

# Midterm Study Guide

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## 1 Arguments

For each of the following, put the argument in propositional form, then draw a truth table to prove whether it is valid or invalid.

Here's a sample truth table for you to work with:

A	B
T	T
T	F
F	T
F	F

And a 3 column one:

A	B	C
T	T	T
T	F	T
F	T	T
F	F	T
T	T	F
T	F	F
F	T	F
F	F	F

1. (a) Not both A and B.  
∴ Not A or not B.

**Solution:** This is one of DeMorgan's laws.  
VALID

A	B	Not (A and B)	Not A or Not B
T	T	F	F
T	F	T	T
F	T	T	T
F	F	T	T

2. You can go to graduate school only if you graduate from college. Therefore, if you didn't graduate from college, you didn't go to graduate school.

**Solution:**

(a) If A, then B. (If grad school, then graduated)

$\therefore$  If not B, then not A. (If did not graduate, then not grad school)

Conversion

VALID

A	B	If A, then B	If not B, then not A
T	T	T	T
T	F	F	F
F	T	T	T
F	F	T	T

3. (a) The clock is not correct.

$\therefore$  It is not the case that it is not the case that the clock is not correct.

**Solution:** This is double negation.

VALID

A	B	A	Not not A
T	T	T	T
T	F	T	T
F	T	F	F
F	F	F	F

4. (a) If we didn't eat out and go to the show, then we can go to the show or get ice cream.  
 $\therefore$  If we didn't go to the show or get ice cream, then we cannot eat out and go to the show.

**Solution:** This argument is valid. But it looks like it shouldn't be!

(a) If not (A and B), then B or C.

$\therefore$  If not (B or C), then not (A and B)

A	B	C	If not (A and B), then B or C	If not (B or C), then not (A and B)
T	T	T	T	T
T	F	T	T	T
F	T	T	T	T
F	F	T	T	T
T	T	F	T	T
T	F	F	F	T
F	T	F	T	T
F	F	F	F	T

## 2 Label the antecedent and consequent

1. If it is cold, I will not be in class.

**Solution:** Antecedent: It is cold.

Consequent: I will not be in class.

2. I'll vote for him only if he promises to lower taxes.

**Solution:** Antecedent: I'll vote for him.  
Consequent: He promises to lower taxes.

3. Only if you are 48 inches tall can you ride the ride.

**Solution:** Antecedent: You can ride the ride.  
Consequent: You are 48 inches tall.

### 3 Fill in the truth table

1.	A	B	A if and only if B
	T	T	
	T	F	
	F	T	
	F	F	

<b>Solution:</b>	A	B	A if and only if B
	T	T	T
	T	F	F
	F	T	F
	F	F	T

2.

A	B	C	If A and B, then not (C or not B BNB)
T	T	T	
T	F	T	
F	T	T	
F	F	T	
T	T	F	
T	F	F	
F	T	F	
F	F	F	

<b>Solution:</b>	A	B	C	If A and B, then not (C or not B BNB)
	T	T	T	F
	T	F	T	T
	F	T	T	T
	F	F	T	T
	T	T	F	T
	T	F	F	T
	F	T	F	T
	F	F	F	T

3. Note that  $\leftrightarrow$  is 'if and only if'.

A	B	C	$(A \leftrightarrow B) \leftrightarrow (B \leftrightarrow C)$
T	T	T	
T	F	T	
F	T	T	
F	F	T	
T	T	F	
T	F	F	
F	T	F	
F	F	F	

<b>Solution:</b>	A	B	C	$(A \leftrightarrow B) \leftrightarrow (B \leftrightarrow C)$
	T	T	T	T
	T	F	T	T
	F	T	T	F
	F	F	T	F
	T	T	F	F
	T	F	F	F
	F	T	F	T
	F	F	F	T