

QNo1:- (A) Let p be the statement "DATAENDFLAG is off", q the statement "ERROR equals 0" and r the statement "SUM is less than 1,000". Express the following sentences in symbolic notation.

a:- DATAENDFLAG is off, ERROR equals 0, and SUM is less than 1000.

$$P \wedge q \wedge r$$

b:- DATA ENDFLAG is off but ERROR is not equal to 0.

$$P \wedge \sim q$$

c:- DATA ENDFLAG is off; however, ERROR is not 0 or SUM is greater than or equal to 1,000.

$$P \wedge (\sim q \vee \sim r)$$

d:- DATA ENDFLAG is on and ERROR equals 0 but SUM is greater than or equal to 1,000.

$$\sim P \wedge q \vee V$$

E:- Either DATAENDFLAG is on or it is the case that both ERROR equals 0 and SUM is less than 1000.

$$\sim P \vee q \wedge r$$

Q1(B):- Show that $P \vee q \rightarrow r \equiv (P \rightarrow r) \wedge (q \rightarrow r)$

P	q	r	$P \vee q$	$P \rightarrow r$	$q \rightarrow r$	$(P \rightarrow r) \wedge (q \rightarrow r)$
T	T	T	T	T	T	T
T	T	F	T	F	F	F
T	F	T	T	T	T	T
T	F	F	T	F	T	F
F	T	T	T	T	T	T
F	T	F	T	F	F	F
F	F	T	F	T	T	T
F	F	F	F	T	T	T

Same truth values and so $P \vee q \rightarrow r = (P \rightarrow r) \wedge (q \rightarrow r)$.

Q2(A):- Write the converse, inverse and contrapositive of the

Following:

a:- IF Howard can swim across the lake then Howard can swim to the island.

converse:- IF Howard can swim to the island then Howard can swim across the lake

inverse:- IF Howard cannot swim to the island then Howard cannot swim to the island.

contrapositive:- IF Howard cannot swim across the lake then Howard cannot swim to the island.

b:- IF today is Easter, then tomorrow is Monday.

converse:- IF tomorrow is Monday then today is Easter.

inverse:- IF today is not Easter, then tomorrow is not Monday

contrapositive:- IF tomorrow is not Monday then today is not Easter.

Q2(B) use truth table to determine whether the argument forms are valid - indicate which columns represent the premises and which represent the conclusion.

a.

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

b.

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

P	q	$\sim q$	Premises		r	
			$p \rightarrow q$	$\sim q \vee r$		
T	T	F	T	T	T	$\rightarrow C_3$
T	T	F	T	F	F	
T	F	T	F	T	T	\rightarrow valid argument
T	F	T	F	T	F	
F	T	F	T	T	T	
F	T	F	T	F	F	
F	F	T	T	T	T	
F	F	T	T	T	F	

$$\begin{aligned} \text{Q)(B)} \quad & P \wedge q \rightarrow \sim r \\ & P \vee \sim q \\ & \sim q \rightarrow P \\ & \therefore \sim r \end{aligned}$$

P	q	r	$\sim q$	$P \wedge q$	Premises			Conclusion
					$P \wedge q$	$P \vee \sim q$	$\sim q \rightarrow P$	
T	T	T	F	T	F	T	T	F
T	T	F	F	T	T	T	T	T
T	F	T	T	F	T	T	T	F
T	F	F	T	F	T	T	T	T
F	T	T	F	F	T	F	T	F
F	T	F	F	F	T	F	T	T
F	F	T	T	F	T	T	F	F
F	F	F	T	F	T	T	F	T

Q) No 3: ans:-

P = This home is next to the lake

$\sim q$ = The treasure is not in the kitchen

r = the tree in the front yard is an elm

q = The treasure is in the kitchen

S = The treasure is buried under the flagpole

$\sim r$ = The tree in the back yard is an oak

t = The treasure is in the garage

