

Instructions: Show all work. Use exact answers unless specifically asked to round. Be sure to complete all parts of each problem.

1. If p is "She has green eyes" and q is "He is 60 years old", translate each of the following notations into an English sentence.

a. $p \vee q$ *She has green eyes or he is 60 years old.*

b. $p \wedge \sim q$ *She has green eyes and he is not 60 years old.*

2. Write the following sentences in logical notation with appropriate quantifiers. Define statements and variables as needed.

a. For all x , there exists a y such that $x + y = 6$

$$\forall x, \exists y (x + y = 6)$$

$$p = x + y = 6$$

$$\forall x \exists y (p(x, y))$$

b. There exists an x such that either $x - 7 = 22$ or $x^2 = 17$.

$$\exists x [(x - 7 = 22) \vee (x^2 = 17)]$$

$$\exists x [p(x) \vee q(x)]$$

$$p = x - 7 = 22$$

$$q = x^2 = 17$$

3. Use a truth table to find the truth value of $\sim p \rightarrow (\sim q \vee r)$.

p	q	r	$\sim p$	$\sim q$	$(\sim q \vee r)$	$\sim p \rightarrow (\sim q \vee r)$
T	T	T	F	F	T	T
T	T	F	F	F	F	F
T	F	T	F	T	T	T
T	F	F	F	T	T	T
F	T	T	T	F	T	T
F	T	F	T	F	F	F
F	F	T	T	T	T	T
F	F	F	T	T	T	T

4. If A is True, B is false, and C is true, find the truth value of the logic gate diagram below.

