

## Worksheet 13.6III: Equivalent Statements, Symbolic and Syllogistic Arguments

Write the statement in symbolic form given

p: Celion is the president

q: Sheldon is the vice president

r: Ron is the secretary

1. Celion is the president but Ron is the secretary, or Sheldon is not the vice president.
2. If Ron is the secretary then Sheldon is the vice president, or Celion is not the president.
3. It is false that Ron is the secretary if and only if Sheldon is not the vice president.

Use p, q, and r as above to write each symbolic statement in words.

4.  $\sim(p \rightarrow \sim r)$

5.  $p \leftrightarrow (q \wedge r)$



Find the truth value of the statement.

8.  $2 + 6 = 8$  or  $7 - 12 = 5$

9. A scissor can cut paper or a nickel has the same value as two dimes, if and only if Louisville is a city in Kentucky.

Given that  $p$  is true,  $q$  is false, and  $r$  is true, determine the truth value of the statement.

10.  $[\sim(r \rightarrow \sim p)] \vee (q \rightarrow p)$

11.  $(r \vee q) \leftrightarrow (p \wedge \sim q)$

Determine whether the two statements are equivalent.

12.  $p \wedge q$                        $\sim(\sim p \vee \sim q)$

13.  $(\sim p \vee \sim q) \rightarrow r$                $\sim(p \wedge q) \rightarrow r$

14.  $q \leftrightarrow (p \wedge \sim r)$                $q \rightarrow (p \vee r)$

Determine which, if any, of the three statements are equivalent.

15.    a) If the bird is red, then it is a cardinal.  
       b) The bird is not red or it is a cardinal.  
       c) If the bird is not red, then it is not a cardinal.

16. a) It is not true that the test is today or the concert is tonight.  
b) The test is not today and the concert is not tonight.  
c) If the test is not today, then the concert is not tonight.

17. Translate the following argument into symbolic form. Determine whether the argument is valid or invalid comparing the argument to a recognized form or by using a truth table.

If the soccer team wins the game, then Sue played fullback. If Sue played fullback, then the team is in second place. Therefore, if the soccer team wins the game, then the team is in second place.

18. Use a Euler diagram to determine whether the syllogism is valid or a fallacy.

All cars have engines.

Some things with engines use gasoline.

∴ Some cars use gasoline

Write the negation of the statement.

19. All leopards are spotted.

20. Some people are funny.

21. The conditional statement "If the apple is red, then it is a delicious apple" is given. Write the inverse, the converse, and the contrapositive of the statement.