Section 2.2 Continued

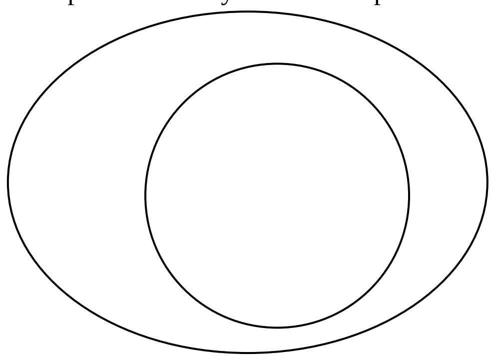
Quantifiers tell how many and they fall into two categories:

Universal quantifiers are works such as *all* and *every* that state all objects of a certain type satisfy a given property.

Existential quantifiers are words such as *some*, *there exists*, and *there is at least one* that state that there are one or more objects that satisfy a given property.

Diagrams are a good way to illustrate the quantifiers.

Ex. 1) Fill in the diagram to represent: "Every student is expected to learn."



2) Diagram: "Some learners are students."

Learners Students

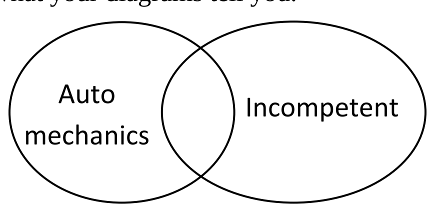
Negating Statements with Quantifiers.

The phrase *Not all are* has the same meaning as __________________________

The phrase *Not some are* has the same meaning as __________________

Ex. Negate the statement and then rewrite it in English in an alternative way. Draw diagrams to illustrate your thinking. Explain what your diagrams tell you.

Some auto mechanics are incompetent.



The negation would be: ____________________________________

This can be written: ______________________________

Auto mechanics Incompetent

Negating Quantifiers to know

- **Not "all are"** has the same meaning as "**At least one is not".**
- **Not "some are"** has the same meaning as **"None are".**

Dominance of Connectives

What does this mean?

$\sim P \wedge Q \rightarrow \sim R$ →
- $\sim(P \wedge Q \rightarrow \sim R)$ (a negation) ????
- $\sim P \wedge (Q \rightarrow \sim R)$ (a conjunction) ?????
- $(\sim P \wedge Q) \rightarrow \sim R$ (a conditional) ?????

Can't leave this ambiguous. Either the parentheses are put in for you, or you need to follow the

Order of Dominance listed from least dominant to most (the most dominant has the last say):

Negation ~ (Only applies to the thing it is immediately next to)
Conjunction $\wedge$, Disjunction $\vee$ (Equal value, must indicate with parentheses)
Conditional → Compound statements except those with ↔ are considered in parentheses
Biconditional ↔ Compound statements on either side are considered in parentheses

Remember to work inside the parenthesis first.

Practice: Add parentheses in each statement to form the type of compound statement indicated.
If none are needed, indicate that fact.

a. Negation: $\sim P \wedge \sim Q$

b. Biconditional: $P \rightarrow Q \vee R$

c. Disjunction: $\sim R \wedge Q \rightarrow P \vee S$

d. Conditional: $\sim R \wedge Q \rightarrow P \vee S$

e. Conjunction: $\sim R \wedge Q \rightarrow P \vee S$

f. Negation: $\sim R \wedge Q \rightarrow P \vee S$

Designating Definers

For this section, first **circle the dominant connective**.

Then define the phrases. Do not include the negative in the defined phrase.

Then rewrite the entire statement in symbolic form, using the negation sign when appropriate.

Example: If the Vikings win their next game, then I will not give up on them.

p = ____

q = ____

Symbolic Statement: ________________________________

Example: I will go to Minneapolis if and only if I have no homework over the weekend.

p = ____

q = ____

Symbolic Statement: ________________________________

Relationships between Biconditional and Conjunction

The biconditional, "if and only if" is like when we say "and vice-versa" in everyday language.

It is the same as the conjunction of two conditionals, one the reverse order of the other.

Example: I will go to Minneapolis if and only if I have no homework over the weekend.

First conditional statement = ____

Reverse conditional statement = ____

Conjunction that is equivalent to the original biconditional statement:

____

____

Equivalent Conjunction as a symbolic statement: ____________________________

Help with Test 1 correction

16. e. If U = { …, -2, -1, 0, 1, 2}, Y = {0, 1, 2}, L = {-2, 2}, then $Y' \cup L'$ =___________

Write out “the definers” and then write the statement in symbols:

Skating is permitted if and only if the ice is 6 inches thick.

Definers:

Symbolic statement: ___________________________

a. Rewrite (b.) above as a conjunction instead of a biconditional in symbols.

Determine if the following quantified statements are **<u>true</u>** or **<u>false</u>**.

If a statement is true, give an example.

If the statement is false, rewrite it as its negation (to change it to a correct statement.)

T F 1. All integers are rational numbers. <u>Example or Correction</u>:

T F 2. There exists a rational number that is not an integer. <u>Example or Correction:</u>

T F 3. All whole numbers are natural numbers. <u>Example or Correction:</u>

<u>Assignment Due Wed. 9/14:</u>

Complete #2, 5, 6, 11, 12, 14, 15, 19, 21, 23, 28, 29, 32, 35, 37, 41, 43, 49, 69, 74 on pp. 88-90

Download the Guided Notes for Section 3.2 and Read pp. 91-99