

1. Consider the following argument:

In my logic class, I learned that some deductively valid arguments are not sound. This led me to see that it's possible for deductively valid arguments to have false conclusions, since any argument that is not sound will have a false conclusion.

a) Extract the argument from this passage and put it in standard form.

b) Is the argument valid?

c) Is it sound?

Briefly explain:

2. Are the following in official notation; informal notation or not well-formed (circle correct answer).  
If well-formed, indicate the main connective (circle, use an arrow, etc.)  
If not well-formed, indicate the problem (circle, use an arrow, etc.)

a)  $(P \leftrightarrow (R \vee \sim\sim S \rightarrow Z)) \wedge P \wedge Q$       Official  
Informal  
Not well-formed

b)  $\sim(\sim(\sim P \rightarrow Q) \leftrightarrow \sim(\sim(R \wedge S)))$       Official  
Informal  
Not well-formed

3. Can a deductively sound argument be made invalid by adding more premises? Can it be made unsound by adding more premises? Briefly explain.

P: John wins the poker hand.	S: Sara wins the poker hand.	W: Sara gets a straight flush.
Q: John has two queens.	T: Tom wins the poker hand.	X: Tom gets a straight flush.
R: John gets a full house	U: John has three tens.	Y: John gets a straight flush.

4. Using the abbreviation scheme above, symbolize the following:

- a) Only provided that Tom doesn't get a straight flush, will John win the poker hand if he gets a full house.
- b) Neither Sara nor Tom wins the poker hand unless John fails to get a full house, in which case Sara will win.
- c) John's having two queens and three tens is sufficient for him to get a full house, but in order for him to win the poker hand it is necessary that he get a straight flush.
- d) No more than two of them (John, Sara and Tom) get a straight flush.

5. Using the abbreviation scheme above, provide an idiomatic English sentence for the following:

$$(W \vee X \vee Y) \wedge \sim((W \wedge X) \vee (X \wedge Y) \vee (Y \wedge W)) \rightarrow ((S \vee T) \wedge \sim(S \wedge T))$$

6. Show that the following argument is valid using **ONLY** the 10 basic rules:

**MP, MT, DN, R, ADJ, S, ADD, MTP, BC, CB**

$$(W \rightarrow V) \leftrightarrow (X \vee P). \quad T \wedge \sim Q \rightarrow W. \quad (V \leftrightarrow W) \rightarrow Z. \quad P \vee Q. \quad Q \rightarrow \sim R. \quad R \wedge T. \\ \therefore Z$$

7. Show that the following theorem is valid using **ONLY** the 10 basic rules:

**MP, MT, DN, R, ADJ, S, ADD, MTP, BC, CB**

$$(\sim P \rightarrow (Q \vee T)) \rightarrow [((Q \rightarrow R) \wedge \sim (P \vee R)) \rightarrow (S \vee T)]$$

8. Provide a derivation to show that the following is a valid argument. Use any of the rules.

$$\sim(Z \leftrightarrow Q). \quad \sim(Z \rightarrow P) \rightarrow \sim(W \wedge X). \quad \sim(R \rightarrow \sim X). \quad \sim W \rightarrow \sim R. \quad \therefore \sim(P \vee Q) \rightarrow S$$