Discrete Mathematics and Proof Unit 1 practice: A conditional and its contrapositive

Name _____ Date _____ Period _____

1. Give the contrapositive of each conditional, in symbols. Cancel any double negation.

(a) $J \to K$

(b) $L \to \neg M$

(c) $\neg K \to L$

(d) $\neg M \to \neg J$

(e) $L \to J$

(f) $K \to \neg M$

2. Decide which of the four are true: the claim, its converse, its inverse and its contrapositive.

(a) For integers n: if n is a multiple of 15, then n is a multiple of 5.

(b) For real x: if $x < 9$, then $x < 7$.

(c) For real x: if $6x > -36$, then $x > -6$.

(d) For integers n: if n is even, then n is a multiple of 9.

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3. Answer each in symbols, or with true and false.

(a) The contrapositive of a conditional is $R \to \neg S$. Write the conditional.

(b) Take P true and Q false. Find the truth values of the converse, the inverse and the contrapositive of $P \to \neg Q$.

(c) Jack says the contrapositive of $(M \vee N) \to \neg K$ is $K \to (\neg M \vee \neg N)$. Find the mistake and write the correct contrapositive.

(d) The inverse of a conditional is $\neg A \to B$. Write the contrapositive of that conditional.

4. (a) A swim club's rule says: "If a swimmer is in the deep lane, the swimmer wears a red cap." On Saturday 11 swimmers used the deep lane, 2 of them without a red cap, and 13 swimmers in all wore red caps. How many swimmers break the rule's contrapositive, and how many break its converse?

(b) A kiln's warning light follows the rule: "If the temperature is above 650 degrees or the door is open, the light is on." The light is off. What do you know about the temperature t and the door?

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