

Write the contrapositive of each of these statements (use deMorgan's laws on 2-5)

1. $p \rightarrow \sim q$

2. $p \rightarrow (q \vee r)$

3. $(p \vee q) \rightarrow r$

4. $p \rightarrow (q \wedge r)$

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

For each statement, circle the statement that is logically equivalent:

6. If a quadrilateral has 4 equal sides, then its diagonals are perpendicular

- a) If a quadrilateral does not have 4 equal sides, then its diagonals are not perpendicular
- b) If a quadrilateral has perpendicular diagonals, then it has 4 equal sides
- c) If a quadrilateral does not have perpendicular diagonals, then it does not have 4 equal sides.

7. For the case where a transversal line falls on two other lines, and a pair of corresponding angles is chosen:

If the corresponding angles are equal, then the two lines are parallel

- a) If the two lines are not parallel, then the corresponding angles are not equal
- b) If the two lines are parallel, then the corresponding angles are equal
- c) If the corresponding angles are not equal, then the two lines are not parallel.

8. If an R-set is finite, then every element is a unit or a zero divisor.

- a) If every element of an R-set is not a unit and not a zero divisor then the R-set is not finite.
- b) If every element of an R-set is not a unit or not a zero divisor then the R-set is not finite.
- c) If some element of an R-set is not a unit and not a zero divisor then the R-set is not finite.
- d) If some element of an R-set is not a unit or not a zero divisor then the R-set is not finite.

Prove each of these statements by using a contrapositive argument (assume $\sim q$ and prove $\sim p$)

9. If $xy > 100$ then $x > 10$ or $y > 10$

10. If n^2 is odd then n is odd.

11. If $n^2 + 4x + 3$ is even, then n is odd