Geometry 2.4

1) Use the law of detachment
2) Use the law of syllogism

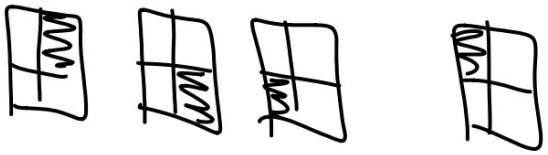
conditional — if (Sat.) then (tom. Sun.)
hypothesis & conclusion — if ... then ...
inductive reasoning
deductive reasoning — rules, def, template
valid — follows logical rules
invalid — violates " "
Law of detachment
Law of syllogism

**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.

2, 5, 8, 11 . . .



Look for a pattern, make a prediction

OR

Rules, definitions, algebra

deductive

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.

if late → $50.00 fee.

late

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$50 fee

(cond.) major premise

(fact) minor premise (hypoth).

(fact) conclusion

if p then q.

p

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q

Law of detachment

If symbol then sign.

Symbol

Sign. Item.

## GuidedPractice

**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.

(if bus, no car.

L.O.D.

→ bus

no car

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

~~*~~ paid tax

W. M.

invalid

if no gas not start
no gas
did not start

major premise: if...then
minor premise: this happened
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.<br>Sarah's car is out of gas. |
| | *Valid Conclusion:* Sarah's car will not start. |

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

too many

gain weight

Is the minor premise about the hypothesis? (required)

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

**Conclusion: Mika is at the beach.**

if beach then S.S.

S.S.

at beach

invalid

if square then polyg.
square

## GuidedPractice

**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 blecch then snort.

not snort

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not blecch

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

L. O. D.

## 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.

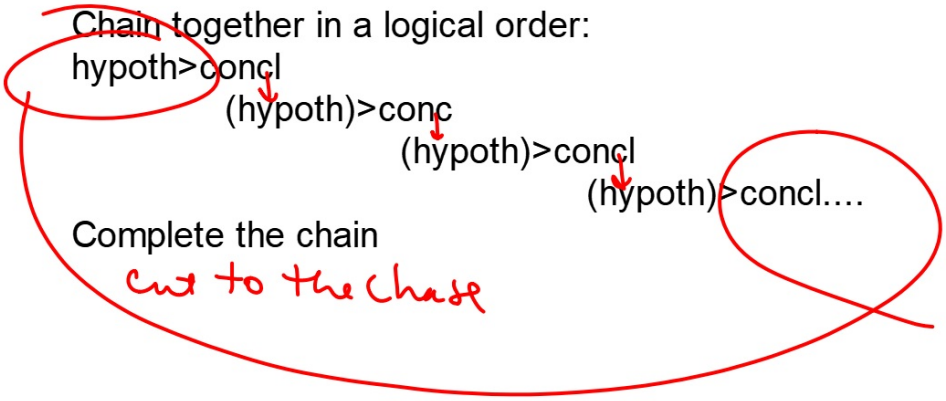
Cut to the chase:

**KeyConcept 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.<br>If you earn money, then you will buy a car.<br>*Valid Conclusion:* If you get a job, then you will buy a car. |

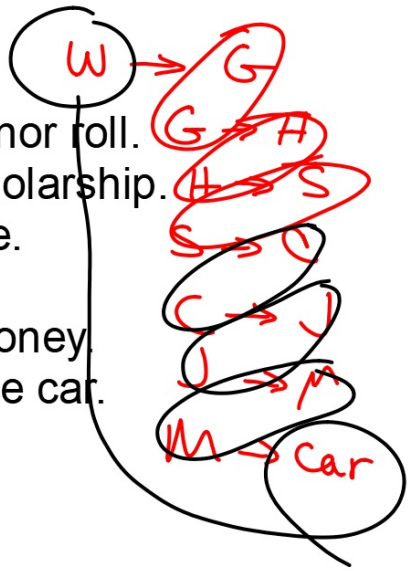
J → M
M → C

a = b  b = c
a = c


Chain together in a logical order:
hypoth>concl
(hypoth)>conc
(hypoth)>concl
(hypoth)>concl....
Complete the chain
cut to the chase

L.O.S. (trans. prop.)

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…

**GuidedPractice**

**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.

F 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.

no valid


**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.

A If you are an actor, then you like musicals.

B If you like musicals, then you are an actor.

C If you do not enjoy musicals, then you are not an actor.

D There is no valid conclusion.

L.O.D. if 16 then D.L.

Nate is 16.

D.L

**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.

2.4 11-33odd

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