

Geometry 2.4

Use the law of detachment

Use the law of syllogism

conditional *if it's Xmas then Dec*

hypothesis & conclusion

inductive reasoning

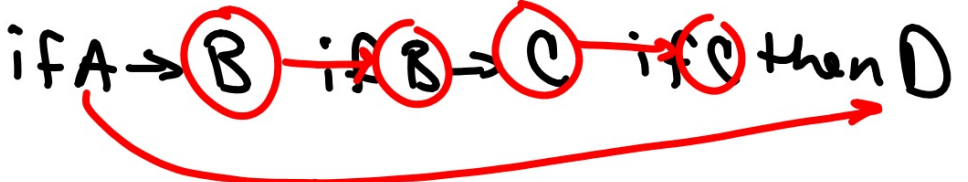
deductive reasoning *x → template (2)*

valid *follows rules*

invalid *does not meet require.*

Law of detachment

Law of syllogism *if A → B if B → C if C then D*



The diagram illustrates the Law of Syllogism with the logical statement: *if A → B if B → C if C then D*. In this statement, the variables A, B, C, and D are each enclosed in a red circle. Red arrows indicate the logical flow: one arrow points from the circle around B to the circle around C, and another arrow points from the circle around C to the word 'then' before D. A long red arrow also originates from the circle around B and points directly to the word 'then' before D, representing the transitive property of implication.

 Real-World Example 1 Inductive and Deductive Reasoning



Determine whether each conclusion is based on *inductive* or *deductive* reasoning.

- a. Every time Katie has worn her favorite socks to a softball game, she has gotten at least one hit. Katie is wearing her favorite socks to a game tonight, so she concludes that she will get at least one hit.

Look for a pattern, make a prediction
OR
Rules, definitions, algebra

if..then

- b. If John is late making his car insurance payment, he will be assessed a late fee of \$50. John's payment is late this month, so he concludes that he will be assessed a late fee of \$50.

D

Guided Practice

D

- 1A. All of the signature items on the restaurant's menu shown are noted with a special symbol. Kevin orders a menu item that has this symbol next to it, so he concludes that the menu item that he has ordered is a signature item.
- 1B. None of the students who ride Raul's bus own a car. Ebony rides a bus to school, so Raul concludes that Ebony does not own a car.



D

* If you buy something at WalMart, you have to pay sales tax.

H
Mrs. K at W.M.

Mrs. K pays taxes

H → C major premise
H minor premise
C apply
Concl.

Law of detachment

if no gas no start
no gas
no start

- * major premise: if...then
- * minor premise: this happened (H)
- * conclusion: therefore...

KeyConcept Law of Detachment

Words If $p \rightarrow q$ is a true statement and p is true, then q is true.

Example Given: If a car is out of gas, then it will not start.
Sarah's car is out of gas.

Valid Conclusion: Sarah's car will not start.

Guided Practice

$\text{if } S \rightarrow P$

3. **Given:** If a figure is a square, then it is a polygon.
Figure A is a square.

Conclusion: Figure A is a polygon.

If you consume too many calories, you will gain weight.

$\text{if } \text{cal} \rightarrow \text{wt.}$ $\text{if not wt} \rightarrow \text{not cal.}$
 $\frac{\text{wt}}{\text{cal}}$ $\frac{\text{not w}}{\text{not cal}}$

Is the minor premise about the hypothesis? (required)

$\text{if } B \rightarrow SS$

b. Given: If Mika goes to the beach, she will wear sunscreen.
Mika is wearing sunscreen.

Conclusion: Mika is at the beach.

$\frac{\sim B \rightarrow \sim A}{\sim B} \quad \frac{A \rightarrow B}{A} \quad B$

if nurfle the diagram.
nurfle.

diagram

If you give a pig a pancake...
Chain of conditional statements
Can link first to last (if you don't break the chain)

2 Law of Syllogism The **Law of Syllogism** is another valid form of deductive reasoning. This law allows you to draw conclusions from two true conditional statements when the conclusion of one statement is the hypothesis of the other.

Key Concept Law of Syllogism

Words If $p \rightarrow q$ and $q \rightarrow r$ are true statements, then $p \rightarrow r$ is a true statement.

Example *Given:* If **you get a job**, then **you will earn money**.
If **you earn money**, then **you will buy a car**.

Valid Conclusion: If **you get a job**, then **you will buy a car**.

Chain together in a logical order:

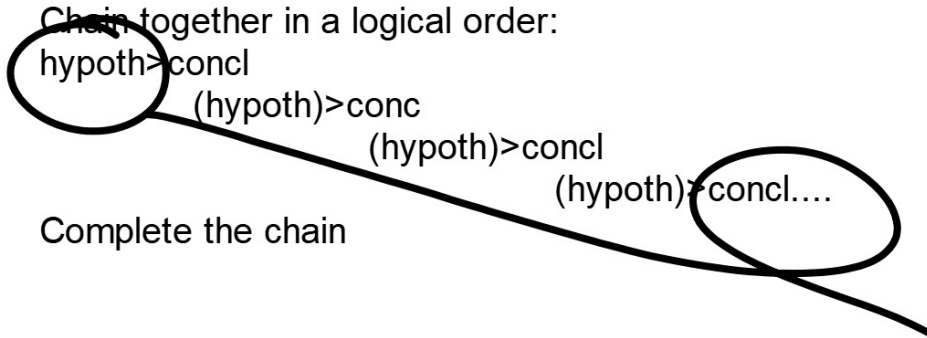
hypoth>concl

(hypoth)>conc

(hypoth)>concl

(hypoth)>concl....

Complete the chain



If you work hard, you will get good grades.

If you get good grades, you will be on the honor roll.

If you are on the honor roll, you will get a scholarship.

If you get a scholarship, you will go to college.

If you go to college, you will get a good job.

If you get a good job, you will make lots of money.

If you make lots of money, you will drive a nice car.

Connect the chain...

If you work hard,

Chain together...

Guided Practice

4. Determine which statement follows logically from the given statements.

(1) If you do not get enough sleep, then you will be tired.

(2) If you are tired, then you will not do well on the test.

~~X~~ If you are tired, then you will not get enough sleep.

☒ G If you do not get enough sleep, then you will not do well on the test.

H If you do not do well on the test, then you did not get enough sleep.

J There is no valid conclusion.



Do they chain together?



Standardized Test Example 4 Law of Syllogism

Determine which statement follows logically from the given statements.

(1) If you like musicals, then you enjoy theater productions.

(2) If you are an actor, then you enjoy theater productions.



Example 5 Apply Laws of Deductive Reasoning

Draw a valid conclusion from the given statements, if possible. Then state whether your conclusion was drawn using the Law of Detachment or the Law of Syllogism. If no valid conclusion can be drawn, write *no valid conclusion* and explain your reasoning.

Given: If you are 16 years old, then you can apply for a driver's license. Nate is 16 years old.

p : You are 16 years old.

q : You can apply for a driver's license.

11-33 ok
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