Worksheet 2.4 Bi-Conditional Statements

Write true or false for each statement. A biconditional is true only if both the conditional and converse are true. If the biconditional is false, give a counterexample.

1. Conditional: If \( x = 1 \), then \( x > 0 \).
   
   Converse: If \( x > 0 \), then \( x = 1 \).
   
   Biconditional: \( x = 1 \) if and only if \( x > 0 \).
   
   Counterexample: ______________________________

2. Conditional: If it is 3:30 AM, then it is night.
   
   Converse: If it is night, then it is 3:30 AM.
   
   Biconditional: It is 3:30 AM if and only if it is night.
   
   Counterexample: ______________________________

3. Colton says “I will graduate from high school if and only if I earn a high school diploma.” Is Colton’s biconditional true or false?
   
   ____________________________

Write the conditional statement and converse within each biconditional.

4. The tea kettle is whistling if and only if the water is boiling.
   
   Conditional: _____________________________________________________
   
   Converse: ______________________________________________________

5. A biconditional is true if and only if the conditional and converse are both true.
   
   Conditional: _____________________________________________________
   
   Converse: ______________________________________________________

For each conditional, write the converse and a biconditional statement.

6. Conditional: If \( n \) is an odd number, then \( n - 1 \) is divisible by 2.
   
   Converse: ______________________________________________________
   
   Biconditional: _________________________________________________

7. Conditional: An angle is obtuse when it measures between 90° and 180°.
   
   Converse: ______________________________________________________
   
   Biconditional: _________________________________________________
Determine whether a true biconditional statement can be determined from each conditional statement. If not, give a counterexample.

8. If the lamp is unplugged, then the bulb does not shine.

______________________________________________________________________________

9. If the date is the 29\textsuperscript{th}, then it is not February.

______________________________________________________________________________

Write each definition as a biconditional.

10. A cube is a three-dimensional solid with six square faces.

______________________________________________________________________________

11. Brandon claims that the definition of \textit{doofus} is Alec.

______________________________________________________________________________

Fill in the blanks.

12. A biconditional combines a conditional and its ________________.

13. A biconditional can be written in the form “p if and only if q” which means “if p, then q, and if _____, then _____.

Determine whether each of the following statements is a postulate or definition.

14. If two lines intersect, then they intersect in exactly one point. __________

15. A right triangle is a triangle that contains a right angle. __________

16. If B is between A and C, then AB + BC = AC. __________

17. If P, Q, and R are three noncollinear points, then there is exactly one plane containing P, Q, and R. __________

18. The midpoint of a segment is the point of a segment that is the same distance from the endpoints. __________