

Q1 (20 July 2021 Shift 1)

The Boolean expression $(p \wedge \sim q) \Rightarrow (q \vee \sim p)$ is equivalent to:

- (1) $q \Rightarrow p$
- (2) $p \Rightarrow q$
- (3) $\sim q \Rightarrow p$
- (4) $p \Rightarrow \sim q$

Q2 (20 July 2021 Shift 2)

Consider the following three statements:

- (A) If $3 + 3 = 7$ then $4 + 3 = 8$.
- (B) If $5 + 3 = 8$ then earth is flat.
- (C) If both (A) and (B) are true then $5 + 6 = 17$.

Then, which of the following statements is correct?

- (1) (A) is false, but (B) and (C) are true
- (2) (A) and (C) are true while (B) is false
- (3) (A) is true while (B) and (C) are false
- (4) (A) and (B) are false while (C) is true

Q3 (22 July 2021 Shift 1)

Which of the following Boolean expressions is not a tautology ?

- (1) $(p \Rightarrow q) \vee (\sim q \Rightarrow p)$
- (2) $(q \Rightarrow p) \vee (\sim q \Rightarrow p)$
- (3) $(p \Rightarrow \sim q) \vee (\sim q \Rightarrow p)$
- (4) $(\sim p \Rightarrow q) \vee (\sim q \Rightarrow p)$

Q4 (25 July 2021 Shift 1)

Questions with Answer Keys

MathonGo

The Boolean expression $(p \Rightarrow q) \wedge (q \Rightarrow \sim p)$ is equivalent to :

(1) $\sim q$

(2) q

(3) p

(4) $\sim p$

Q5 (25 July 2021 Shift 2)

Consider the statement "The match will be played only if the weather is good and ground is not wet". Select the correct negation from the following:

(1) The match will not be played and weather is not good and ground is wet.

(2) If the match will not be played, then either weather is not good or ground is wet.

(3) The match will be played and weather is not good or ground is wet.

(4) The match will not be played or weather is good and ground is not wet.

Q6 (27 July 2021 Shift 1)

The compound statement $(P \vee Q) \wedge (\sim P) \Rightarrow Q$ is equivalent to:

(1) $P \vee Q$

(2) $P \wedge \sim Q$

(3) $\sim (P \Rightarrow Q)$

(4) $\sim (P \Rightarrow Q) \Leftrightarrow P \wedge \sim Q$

Q7 (27 July 2021 Shift 2)

Which of the following is the negation of the

statement "for all $M > 0$, there exists $x \in S$ such that $x \geq M$ "?

(1) there exists $M > 0$, such that $x < M$ for all $x \in S$

(4) there exists $M > 0$, such that $x \geq M$ for all $x \in S$

Answer Key

Q1 (2)

Q2 (2)

Q3 (4)

Q4 (4)

Q5 (3)

Q6 (4)

Q7 (1)

Q1

p	q	$\sim p$	$\sim q$	$p \wedge \sim q$	$q \vee \sim p$	$(p \wedge \sim q) \Rightarrow (q \vee \sim p)$	$p \Rightarrow q$
T	F	F	T	T	F	F	F
F	T	T	F	F	T	T	T
T	T	F	F	F	T	T	T
F	F	T	T	F	T	T	T

$$\therefore (p \wedge \sim q) \Rightarrow (q \vee \sim p)$$

$$\equiv p \Rightarrow q$$

So, option (2) is correct.

Q2

Truth Table

P	q	$P \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

Q3

$$(1) (p \rightarrow q) \vee (\sim q \rightarrow p)$$

$$= (\sim p \vee q) \vee (q \vee p)$$

$$= (\sim p \vee p) \vee q$$

$$= t \vee q = t$$

$$(2) (q \rightarrow p) \vee (\sim q \rightarrow p)$$

$$= (\sim q \vee p) \vee (q \vee p)$$

$$= (\sim q \vee q) \vee p$$

$$= t \vee p = t$$

$$(3) (p \rightarrow \sim q) \vee (\sim q \rightarrow p)$$

Hints and Solutions

MathonGo

$$= (\sim p \vee \sim q) \vee (q \vee p)$$

$$= (\sim p \vee q) \vee (\sim q \vee p)$$

$$= t \vee t = t$$

$$(4) (\sim q \rightarrow q) \vee (\sim q \rightarrow p)$$

$$= (p \vee q) \vee (q \vee p)$$

$$= (p \vee p) \vee (q \vee p)$$

$$= p \vee q$$

Which is not a tautology.

Q4

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

$$= (\sim p \vee q) \wedge (\sim q \vee \sim p) \{p \rightarrow q = \sim p \vee q\}$$

$$= (\sim p \vee q) \wedge (\sim p \vee \sim q) \{\text{commutative property}\}$$

$$= \sim p \vee (q \wedge \sim q) \{\text{distributive property}\}$$

$$= \sim p$$

Q5

p : weather is good q : ground is not wet

$$\sim (p \wedge q) \equiv \sim p \vee \sim q$$

\equiv weather is not good or ground is wet

Q6

Using Truth Table

P	Q	$P \vee Q$	$\sim P$	$(P \vee Q) \wedge P$	$(P \vee Q) \wedge \sim P \rightarrow Q$
T	T	T	F	F	T
T	F	T	F	F	T
F	T	T	T	T	T
F	F	F	T	F	T

P	Q	$\sim Q$	$P \wedge \sim Q$	$P \rightarrow Q$	$\sim(P \rightarrow Q)$
T	T	F	F	T	F
T	F	T	T	F	T
F	T	F	F	T	F
F	F	T	F	T	F

$\sim(P \rightarrow Q)$	$P \wedge \sim Q$	$\sim(P \rightarrow Q) \Leftrightarrow P \wedge \sim Q$
F	F	T
T	T	T
F	F	T
F	F	T

Q7

P : for all $M > 0$, there exists $x \in S$ such that $x \geq M$

$\sim P$: there exists $M > 0$, for all $x \in S$

Such that $x < m$

Negation of 'there exists' is 'for all'.