



James Madison
HIGH SCHOOL

Deductive Reasoning



James Madison HIGH SCHOOL Objectives

- Learn and Use Law of Detachment
- Learn and Use Law of Syllogism



James Madison HIGH SCHOOL Definition

- Deductive Reasoning – to reach a logical conclusion by using facts, rules, definitions, or properties.
- Remember: Inductive Reasoning uses examples to make conjectures!



James Madison HIGH SCHOOL Laws

- **Law of Detachment** and **Law of Syllogism** are both a form of deductive reasoning that is used to draw conclusions from true conditional statements.



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Law of Detachment

- If $p \rightarrow q$ is true AND p is true, then q is also true.
- In symbols: $[(p \rightarrow q) \wedge p] \rightarrow q$



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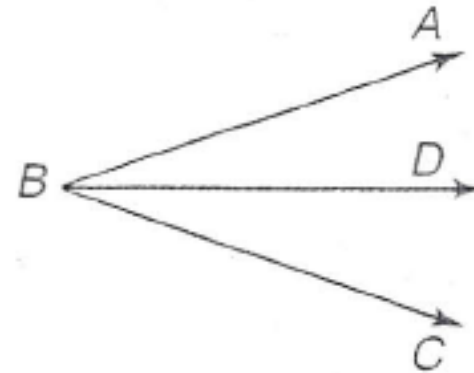
Determine if the Conclusion is Valid

- We know: If a ray is an angle bisector, then it divides the angle into two congruent angles.

• Given: BD bisects $\angle ABC$

Conclusion: $\angle ABD \cong \angle CBD$

Valid?



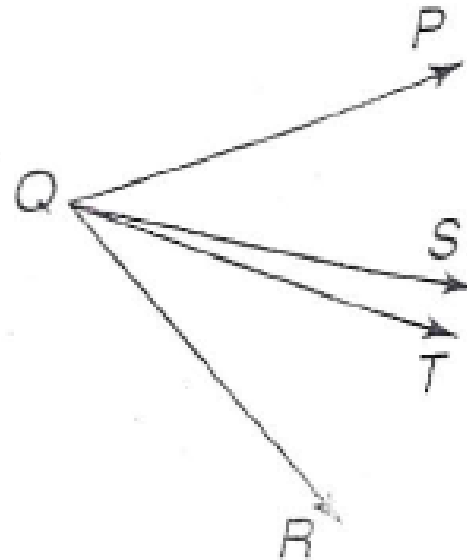


James Madison HIGH SCHOOL Cont.

- Given: $\angle PQT \cong \angle RQS$

Conclusion: QS and QT are angle bisectors.

Valid?





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Law a Syllogism

- If $p \rightarrow q$ and $q \rightarrow r$ are true, then $p \rightarrow r$ is also true
- In symbols: $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$
- This is similar to the Transitive Property



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Use Law of Syllogism to determine whether a valid conclusion can be reached:

- Given: (1) If the symbol of a substance is PB, then it is lead. (2) The atomic number of lead is 82.
- Hint: use letters to represent the parts of a statement:
p: the symbol of a substance is PB
q: it is lead
r: the atomic number is 82.
- Can there be a valid conclusion?



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Use Law of Syllogism to determine whether a valid conclusion can be reached:

- Given: (1) Water can be represented as H_2O . (2) Hydrogen, H, and oxygen, O, are in the atmosphere.
- Can there be a valid conclusion?



James Madison HIGH SCHOOL Example

- 1. If you drive safely, then you can avoid accidents.
2. Tim drives safely.
3. Tim can avoid accidents.

- Law of Detachment!



James Madison HIGH SCHOOL Example

- 1. If you are a customer, then you are always right
 - 2. If you are a teenager, then you are always right
 - 3. If you are a teenager, then you are a customer
-
- INVALID



James Madison HIGH SCHOOL Example

- 1. If you are an athlete, then you work out.
2. If you work out, then you are in shape.
3. If you are an athlete, then you are in shape.

- Law of Syllogisms