

Logic—Sample Test C1 with Answers

NAME _____

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

$Px = x$ is a person.

$Fx = x$ flees.

$Ty = y$ is threatened.

$Sx = x$ is a serpent.

$Dx = x$ is a demon.

$Ax = x$ is an angel.

$a =$ Angela

$j =$ Juan

$m =$ Melissa

1. “Angela isn’t being threatened.”

$\sim Ta$

2. “Melissa, the angel, is fleeing.”

$Am \ \& \ Fm$

3. “Juan, Melissa and Angela are not all demons.”

$\sim((Dj \ \& \ Dm) \ \& \ Da)$

4. “Someone is being threatened.”

$\exists x(Px \ \& \ Tx)$

5. Not everyone who is threatened, flees.”

$\sim \forall x((Px \ \& \ Tx) \supset Fx)$

6. “All serpents are demons.”

$\forall x(Sx \supset Dx)$

7. “Demons never flee when threatened.”

$\forall x((Dx \ \& \ Tx) \supset \sim Fx)$

8. “If Juan flees, there is a serpent demon in existence.”

$Fj \supset \exists x(Sx \ \& \ Dx)$

9. “No fleeing demons are serpents.”

$\sim \exists x(Dx \ \& \ (Fx \ \& \ Sx))$

10. “Unless threatened, angels never flee.”

$\forall x(Ax \supset (\sim Tx \supset \sim Fx))$

11. “The serpent-demon Juan is threatened.”

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$(S_j \& D_j) \& T_j$

12. “An angel flees only if it is threatened.”

$\forall x(Ax \supset (Fx \supset Tx))$

13. “Not everybody is an angel or demon.”

$\sim \forall y(Py \supset (Ay \vee Dy))$

14. “Angels flee if threatened, unlike demons, who never do so.”

$\forall x(Ax \supset (Tx \supset Fx)) \& \forall x(Dx \supset (Tx \supset \sim Fx))$

15. “Both angels and demons flee when threatened.”

$\forall x(((Ax \vee Dx) \& Tx) \supset Fx)$ or

$\forall x((Ax \& Tx) \supset Fx) \& \forall x((Dx \& Tx) \supset Fx)$

16. “Unless an angel is threatened, Juan the serpent flees.”

$\sim \exists x(Ax \& Tx) \supset (S_j \& F_j)$

17. “Neither Juan nor Angela are demons, but someone is.”

$\sim (D_j \vee D_a) \& \exists x(Px \& Dx)$

18. “Unless no angels are serpents, there will be serpents that are demons as well.”

$\sim \sim \exists x(Ax \& Sx) \supset \exists x(Sx \& Dx)$

19. “Juan is not a demon, nor is Angela; they are angels instead.”

$(\sim D_j \& \sim D_a) \& (A_j \& A_a)$

20. “All angels are threatened if there is some demon that is not a serpent.”

$\exists x(Dx \& \sim Sx) \supset \forall x(Ax \supset Tx)$

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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.

21. Every woman has a right to fair treatment.
Thus, women exist.

$Wx = x$ is a woman
 $Rx = x$ has a right to fair treatment

$\forall x(Wx \supset Rx)$
 $\exists xWx$

1. $\forall x(Wx \supset Rx)$
 2. $\sim \exists xWx$
 3. $\forall x \sim Wx$ 2, $\sim \exists$
 4. $\sim Wa$ 3, \forall
 5. $Wa \supset Ra$ 1, \forall
 6. $\sim Wa$ Ra 5, \supset
- Invalid

22. $\sim \exists x(Ex \ \& \ Fx)$
 $\sim \exists x(Fx \ \& \ Gx)$
 $\sim \exists x(Ex \ \& \ Gx)$

1. $\sim \exists x(Ex \ \& \ Fx)$
 2. $\sim \exists x(Fx \ \& \ Gx)$
 3. $\sim \sim \exists x(Ex \ \& \ Gx)$
 4. $\exists x(Ex \ \& \ Gx)$ 3, $\sim \sim$
 5. $Ea \ \& \ Ga$ 4, \exists
 6. Ea 5, $\&$
 7. Ga 5, $\&$
 - ✓ 8. $\forall x \sim (Ex \ \& \ Fx)$ 1, $\sim \exists$
 - ✓ 9. $\forall x \sim (Fx \ \& \ Gx)$ 2, $\sim \exists$
 10. $\sim (Ea \ \& \ Fa)$ 8, \forall
 11. $\sim (Fa \ \& \ Ga)$ 9, \forall
 12. $\sim Ea$ $\sim Fa$ 10, $\sim \&$
 13. $\sim Fa$ $\sim Ga$ 11, $\sim \&$
- Invalid

$$\begin{array}{l}
 24. \quad \forall y(My \supset Fy) \supset \exists z(Pz \ \& \ Qz) \\
 \quad \quad \sim \exists x(Px \ \& \ Qx) \\
 \hline
 \quad \quad \exists x(Mx \ \& \ \sim Fx)
 \end{array}$$

$$1. \quad \forall y(My \supset Fy) \supset \exists z(Pz \ \& \ Qz)$$

$$2. \quad \sim \exists x(Px \ \& \ Qx)$$

$$3. \quad \sim \exists x(Mx \ \& \ \sim Fx)$$

$$4. \quad \sim \forall y(My \supset Fy) \quad \exists z(Pz \ \& \ Qz)$$

$$5. \quad \exists y \sim (My \supset Fy) \quad \times$$

$$\checkmark 6. \quad \forall x \sim (Mx \ \& \ \sim Fx)$$

$$7. \quad \sim (Ma \supset Fa)$$

5, \exists

$$8. \quad Ma$$

7, $\sim \supset$

$$9. \quad \sim Fa$$

7, $\sim \supset$

$$10. \quad \sim (Ma \ \& \ \sim Fa)$$

6, \forall

$$11. \quad \begin{array}{cc} \sim Ma & \sim \sim Fa \\ \times & \times \end{array}$$

10, $\sim \&$

Valid