Just In Time Quick Check

Standard of Learning (SOL) G.1a

Strand: Reasoning, Lines, and Transformations
Standard of Learning (SOL) G.1a ***The student will use deductive reasoning to construct and judge the validity of a logical argument consisting of a set of premises and a conclusion. This will include identifying the converse, inverse, and contrapositive of a conditional statement.***
Grade Level Skills: ● Identify the converse, inverse, and contrapositive of a conditional statement.
Just in Time Quick Check
Just in Time Quick Check Teacher Notes
Supporting Resources: ● VDOE Mathematics Instructional Plans (MIPS) o G.1ab – Logic and Conditional Statements (Word) / PDF Version ● VDOE Word Wall Cards: Geometry (Word) | (PDF) o Logic Notation o Conditional Statement o Converse o Inverse o Contrapositive o Symbolic Representations in Logical Arguments o Conditional Statements and Venn Diagrams ● Other VDOE Resources o Geometry Logic and Proofs: Conditional Statements Lesson 3[eMediaVA] o Geometry Logic and Proofs: Conditional Statements Lesson 3 Part 2 [eMediaVA] o Geometry, Module 1, Topic 1 – Conditional and Biconditional Statements[eMediaVA]
Supporting and Prerequisite SOL: None

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1. Statement: *If a figure is a rectangle, then it has four right angles.*
   a) Write the converse of the given statement.

2. Write the inverse of the following statements.
   a) If it is not raining, then we will have our baseball game.
   b) If $x = 2$, then $x + 4 = 6$.

3. Statement: A six-sided polygon is a hexagon.
   a) Write the statement in if-then form
   b) Write the contrapositive of the given statement.

4. Given: $p \rightarrow \sim q$.
   a) What is the converse of this statement?
   b) What is the inverse of this statement?
   c) What is the contrapositive of this statement?

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Common Errors/Misconceptions and their Possible Indications

1. Statement: *If a figure is a rectangle, then it has four right angles.*
   a) Write the converse of the given statement.

   A common misconception some students may have is to confuse the converse and the inverse. Another common misconception is some students may confuse the converse and the contrapositive. This might indicate that students do not properly understand the vocabulary terms. These students may benefit from the use of Word Wall Cards as an anchor chart to provide a visual cue. Teachers may consider phrases or other connections to help students remember the difference between converse and inverse and between converse and contrapositive. To help students understand the contrapositive, have them think about it as the "inverse of the converse." They are changing the order of the hypothesis and the conclusion of the inverse statement. Students may benefit from additional practice in matching sentence strips to create the converse, inverse, and contrapositive to a given conditional statement. For students having difficulty discerning the hypothesis and conclusion, one strategy may be helpful for students is to underline the hypothesis and circle the conclusion.

2. Write the inverse of the following statements.
   a) If it is not raining, then we will have our baseball game.
   b) If $x = 2$, then $x + 4 = 6$.

   A common misconception a student might have for part a would be to think the word "not" must be included in both the hypothesis and conclusion. This may indicate that a student is not aware that they must adjust the hypothesis and conclusion to represent the opposite of each component. In part b, some students may have difficulty expressing the inverse when mathematical symbols are involved. This may indicate that a student does not understand writing the inverse of a conditional statement in symbolic form. Students would benefit from examples that include the word "not" as well as examples that include mathematical equations. A strategy that could be used with students is to have them create statements and then partner with another student to negate the statement and then progress to writing the inverse of the statement. Teachers are also encouraged to provide real world examples which may resonate more with students.

3. Statement: A six-sided polygon is a hexagon.
   a) Write the statement in if-then form
   b) Write the contrapositive of the given statement.

   A common misconception some students may have is incorrectly identifying the hypothesis and conclusion, in a statement that is not in if-then form. This may indicate that a student does not understand how to transfer a statement into a conditional statement written in if-then form. A strategy that might benefit some students is to start with an if-then statement and transition backwards into a non-conditional statement. An additional strategy is to have students create their own conditional statement and rewrite it as a non-conditional statement and then identify the hypothesis and conclusion in both statements.

   Some students may confuse the contrapositive with the converse. Students may benefit from additional practice in matching sentence strips to create the converse, inverse, and contrapositive to a given conditional statement. For students having difficulty discerning the hypothesis and conclusion, one strategy may be helpful for students is to underline the hypothesis and circle the conclusion.

Teachers may benefit from using VDOE Mathematics Instructional Plans (MIPS) specifically Logical and Conditionals Statements Part 2.

4. Given: $p \rightarrow \sim q$.
   a) What is the converse of this statement?
   b) What is the inverse of this statement?
   c) What is the contrapositive of this statement?

Some students may understand how to write the converse, inverse, and contrapositive, but struggle when they must write the statement in symbolic form. In addition, the concept of negating the symbolic form is difficult for some students. A strategy that may be used to help students is to use index cards and have a card with each of the following: p, q, →, ~. Teachers may write a conditional and then use the notecards to place the symbols above the words. Once students are familiar with transferring the written to the symbolic, they can progress to all symbolic notation. Using the notecards may also help some students when they must negate a 'not'. They can transfer the knowledge of two negatives (minus a negative) means a positive from algebra.