Home Work 3

June 14, 2024

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1 Question

Rewrite the statements in if-then form.

(a) $If\ the\ loop\ does\ not\ contain\ a\ stop\ or\ a\ go\ to,\ then\ it\ will\ repeat\ exactly\ N\ times$

(b) $If\ you\ do\ not\ freeze,\ then\ I'll\ shoot$

(c) $If\ you\ do\ not\ fix\ my\ ceiling,\ then\ I\ won't\ pay\ my\ rent$

2 Question

Construct truth tables for the statement forms.

(a)

p	q	$\sim p$	$\sim q$	$\sim p \vee q$	$\sim p \vee q \to \sim q$
T	T	F	F	T	F
T	F	F	T	F	T
F	T	T	F	T	F
F	F	T	T	T	T

(b)

p	q	$p \vee q$	$\sim p$	$\sim p \wedge q$	$(p \vee q) \vee (\sim p \wedge q)$	$(p \vee q) \vee (\sim p \wedge q) \to q$
T	T	T	F	F	T	T
T	F	T	F	F	T	F
F	T	T	T	T	T	T
F	F	F	T	F	F	T

(c)

p	q	r	$p \to r$	$q \to r$	$(p \to r) \leftrightarrow (q \to r)$
T	T	T	T	T	T
T	T	F	F	F	T
T	F	T	T	T	T
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	F	F
F	F	T	T	T	T
F	F	F	T	T	T

3 Question

Suppose that p and q are statements so that p $\rightarrow$ q is false. Find the truth values.

(a) $True$

(b) $True$

(c) $True$

4 Question

(a) $(A.) \sim (p \wedge \sim q) \vee r \equiv (\sim p \vee q) \vee r$
$(B.) (\sim p \vee q) \vee r \equiv \sim (\sim (\sim p \vee q) \wedge \sim r)$

(b) $(A.) \sim (p \vee \sim q) \vee (r \vee q) \equiv (\sim p \wedge p) \vee (r \vee q)$
$(B.) (\sim p \wedge q) \vee (r \vee q) \equiv \sim (\sim (\sim p \wedge q) \wedge \sim (r \vee q))$

(c)

(d)

5 Question

Write negations, contrapositives, converse and in-verse for each of the following statements.

(a) Negation: P is a rectangle and P is not a square
Contrapositive: If P is not a square, then P is not a rectangle
Converse: If P is a square, then P is a rectangle
Inverse: If P is not a rectangle, then P is not a square

(b) Negation: Today is New Year's Eve and tomorrow is February
Contrapositive: If tomorrow is February, then today is not New Year's Eve
Converse: If tomorrow is not February, then today is New Year's Eve
Inverse: If today is not New Year's Eve, then tomorrow is February

(c) Negation: n is prime and n is not odd and n is not 2
Contrapositive: If n is not odd and n is not 2, then n is not prime
Converse: If n is odd or n is 2, then n is prime
Inverse: If n is not prime, then n is not odd and n is not 2

(d) Negation: Jane is Ann's mother and Jim is not her uncle or Sue is not her aunt
Contrapositive: If Jim is not her uncle or Sue is not her aunt, then Jane is not Ann's mother

Converse: If Jim is her uncle and Sue is her aunt, then Jane is Ann's mother
Inverse: If Jane is not Ann's mother, then Jim is not her uncle and Sue is not her aunt

6 Question

Some of the arguments are valid, whereas others exhibit the converse or the inverse error. Use symbols to write the logical form of each argument. If the argument is valid, identify the rule of inference that guarantees its validity. Otherwise, state whether the converse or the inverse error is made.

(a) (Jules solved this problem correctly) = p (Jules obtained the answer 2) = q
(A.) $p \to q$
(B.) q
(C.) $\therefore p$
Converse error

(b) (I go to the movies) = p (I finish my homework) = q (I do well on the exam tomorrow) = r
(A.) $p \to \sim q$
(B.) $q \to \sim r$
(C.) $\therefore q \to \sim r$
Valid, Hypothetical Syllogism

(c) (at least one of these two numbers is divisible by 6) = p (the product of these two numbers is divisible by 6) = q
(A.) $p \to q$
(B.) $\sim p$
(C.) $\therefore \sim q$
Inverse error

(d) (This computer program is correct) = p (it produces the correct output when run with the test data my teacher gave me) = q
(A.) $p \to q$
(B.) q
(C.) $\therefore p$ Converse error

(e) (Sandra knows Java) = p (Sandra knows C++) = q
(A.) $p \wedge q$
(B.) $\therefore p$
Valid, Simplification

7 Question

Explain in your own words what distinguishes a valid form of argument from an invalid one. In addition what make an argument a sound argument.

Validity is dependent on the premise and the conclusion of the argument if the follow rules of logic.

8 Question

Use truth tables to determine whether the argument forms are valid. Indicate which columns represent the premises and which represent the conclusion, and include a sentence explaining how the truth table supports your answer. Your explanation should show that you understand what it means for a form of argument to be valid or invalid.

(a)

p	q	$p \to q$	$q \to p$	$p \vee q$	Premises lead to conclusion
T	T	T	T	T	T
T	F	F	T	T	F
F	T	T	F	T	F
F	F	T	T	F	T

This argument form is **invalid** because the premises $(p \to q)$ and $(q \to p)$ do not always lead to the conclusion $(p \vee q)$. The rows where the conclusion is false while the premises are true show the invalidity.

(b)

p	q	$p \vee q$	$p \to \neg q$	$p \to r$	r	Premises lead to conclusion
T	T	T	F	T	T	F
T	F	T	T	T	T	T
F	T	T	T	T	T	T
F	F	F	T	T	T	T

This argument is **invalid** because there is a case where the premises are all true but the conclusion is false (first row).

(c)

p	q	$\neg r$	$(p \wedge q)$	$(p \wedge q) \to \neg r$	$p \vee \neg q$	$\neg q \to p$	Premises lead to conclusion
T	T	T	T	T	T	T	T
T	T	F	T	F	T	T	F
T	F	T	F	T	T	T	T
T	F	F	F	T	T	T	T
F	T	T	F	T	F	F	T
F	T	F	F	T	F	F	T
F	F	T	F	T	T	T	T
F	F	F	F	T	T	T	T

This argument form is **invalid** because there is a case where the premises are all true but the conclusion is false (second row).

(d)

p	q	r	$p \to r$	$q \to r$	$(p \vee q) \to r$
T	T	T	T	T	T
T	T	F	F	F	F
T	F	T	T	T	T
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	F	F
F	F	T	T	T	T
F	F	F	T	T	T

This argument form is **valid** because in all cases where the premises are true, the conclusion is also true.

9 Question