neg(P \wedge Q)$	$\neg P$	$\neg Q$
T	T	T	F	F	F
T	F	F	T	F	T
F	T	F	T	T	F
F	F	F	T	T	T

The argument is invalid.

In the third row both premises  $\neg(P \wedge Q)$  and  $\neg P$  are true, but the conclusion ( $\neg Q$ ) is false.

Since there is a possible interpretation where the premises are true and the conclusion is false, the argument is not valid.