Section 2.3

Deductive Reasoning

REMEMBER:
Inductive reasoning uses patterns & observations.

Deductive reasoning uses facts, definitions, rules, or properties to reach a conclusion.
**LAW OF DETACHMENT**

If \( p \), then \( q \).

\( p \) is true.

**Conclusion:** \( q \) is true.

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**Example 1**

Use the Law of Detachment to reach a logical conclusion.

\[ p \quad \text{and} \quad q \]

If two numbers are odd, then their sum is even.

Three & five are odd numbers. \( p \) is true

either one \( \begin{cases} 
\text{Their sum is even.} \\
\text{The sum of 3 & 5 is even.} 
\end{cases} \)
**LAW OF SYLLOGISM**

If p, then q.
If q, then r.

**Conclusion:** If p, then r.

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**Example 2**

Use the Law of Syllogism to reach a logical conclusion.

If Elena takes the car to the store, then she will stop at the post office.

If Elena stops at the post office, then she will buy stamps.

Conclusion: If p, then r.

If Elena takes the car to the store, then she will buy stamps.
Example 3
Determine if a valid conclusion can be reached from the two true statements using the Law of Detachment or the Law of Syllogism. If a valid conclusion is possible, state it and the law that is used. If a valid conclusion does not follow, write no conclusion.

If Jay is from Quebec, then he is Canadian.

Jay is from Quebec.  \[ p \text{ is true} \]

Law of Detachment

Jay is Canadian.

Example 4
Determine if a valid conclusion can be reached from the two true statements using the Law of Detachment or the Law of Syllogism. If a valid conclusion is possible, state it and the law that is used. If a valid conclusion does not follow, write no conclusion.

If grandma drives a car, then she is going to the store.

Grandma is going to the store.  \[ q \text{ is true} \]

No conclusion
Example 5
Determine if a valid conclusion can be reached from the two true statements using the Law of Detachment or the Law of Syllogism. If a valid conclusion is possible, state it and the law that is used. If a valid conclusion does not follow, write no conclusion.

If Henry runs everyday, he gets better at running track.

If Henry gets better at running track, then he can race on Saturday.

Law of Syllogism
If Henry runs everyday, then he can race on Saturday.

Example 6
Determine if a valid conclusion can be reached from the two true statements using the Law of Detachment or the Law of Syllogism. If a valid conclusion is possible, state it and the law that is used. If a valid conclusion does not follow, write no conclusion.

If Amy earns an A, then she feels good about her grades.

If Amy earns an A, then she has studied.

No conclusion
Example 7
Determine if statement (3) follows from statements (1) and (2) by the Law of Detachment or the Law of Syllogism.
If it does, state which law was used.
If it does not, write invalid.

(1) If Holly is writing, then she is writing an essay for English.
(2) If Holly is writing an essay for English, then she is having fun.
(3) If Holly is writing, then she is having fun.

Law of Syllogism

Example 8
Determine if statement (3) follows from statements (1) and (2) by the Law of Detachment or the Law of Syllogism.
If it does, state which law was used.
If it does not, write invalid.

(1) If it is Saturday, then Mary is at her dad's.
(2) Mary is at her dad's. \( q \) is true.
(3) It is Saturday.

Invalid
Example 9
Determine if statement (3) follows from statements (1) and (2) by the Law of Detachment or the Law of Syllogism.
If it does, state which law was used.
If it does not, write invalid.

(1) If Georgia loses to Carolina, then Mr. Wingard is not happy.
(2) Georgia lost to Carolina.
(3) Mr. Wingard is not happy.

\( p \) is true
\( q \) is true
Law of Detachment