

Andrew So

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CIS7 - Fall 17

Practice 18: Using the predicate symbols $S(x)$ for “ x is a student”, $I(x)$ for “ x is intelligent,” and $M(x)$ for “ x likes music,” write wffs that express the following statements.

- A. All students are intelligent.
 - a. $(\forall x)[S(x) \rightarrow I(x)]$
- B. Some intelligent students like music.
 - a. $(\exists x)[S(x) \wedge I(x) \wedge M(x)]$
- C. Everyone likes music is a stupid student.
 - a. $(\forall x)[M(x) \rightarrow S(x) \wedge I(x)]$
- D. Only intelligent students like music.
 - a. $(\forall x)[M(x) \rightarrow S(x) \wedge I(x)]$

Question 25: Give English language translations of the the following wffs if

$L(x,y)$: x loves y

$H(x)$: x is handsome

$M(x)$: x is a man.

$P(x)$: x is pretty.

$W(x)$: x is a woman

j : John

k : Kathy

- A. $H(j) \wedge L(k,j)$
 - a. John is handsome and Kathy loves John.
- B. $(\forall x)[M(x) \rightarrow H(x)]$
 - a. All men are handsome.
- C. $(\forall x)(W(x) \rightarrow \forall (y)[L(x,y) \rightarrow M(y) \wedge H(y)])$
 - a. All women love only handsome men.
- D. $(\exists x)[M(x) \wedge H(x) \wedge L(x,k)]$
 - a. There exists a handsome man who loves Kathy.
- E. $(\exists x)(W(x) \wedge P(x) \wedge (\forall y)[L(x,y) \rightarrow H(y) \wedge M(y)])$
 - a. There exists a beautiful woman who loves only handsome men.
- F. $(\forall x)[W(x) \wedge P(x) \rightarrow L(j,x)]$
 - a. John loves all beautiful women.

Question 34: Give interpretations to prove that each of the following wffs is not valid:

- A. $(\exists x)A(x) \wedge (\exists x)B(x) \rightarrow (\exists x)[A(x) \wedge B(x)]$

- a. The argument is invalid if we set $A(x)$ is odd and $B(x)$ is even.
- B. $(\forall x)(\exists y)P(x,y) \rightarrow (\exists x)(\forall y)P(x,y)$
 - a. The argument is invalid if $P(x,y): x+y=0$
- C. $(\forall x)[P(x) \rightarrow Q(x)] \rightarrow [(\exists x)P(x) \rightarrow (\forall x)Q(x)]$
 - a. The argument is invalid if we set $P(x): x$ is a man and $Q(x): x$ is a tall.
All men are tall does not imply that some are tall.
- D. $(\forall x)[A(x)]' \Leftrightarrow [(\forall x)A(x)]'$
 - a. The structure is not equivalent as it implies “all of x is not *blank*” equivalent to “not all of x is *blank*”. Not the same.