Quiz 2

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①

q	p	~q	~p	p => ~q	q ∧ (p => ~q)	(q ∧ (p => ~q)) => ~p
T	T	F	F	F	F	T
T	F	F	T	T	T	T
F	T	T	F	T	F	T
F	F	T	T	T	F	T

∴ t autology

② r = it's raining

F(x) = x is a frog D = { all animals }

G(x) = x is green

H(x) = x hops

ⓐ $\exists x\,(F(x) \wedge \sim G(x))$

ⓑ $\forall x\,(F(x) \wedge G(x) \wedge H(x))$

ⓒ $\forall x\, \sim G(x) \rightarrow \sim G(x) \wedge \sim F(x)$

ⓓ $\forall x\,(F(x) \wedge G(x) \wedge H(x)) \longleftrightarrow r$

ⓔ $\forall x\,(F(x) \wedge G(x))] = 2 \rightarrow r$

ⓕ $\exists x\, G(x) \wedge \exists y \sim G(y)$

ⓖ $\forall x \sim G(x) \vee \forall y\, G(y)$

All animals aren't green or all animals are green

(3)

(a) False. 7 is prime

(b) True. 27 is divisible by 3

(c) True. 1 is a factor of every number

(d) True. Every number is a factor of zero

(e) True. Every number is a factor of itself.

(f) True. 1 & y are always factors of y

(g) True. The number 0.

(h) True. If n is a factor of m & m is a factor of n then $n = m$ since no factor can be greater than the number.

(4)

A = A is a knight
B = B is a knight
C = C is a knight

A: $C \rightarrow \sim B$
B: $\sim A \wedge \sim C$

A	B	C	$C \rightarrow \sim B$	$\sim A \wedge \sim C$
T	T	T	~~F~~	F
T	T	F	T	~~F~~
* T	F	T	T	$A \vee C \equiv T$
F	T	T	$C \wedge B \equiv T$	~~F~~
* T	F	F	T	$A \vee C \equiv T$
F	T	F	F	T
F	F	T	F	F

F	F	F	T	F

We can't know. A must be a knight & B must be a knave but C could be either.

(5) Case 1: A = knight; B = knave; C = spy

A says: A = knight
B says: A != knave
C says: B != knave

A can't be both knight & knave

Case 2: A = knight; B = spy; C = knave

B can't be both spy & knave

Case 3: A = knave; B = knight; C = spy

$\sim P(A) \wedge \sim Q(A) \equiv K(A)$

A is a knave, reading this logically A must be a spy which contradicts this

Case 4: A = spy; B = knight; C = knave

$\sim P(A) \equiv Q(A) \oplus S(A) \wedge \sim Q(A) \equiv S(A)$ ✓

~~Q(B)~~

B is a knight. reading this logically, B must be a knave which contradicts the premise

Case 5: A = knave; B = spy; C = knight

$\sim P(A) \equiv Q(A) \oplus S(A)$

$Q(A)$

$\sim Q(B) \equiv P(B) \oplus S(B)$

This is a solution. A must be a knave, B can be a knight or spy (is spy for this to work), & C

could be "anything" (must be "knight" for this to work)

Case b: A = spy ; B = knave ; C = knight

~~~P(A) = Q(A) ⊕ S(A)~~~
~~Q(A)~~

A is a spy. Reading this logically A must be a knave and this contradicts the premise

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(b)

(a)

S	J	W	S: F(J) ∧ ~L(W)	J:
~~T~~	~~T~~	F	contra	
✓T	F	T		
F	T	T	contra	

The murderer was Jones. I(S) ∧ I(J) ∧ ~I(W) has no contradiction about being friends. ~I(S) ∧ I(J) ∧ I(W) has a contradiction about being at the scene. Only I(S) ∧ ~I(J) ∧ I(W) pans out logically
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