Instructions   Submission   Instructor example   Give feedback

Assignment instructions

🕐 120 minutes to complete | 👤 19 student solutions

Each question will take a decent amount of time to complete. Although it is recommended that you spend 2 hours completing this assignment, it might take more time, and that is understandable. That doesn't mean that you are bad at mathematics - it means you are persistent, and that's a great trait to have. Please note though that I don't want you spending too much time on these problems. If you get stuck in the mindset of "I have no idea what to do from here," then wait 2 minutes and then review the solution. It's okay to cheat in this course, because the purpose is ultimately that you learn the mathematics here. If you review the solution, I want you to think about how to get there. Please feel free to message me if you have any questions about how to get to each solution. I am more than happy to help you.

Questions for this assignment

1. **For each sentence below, decide whether it is an atomic statement, a molecular statement, or not a statement at all.**

   (a) Customers must wear shoes.

   (b) The customers wore shoes.

   (c) The customers wore shoes and they wore socks.

2. **Suppose P and Q are the statements: P: Jack passed math. Q: Jill passed math.**

   (a) Translate "Jack and Jill both passed math" into symbols.

   (b) Translate "If Jack passed math, then Jill did not" into symbols.

   (c) Translate "P ∨ Q" into English.

   (d) Translate "¬(P ∧ Q) → Q" into English.

   (e) Suppose you know that if Jack passed math, then so did Jill. What can you conclude if you know that:

can you conclude if you know that:

i. **Jill passed math?**

ii. **Jill did not pass math?**

3. **Determine whether each molecular statement below is true or false, or whether it is impossible to determine. Assume you do not know what my favorite number is (but you do know that 13 is prime).**

   (a) If 13 is prime, then 13 is my favorite number.

   (b) If 13 is my favorite number, then 13 is prime.

   (c) If 13 is not prime, then 13 is my favorite number.

   (d) 13 is my favorite number or 13 is prime.

   (e) 13 is my favorite number and 13 is prime.

   (f) 7 is my favorite number and 13 is not prime.

   (g) 13 is my favorite number or 13 is not my favorite number.

4. **In my safe is a sheet of paper with two shapes drawn on it in colored crayon. One is a square, and the other is a triangle. Each shape is drawn in a single color. Suppose you believe me when I tell you that if the square is blue, then the triangle is green. What do you therefore know about the truth value of the following statements?**

   (a) The square and the triangle are both blue.

   (b) The square and the triangle are both green.

   (c) If the triangle is not green, then the square is not blue.

   (d) If the triangle is green, then the square is blue.

   (e) The square is not blue or the triangle is green.

5. **Again, suppose the statement "if the square is blue, then the triangle is green" is true. This time however, assume the converse is false. Classify each statement below as true or false (if possible).**

   (a) The square is blue if and only if the triangle is green.

   (b) The square is blue if and only if the triangle is not green.

   (c) The square is blue.

   (d) The triangle is green.

6. **Consider the statement, "If you will give me a cow, then I will give you magic beans." Decide whether each statement below is the converse, the contrapositive, or neither.**

(a) If you will give me a cow, then I will not give you magic beans.

(b) If I will not give you magic beans, then you will not give me a cow.

(c) If I will give you magic beans, then you will give me a cow.

(d) If you will not give me a cow, then I will not give you magic beans.

(e) You will give me a cow and I will not give you magic beans.

(f) If I will give you magic beans, then you will not give me a cow.

7. You have discovered an old paper on graph theory that discusses the viscosity of a graph (which for all you know, is something completely made up). A theorem in the paper claims that "if a graph satisfies condition (V), then the graph is viscous." Which of the following are equivalent ways of stating this claim? Which are equivalent to the converse of the claim?

(a) A graph is viscous only if it satisfies condition (V).

(b) A graph is viscous if it satisfies condition (V).

(c) For a graph to be viscous, it is necessary that it satisfies condition (V).

(d) For a graph to be viscous, it is sufficient for it to satisfy condition (V).

(e) Satisfying condition (V) is a sufficient condition for a graph to be viscous.

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