

**Due: Thursday, January 22, 2004 by 4pm**

*Please attach the completed COVER PAGE to the front of your assignment.*

1. Consider the statement:

(S1) If a student is in CSC108, then the student is not in CSC150.

(a) Rewrite (S1) in precise symbolic notation. Clearly define the predicates that you are using.

(b) Write the contrapositive of (S1) in:

i. English

ii. precise symbolic notation

(c) Write the converse of (S1) in:

i. English

ii. precise symbolic notation

2. Consider the following statements:

(S2) Every computer on a network has an IP address.

(S3) If a computer has an IP address, then it can share files.

(a) Rewrite (S2) in:

i. English, using implication and not explicit quantification

ii. precise symbolic notation

(b) Rewrite (S3) in precise symbolic notation

(c) Assume that  $x$  is a computer and  $x$  is on a network. What, if anything, can you conclude from this? Explain your reasoning.

(d) Assume that  $x$  is a computer and  $x$  does not have an IP address. What, if anything, can you conclude from this? Explain your reasoning.

3. This question uses the following database:

Computer	Windows	Linux	MAC
1	Yes	Yes	No
2	Yes	No	No
3	No	No	Yes
4	No	Yes	No
5	Yes	Yes	No
6	No	No	No

(a) State whether each sentence below is true or false. Where appropriate, justify your answer by citing a specific counter-example.

i. Every computer runs at least one operating system.

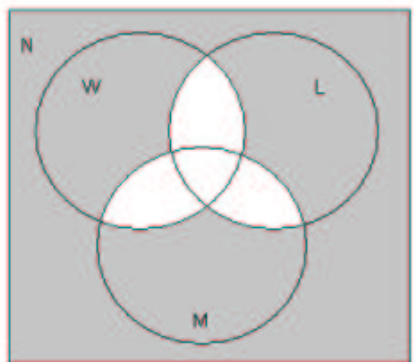
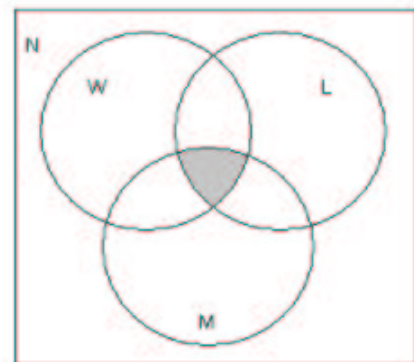
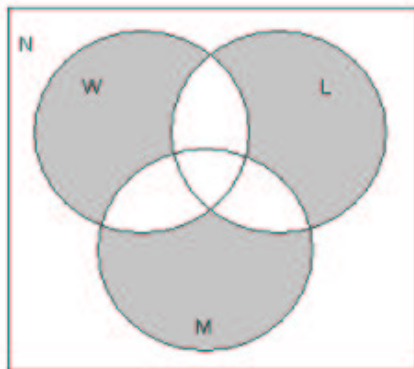
ii. If a computer runs MAC OS, then it does not run any other operating system.

iii. A computer can't run Linux, without running Windows.

(b) In the following Venn Diagrams:

$W$  represents computers that are running Windows,  
 $L$  represents computers that are running Linux, and  
 $M$  represents computers that are running MAC OS.

Describe in English what the shaded areas in each of the following Venn diagrams represent:



4. Consider this database of hockey players:

Name	Position	Penalized
Biff	Defence	Yes
Rocko	Defence	No
Andria	Forward	No
Wayne	Forward	Yes

- (a) In English, write an implication statement using “if...then” for which Biff is a counterexample.
- (b) In English, write an implication statement using “only if” for which Rocko is a counterexample.
- (c) In English, write an implication statement using “necessary” for which Andria is a counterexample.
- (d) In English, write a universal quantification statement for which Wayne is a counterexample.
- (e) In English, write a different implication that is equivalent to:
- (a) using “if then”
  - (b) using “only if”
  - (c) using “necessary”
- (f) In English, write a different universal quantification statement that is equivalent to (d).