2-4 Deductive Reasoning

Vocabulary

Review

Write the *converse* of each conditional.

1. If I am thirsty, then I drink water.

   _____

2. If the car outside is wet, then it rained.

   _____

Vocabulary Builder

deduce (verb) **dee DOOS**

Related Words: deductive (adjective), deduction (noun)

Definition: To **deduce** is to use known facts to reach a conclusion.

Main Idea: When you use general principles and facts to come to a conclusion, you **deduce** the conclusion.

Example: Your friend is wearing red today. He wears red only when there is a home game. You use these facts to **deduce** that there is a home game today.

Use Your Vocabulary

Complete each statement with a word from the list. Use each word only once.

deduce deduction deductive

3. You use _?_ reasoning to draw a conclusion based on facts. _____
4. The conclusion of your reasoning is a _?_. _____
5. The teacher will not _?_ that a dog ate your homework. _____

Take note

Property Law of Detachment

Law

If the hypothesis of a true conditional is true, then the conclusion is true.

Symbols

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

Problem 1 Using the Law of Detachment

Got It? **What can you conclude from the given information?**

If there is lightning, then it is not safe to be out in the open.
Marla sees lightning from the soccer field.

6. Underline the hypothesis of the conditional. Circle the conclusion.

If there is lightning, then it is not safe to be out in the open.

Underline the correct word or phrase to complete each sentence.

7. "Marla sees lightning from the soccer field" fits / does not fit the hypothesis of the conditional.

8. It is safe / not safe to be on the soccer field.

Take note

Property Law of Syllogism

You can state a conclusion from two true conditional statements when the conclusion of one statement is the hypothesis of the other statement.

If $p \rightarrow q$ is true and $q \rightarrow r$ is true, then $p \rightarrow r$ is true.

Complete each conclusion.

9. If it is July, then you are on summer vacation.

If you are on summer vacation, then you work in a smoothie shop.

Conclusion: If it is July, then _____.

10. If a figure is a rhombus, then it has four sides.

If a figure has four sides, then it is a quadrilateral.

Conclusion: If a figure is a rhombus, then _____.

Problem 2 Using the Law of Syllogism

Got It? **What can you conclude from the given information? What is your reasoning?**

If a number ends in 0, then it is divisible by 10.
If a number is divisible by 10, then it is divisible by 5.

11. Identify p, q, and r.

p: a number ends in _____ q: a number is divisible by _____ r: a number is divisible by _____

12. Decide whether each part of the given information is *true* or *false*. Write T for *true* or F for *false*.

_____ $p \rightarrow q$ _____ $q \rightarrow r$ _____ $p \rightarrow r$

13. Circle the part of the Law of Syllogism that you will write.

$p \rightarrow q$ $q \rightarrow r$ $p \rightarrow r$

14. Now write your conclusion.

If _____, then _____.

Problem 3 Using the Laws of Syllogism and Detachment

Got It? **What can you conclude from the given information? What is your reasoning?**

If a river is more than 4000 mi long, then it is longer than the Amazon.
If a river is longer than the Amazon, then it is the longest river in the world.
The Nile is 4132 mi long.

15. Identify p, q, and r in the given information.

p: _____

q: _____

r: _____

16. Use the Law of Syllogism to complete the conditional.

If a river is more than _____.

then it _____.

17. Use the Law of Detachment and the conditional in Exercise 16 to write a conclusion.

The Nile is _____.

Lesson Check • Do you know HOW?

If possible, make a conclusion from the given true statements. What reasoning did you use?

If a figure is a three-sided polygon, then it is a triangle.

Figure *ABC* is a three-sided polygon.

18. Identify p and q in the first statement.

p: _____

q: _____

19. Underline the correct words to complete each sentence.

The second statement matches the hypothesis / conclusion of the first statement.

I can use the Law of Detachment / Syllogism to state a conclusion.

20. Write your conclusion.

_____

Lesson Check • Do you UNDERSTAND?

Error Analysis **What is the error in the reasoning below?**

~~Birds that weigh more than 50 pounds cannot fly. A kiwi cannot fly. So, a kiwi weighs more than 50 pounds.~~

21. Write "Birds that weigh more than 50 pounds cannot fly" as a conditional.

_____

_____

22. Write the hypothesis of the conditional in Exercise 21.

_____

Underline the correct word to complete each sentence.

23. "A kiwi cannot fly" matches the hypothesis / conclusion of the conditional.

24. The student incorrectly applied the Law of Detachment / Syllogism.

Math Success

Check off the vocabulary words that you understand.

☐ Law of Detachment ☐ Law of Syllogism ☐ deductive reasoning ☐ conditional

Rate how well you can use *deductive reasoning*.

Need to review 0 2 4 6 8 10 Now I get it!