

Logic—Sample Test D3

NAME _____

1. Define 'counterexample'. (10 points)

2. Define 'valid'. (20 points)

Translate the following sentences into the language of quantifier logic using the given abbreviations. Remember that you do not need to worry about tense. (2 points each.)

$Px = x$ is a person.	$n =$ Nathan
$Lx = x$ is a location.	$t =$ Tim
$Gxy = x$ goes to y .	$k =$ Kara
$Oxy = x$ is older than z .	$b =$ the beach
$Ixy = x$ is impressed with y .	$m =$ the museum
$Fx = x$ is fun.	

You can assume (and don't need to write down) that Nathan, Tim, and Kara are all people, and that the beach and the museum are locations.

3. "Nathan is not going to both the museum and the beach."

4. "Kara is going somewhere fun."

5. "Kara and Tim are going to the same place."

6. "Someone is older than Tim, but it isn't Nathan."

7. "The beach is fun even if Tim is unimpressed with it."

8. "Kara is the oldest person going to the beach."

9. "Tim is older than Kara and someone else."

10. "Anyone younger than Nathan is fun."

$Px = x$ is a person.	$n =$ Nathan
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Logic—Sample Test D3

$Lx = x$ is a location.

$Gxy = x$ goes to y .

$Oxy = x$ is older than z .

$Ixy = x$ is impressed with y .

$Fx = x$ is fun.

$t =$ Tim

$k =$ Kara

$b =$ the beach

$m =$ the museum

11. “Tim is unimpressed with someone.”
12. “Kara is impressed with anyone who is older than she is.”
13. “If Nathan goes anywhere fun, Tim will go there too.”
14. “The beach is older than the museum, but it is still fun anyway.”
15. “Tim will be impressed with someone only if he or she is fun.”
16. “Someone is going to the beach but not anywhere else.”
17. “Someone older than Nathan is going to the museum.”
18. “Kara is impressed with anyone who goes to the museum.”
19. “Only one person is going to the museum.”
20. “Only Tim is impressed with Kara.”
21. “Everyone going to the museum is older than some or other beach-goer.”
22. “No one who goes to the beach is impressed with all the other people who go to the beach.”
23. “Anyone will be impressed with any location that’s fun.”
24. Use the truth tree method to determine whether the argument is valid. (7 points)

Logic—Sample Test D3

$$\frac{\forall z(z=b \supset \exists yHyz) \quad \forall xy(x=y)}{\exists xHxx}$$

25. Use the truth tree method to determine whether the set of sentences is consistent.
(7 points)

$$\{ \forall x\exists y(x \neq y \ \& \ \sim Axy), \exists x\forall y(x \neq y \supset Axy) \}$$

Logic—Sample Test D3

26. Use the truth tree method to determine whether these two sentences are logically equivalent. (14 points)

$\sim\exists x(Gx \ \& \ \forall y(Nyx \supset Jy))$

$\forall y(Gy \supset \exists z(\sim Jz \ \& \ Nz))$