

Logic Statements and Their Negations

Statements: This leaf is green.

Sarah lives in Griffin, Georgia.

If a hawk is a bird, then it can fly.

All whales are Mammals.

Tokyo is not in Japan.

$$3^2 + 4^2 = 5^2$$

A rectangle has 4 right angles.

Non-statements:

What is that?

Go, fight, win!

1. Find the negation of each statement and its truth value.

The leaf is green.

Sarah lives in Griffin, Georgia.

Tokyo is not in Japan.

$$3^2 + 4^2 = 5^2$$

A rectangle has 4 right angles.

Truth Tables

2. Complete the following truth table for the various types of propositions.

(1) Negation

p	not p
T	
F	

(2) And statements (Conjunctions)

Atlanta is the capitol of Georgia, and the Nile River is in South America.

p	q	p and q
T	T	
T	F	
F	T	
F	F	

(3) Or statements (Disjunctions)

Atlanta is the capitol of Georgia, or the Nile River is in South America.

p	q	p or q
T	T	
T	F	
F	T	
F	F	

(4) If . . . then statements (Conditionals)

If a creature is a whale, then it is a mammal.

p	q	if p, then q
T	T	
T	F	
F	T	
F	F	

3. Write the general form for each variation of the conditional statement, along with the example (using the given conditional statement).

Conditional: If p, then q. If Teresa works in Thomaston, then she works in Georgia.

Converse: _____

Inverse: _____

Contrapositive: _____

4. Complete the following truth tables.

(a)

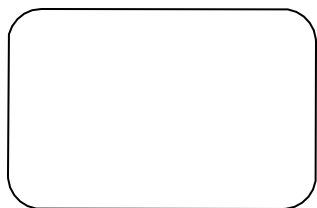
p	q	$\sim q \rightarrow \sim p$
T	T	
T	F	
F	T	
F	F	

(b)

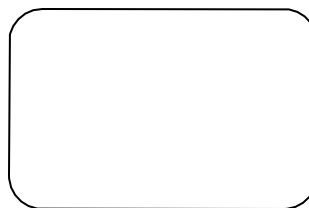
p	q	r			$(p \wedge r) \rightarrow (q \vee r)$
T	T	T			
T	T	F			
T	F	T			
T	F	F			
F	T	T			
F	T	F			
F	F	T			
F	F	F			

5. For the following propositions, draw a Venn diagram and label all regions of the diagram.

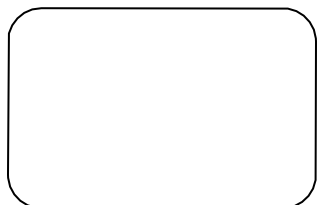
(a) All whales are mammals.



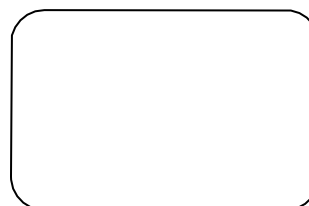
(b) No dogs are cats.



(c) Some pet owners have dogs.



(d) Some pet owners do not have dogs.



Valid Arguments

6. A(n) _____ argument makes the case for a general conclusion from more specific premises.

For example, Premise: $2 \times 3 = 6$

Premise: $5 \times 4 = 20$

Premise: $7 \times 6 = \underline{\hspace{2cm}}$

Conclusion:

The product of an even integer and an odd integer is an _____ integer.

A(n) _____ argument makes the case for a specific conclusion from more general premises.

For example, Premise: All professors are married.

Premise: Dr. Clement is a professor.

Conclusion: Dr. Clement is married.

7. A **valid argument** is a deductive argument where the conclusion is guaranteed from the premises.

An **invalid argument** is an argument where the conclusion is not always guaranteed from the premises.

A **sound argument** is a valid argument using true premises.

Complete the table of conditional arguments.

	Affirming the Hypothesis	Affirming the Conclusion	Denying the Hypothesis	Denying the Conclusion
Structure Premises	If p, then q. p is true.	If p, then q. q is true.	If p, then q. p is not true.	If p, then q. q is not true.
Conclusion	q is true.		q is not true.	
Validity	Valid			

Analyze the following arguments.

- (a) All professors at the university received a 3% raise this year. My dad is a psychology professor at the university, so he must have gotten a raise.
- (b) All potatoes have skin. I have skin. Therefore, I must be a potato.
- (c) If you buy a new car, then you cannot pay your student loan bills. You are able to pay your student loan bills. Therefore, you must not have bought a new car.