Conditional Statements

Remember, conditional statements are IF...Then... statements.

\[
\text{If the weather is good, then I will go swimming.}
\]

hypothesis - p \hspace{1cm} \text{conclusion - q}

The converse of a conditional statement is written by interchanging the hypothesis and conclusion.

\[
\text{If I go swimming, then the weather is good.}
\]

conclusion - q \hspace{1cm} \text{hypothesis - p}

Negation

Negation is ____________________________

can \hspace{1cm} can't \hspace{1cm} will \hspace{1cm} will not \hspace{1cm} does \hspace{1cm} does not (doesn't) \hspace{1cm} is \hspace{1cm} is not (isn't)

The symbol for negation is ________________

Example:

\begin{itemize}
  \item \textbf{conditional}: The weather is good.
  \item \textbf{negation}: The weather is not good.
\end{itemize}

Contrapositive

The contrapositive of a conditional is formed by ____________________________

and then ___________________________ the hypothesis and conclusion.

The notation for contrapositive is ____________________________.

Example:

\begin{itemize}
  \item \textbf{Conditional}: If the weather is good, then I will go swimming.
  \item \textbf{Converse}: If I go swimming, then the weather is good.
  \item \textbf{Contrapositive}: If I \underline{not} go swimming, then the weather is \underline{not} good.
\end{itemize}

The conditional statement and the contrapositive have the same truth value!
Examples: Find the contrapositive of each conditional statement.

If Sally visits Florida, then she will go to Disney World.

\[ \sim q \rightarrow \sim p: \quad \text{____________________________} \]

If the cross country team wins, then they will go to the state finals.

\[ \sim q \rightarrow \sim p: \quad \text{____________________________} \]

Laws of Logic: Law of Detachment

**Law of Detachment:** Given a conditional statement that is true and a hypothesis that is true, then the conclusion is also true.

1. One conditional statement
2. A statement of the hypothesis

Examples: Using the Law of Detachment, state the conclusion.

If an angle is obtuse, then it cannot be acute.

Angle A is obtuse.
Therefore, \[ \quad \text{________________________________________} \]

If I pass the test, then I get an “A” in Geometry.

I passed the test.
So, \[ \quad \text{________________________________________} \]

Examples: Using the Law of Detachment to draw conclusions.

If a person goes to the zoo, then he or she will see animals.

\[ \quad \text{Hypothesis} \]
\[ \quad \text{Conclusion} \]

If a person goes to the zoo, then he or she will see animals.

\[ \quad \text{Conclusion} \]
\[ \quad \text{Hypothesis} \]
Practice Using the Law of Detachment

State the conclusion.

1. If it is snowing, then I am going skiing.
   It is snowing. ______________________________________________________

2. If Jamal misses practice, then he is not allowed to play in tomorrow’s game.
   Jamal missed practice. ______________________________________________

3. If two angles form a linear pair, then they are supplementary.
   ∠A and ∠B form a linear pair. _______________________________________

Laws of Logic: Law of Syllogism (Transitive Property of Conditionals)

Law of Syllogism - if p→q and q→r, then p→r.

2 conditional statements
1 conditional statement as the conclusion

Examples: State the conclusion.

1. If a polygon is a hexagon, then the sum of its angles is 720°.
   If the sum of the angles of a polygon is 720°, then it has six sides.

   If a polygon is a hexagon, then it has six sides.

2. If I pass the test, then I get an A in Geometry.
   If I get an A in Geometry, then I get a new car.

   If I pass the test, then I get a new car.

3. If the electric power is cut, then the refrigerator does not work.
   If the refrigerator does not work, then the food spoils.

   ____________________________________________________________
Practice Using the Law of Syllogism and Detachment

1. If Mike goes to Allentown, then he will visit Dorney Park.
   If Mike goes to Dorney Park, then he will ride the Dominator.

2. If it is Black Friday, then I am getting up at 3 am.
   If I am getting up at 3 am, then I will find some good deals.

3. Write the conditionals that can be made based on the Law of Syllogism.
   
   1. If a bird is the fastest bird on land, then it is the largest of all birds.
   2. If a bird is the largest of all birds, then it is an ostrich.
   3. If a bird is a bee hummingbird, then it is the smallest of all birds.
   4. If a bird is the largest of all birds, then it is flightless.
   5. If a bird is the smallest bird, then it has a nest the size of a walnut half-shell.

State the law of logic illustrated by the statements.

4. If Ann is the oldest daughter, then Ann has the largest bedroom.
   Ann is the oldest daughter.
   Ann does have the largest bedroom.

5. If \( \angle A = 40^\circ \), then \( \angle B = 140^\circ \).
   If \( \angle B = 140^\circ \), then \( \angle C = 140^\circ \).
   If \( \angle A = 40^\circ \), then \( \angle C = 140^\circ \).
Assume the statements are true. Write the conclusion and state the law of logic illustrated.

6. If it snows today, then we will go skiing.
   It snows today.

7. If it snows today, then our family will go skiing.
   If our family goes skiing, then we will need motel reservations.
   It snows today.

8. If Tim gets stung by a bee, then he will get very ill.
   If he gets very ill, then he will go to the hospital.
   Tim gets stung by a bee.

State whether the argument is valid.

9. Pat knows that if he does not do his chores in the morning, he will not be able to play video games later that same day.
   Pat does not play video games on Friday afternoon.
   So, Pat did not do his chores on Friday morning.

10. If two angles are vertical, then they are congruent.
    \(\angle ABC\) and \(\angle DBE\) are vertical.
    \(\angle ABC\) and \(\angle DBE\) are congruent.