1. Let p be the statement "Billy Bob is a chemistry major," and q be the statement "Linda Lou is a Physics major." Write the following statements in symbols.

It is false that Billy Bob is a chemistry major or Linda Lou is Physics major.

A. $p \rightarrow q$

B. $\sim p$

C. $q \leftrightarrow p$

D. $\sim (p \vee q)$

E. $p \wedge q$

F. $\sim q$

G. $\sim q \rightarrow p$

2. Determine if the following sentence is a statement or not.

Who will be president in 2024?

A. Not a statment.

B. Is a statement.

3. Fill in the missing values of the following truth table. Note: You may need to include more columns in your truth table to decide the truth values in the right-most column below.

p	q	$\sim (p \wedge q) \rightarrow p$
T	T	
T	F	
F	T	
F	F	

A.

$\sim (p \wedge q) \rightarrow p$
T
F
F
T

B.

$\sim (p \wedge q) \rightarrow p$
T
F
F
F

C.

$\sim (p \wedge q) \rightarrow p$
T
T
T
F

D.

$\sim (p \wedge q) \rightarrow p$
T
F
T
T

E.

$\sim (p \wedge q) \rightarrow p$
T
T
F
F

F.

$\sim (p \wedge q) \rightarrow p$
T
T
F
T

G.

$\sim (p \wedge q) \rightarrow p$
T
T
T
T

H.

$\sim (p \wedge q) \rightarrow p$
T
F
T
F

4. Fill in the missing values of the following truth table. Note: You may need to include more columns in your truth table to decide the truth values in the right-most column below.

p	q	$\sim p \leftrightarrow q$
T	T	
T	F	
F	T	
F	F	

A.

$\sim p \leftrightarrow q$
F
F
F
T

B.

$\sim p \leftrightarrow q$
T
T
F
F

C.

$\sim p \leftrightarrow q$
F
T
F
T

D.

$\sim p \leftrightarrow q$
F
F
T
T

E.

$\sim p \leftrightarrow q$
F
T
T
F

F.

$\sim p \leftrightarrow q$
T
F
T
F

G.

$\sim p \leftrightarrow q$
T
T
T
T

H.

$\sim p \leftrightarrow q$
T
F
F
F

5. Determine if the statement is a tautology, a self-contradiction, or neither.

$$(p \to q) \wedge (q \to p)$$

A. Tautology

B. Neither

C. Self-Contradiction

6. Write the contrapositive of the following statement:

If he graduates, then he will get a good job.

A. If he doesn't graduate, then he won't get a good job.

B. If he doesn't get a good job, then he doesn't graduate.

C. If he gets a good job, then he will graduate.

7. Write the inverse of the statement $(p \vee \sim q) \rightarrow r$.

A. $r \rightarrow (p \vee \sim q)$

B. $\sim r \rightarrow \sim (p \vee \sim q)$

C. $\sim (p \vee \sim q) \rightarrow \sim r$

8. Use a truth table to decide if the following argument is valid.

$$\begin{array}{l} p \leftrightarrow q \\ \sim q \\ \hline \therefore \sim p \end{array}$$

A. Valid

B. Invalid

9. Use a truth table to decide if the following argument is valid.

$$\begin{array}{l} p \leftrightarrow q \\ q \leftrightarrow r \\ \hline \therefore p \wedge q \end{array}$$

A. Valid

B. Invalid

10. Use a truth table to decide if the following argument is valid.

$$\begin{array}{l} \sim p \vee q \\ q \rightarrow \sim p \\ \hline \therefore p \end{array}$$

A. Invalid

B. Valid

Answers

1. D.
2. A.
3. E.
4. E.
5. B.
6. B.
7. C.
8. A.
9. B.
10. A.