

Logic—Sample Test D2

NAME _____

1. Define 'counterexample'. (10 points)
2. Define 'valid'. (10 points)

Translate the following sentences into the language of predicate and relational logic using the abbreviations given to you. (These problems are worth 2 points each.)

$Px = x$ is a person
 $Hx = x$ is happy
 $Kxy = x$ knows y
 $Gxyz = x$ gives y to z
 $i =$ Irene
 $s =$ Irene's sandwich
 $k =$ Kirk

3. "Kirk knows Irene."
4. "Irene is giving Kirk her sandwich."
5. "Irene doesn't give her sandwich to anyone."
6. "Not everyone is happy."
7. "Someone gave Kirk something."
8. "Everyone knows Irene and Kirk."
9. "Kirk and Irene give each other things."
10. "Nothing is given by Irene to Kirk."

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Px = x is a person

Hx = x is happy

Kxy = x knows y

$Gxyz$ = x gives y to z

i = Irene

s = Irene's sandwich

k = Kirk

11. "There is something Kirk doesn't give to anyone."
12. "If anyone is not happy, Irene will give her sandwich to that person."
13. "If Irene isn't happy, nobody will be happy."
14. "No one gives Irene her sandwich, and Irene is not happy."
15. "Kirk will give Irene's sandwich to someone if he knows him."
16. "Either Kirk or Irene knows somebody who is happy."
17. "Irene doesn't know anyone who is giving something to Kirk."
18. "Someone is giving Irene's sandwich to someone he knows."
19. "Anyone who knows Irene is happy."
20. "No one gives Kirk anything."
21. "Irene's sandwich is given to her by someone."

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Use the truth tree method to determine whether the following argument is valid. List a separate translation before doing the tree if the argument is in English. Number all lines. Label all derived lines with the rule and the line from which they were derived. Use the notation provided for your translations. (1 point for each translated sentence, and 7 points per truth tree)

$$\begin{array}{l} 22. \quad \exists x \forall y Txy \\ \quad \exists xz Txz \supset \forall y Tmy \\ \hline \quad Tmm \end{array}$$

$$\begin{array}{l} 23. \quad \underline{\exists x \forall y Yxy} \\ \quad \forall x \exists y Yyx \end{array}$$

24. $\forall x(Gxx \vee \exists yFxy)$
 $\sim \exists zGzz$

 $\exists xyFxy$

25. Every dog loves to chew a bone.
Thus, there is a bone that every dog loves to chew.

$Dx = x$ is a dog
 $Bx = x$ is a bone
 $Cxy = x$ loves to chew y

26. (12 points).

Everyone who is famous knows Monica.

Everyone who is famous knows Jill.

Either Monica or Jill is famous.

Monica and Jill are both people.

Thus, either Monica knows Jill or Jill knows Monica.

$Px = x$ is a person

$Fx = x$ is famous

$Kxy = x$ knows y

$m =$ Monica

$j =$ Jill