

Logic: The Conditional and Related Statements
Worksheet Solutions

1. Determine if each of the following statements is true or false.

(a) If the consequent of a conditional statement is true, the conditional statement is true.

True

(b) If q is true then $(p \wedge (q \rightarrow r)) \rightarrow q$ is true.

True

(c) $T \rightarrow (10 < 4)$

False

(d) $F \rightarrow (8 < 2)$

True

2. Use truth tables to show that the following statements are equivalent.

(a) $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$

(b) $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$

(c) $p \rightarrow q \equiv \sim q \rightarrow \sim p$

3. Write the converse, the inverse, and the contrapositive of the following statements. It may be helpful to rewrite the original statement in the *if...then* form.

Solutions may vary

- (a) A rolling stone gathers no moss.
If a stone gathers no moss, then it is rolling.
If a stone does not roll then it gathers no moss.
If a stone gathers moss then it is not rolling.
- (b) Receiving a B in the class is sufficient for moving on to the next level.
If you move on to the next level then you receive a B in the class.
If you do not receive a B in the class then you do not move on to the next level.
If you do not move on to the next level then you do not receive a B in the class.
- (c) Having passed a math class is necessary to graduate from UH Manoa.
If you have passed a math class then you graduate from UH Manoa.
If you do not graduate from UH Manoa then you have not passed a math class.
If you have not passed a math class then you don't graduate from UH Manoa.
- (d) If I had a million dollars, I'd be rich.
If I was rich then I would have a million dollars.
If I do not have a million dollars then I am not rich.
If I am not rich then I don't have a million dollars.
4. You are traveling along a path when you realize you are lost. You encounter two forest dwellers, Hall and Oates. Hall says, I and Oates are different. Oates claims, Its false that Hall is an orc. Can you determine who is an elf and who is an orc?
Hall and Oates are both orcs.