Conditional Statements and Counterexamples TEKS *G.3.A, G.3.C*

A **conditional statement** has two parts, a hypothesis and a conclusion. When a conditional statement is written in **if-then form**, the "if" part contains the **hypothesis** and the "then" part contains the **conclusion**. An example of a conditional statement is shown below.

If **a triangle is equiangular**, then **each angle of the triangle measures 60°**.

Hypothesis   Conclusion

The **converse** of a conditional statement is formed by switching the hypothesis and the conclusion. The converse of the statement above is as follows:

If **each angle of a triangle measures 60°**, then **the triangle is equiangular**.

EXAMPLE   **Rewrite the conditional statement in if-then form. Then write its converse and tell whether the converse is *true* or *false*.**

  a. Bob will earn $20 by mowing the lawn.

    If-then form: If Bob mows the lawn, then he will earn $20.

    Converse: If Bob earns $20, then he mowed the lawn. False

  b. $x = 8$ when $5x + 1 = 41$.

    If-then form: If $5x + 1 = 41$, then $x = 8$.

    Converse: If $x = 8$, then $5x + 1 = 41$. True

A **biconditional statement** is a statement that has the words "if and only if." You can write a conditional statement and its converse together as a biconditional statement.

  A triangle is equiangular if and only if **each angle of the triangle measures 60°**.

A biconditional statement is true only when the conditional statement and its converse are both true.

EXAMPLE   **Tell whether the biconditional statement is *true* or *false*. Explain.**

  a. An angle measures 90° if and only if it is a right angle.

    Conditional: If an angle is a right angle, then it measures 90°. True
    Converse: If an angle measures 90°, then it is a right angle. True

    ▶ The biconditional statement is true because the conditional and its converse are both true.

  b. Bonnie has $.50 if and only if she has two quarters.

    Conditional: If Bonnie has two quarters, then she has $.50. True
    Converse: If Bonnie has $.50, then she has two quarters. False

    ▶ The biconditional statement is false because the converse is not true.