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Q1: Which of the following are preposition?

(a) It is not a proposition (it is a command imperative)

(b) It is preposition

(c) It is also a preposition

(d) It is not a proposition, its a question

(e) Strickly speaking is a propositional function, but many people says that it is a proposition.

(f) It is not a proposition, because the result can be either true or false, it is depends on value of a and b

Q2 P is "$X < 50$"; q is "$X > 40$".

Ans

$X \geq 50$

$X \leq 40$

$40 \leq X \leq 50$

$X < 50$ or $X > 40$ this is true for all values of $X$.

$X \geq 50$ (Note that we don't need to say, in addition, that $X > 40$; this must be true whenever $X \geq 50$)

$X \geq 50$ and $X \leq 40$. This can never be true whenever the value of $X$.

So (d) is a tautology its always true; and (f) is always false

Q3 In each parts of this equation ..... the proposition P ? (There may be more than one answer)

Ans A)

ii) Every body dislikes maths''

B)

ii) Neither 2 nor 3 is the answer.

iii) The answer is not 2 and it is not 3".

C)

iii) Someone in my class is short or fat"

Q4 Construct truth table for

a) $\neg P \vee \neg q$

| P | q | $\neg p$ | $\vee$ | $\neg q$ |
|---|---|---|---|---|
| T | T | F | F | T |
| T | F | F | T | F |
| F | F | T | T | F |
| F | F | T | T | T |
| | | (1) | (3) | (2) |
| | | | output | |

b) $q \wedge (\neg p \vee q)$

| p | q | $q \wedge$ | $\neg p$ | $\vee q$ |
|---|---|---|---|---|
| T | T | T | F | T |
| T | F | F | F | F |
| F | T | T | T | T |
| F | F | F | T | T |
| | | (3) | (1) | (2) |
| | | output | | |

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

| P | q | r | $P \vee$ | $(q \vee r)$ |
|---|---|---|---|---|
| T | T | T | T | T |
| T | T | F | T | T |
| T | F | T | T | T |
| T | F | F | F | F |
| F | T | T | F | T |
| F | T | F | F | T |
| F | F | T | F | T |
| F | F | F | F | F |
| | | | (2) | (1) |
| | | | Output | |

d) $(P \vee q) \vee r$

| P | q | r | $(P \wedge q)$ | $\vee r$ |
|---|---|---|---|---|
| T | T | T | T | T |
| T | T | F | T | T |
| T | F | T | F | T |
| T | F | F | F | F |
| F | T | T | F | T |
| F | T | F | F | F |
| F | F | T | F | T |
| F | F | F | F | F |
| | | | (1) | (2) |
| | | | | Output |

Q5 Use truth tables to show that
$\neg((p \vee q) \vee (r \wedge (p \vee \neg q))] \equiv \neg p \wedge q$
In each case the result is
F, F, F, F, T, T, F

Q6 Use the law of logical proposition to prove; $(Z \wedge W) \vee (\neg Z \vee W) \vee (Z \wedge \neg W) \equiv Z \vee W$
State carefully which law you are using.

$(Z \wedge W) \vee (\neg Z \vee W) \vee (Z \wedge \neg W) \equiv$
$(Z \wedge W) \vee (Z \wedge \neg W) \vee (\neg Z \wedge W)$
Commutative law

$= (Z \wedge (W \vee \neg W)) \vee (\neg Z \wedge W)$ Distributive law
$= (Z \wedge T) \vee (\neg Z \wedge W)$ Complement law
$= Z \vee (\neg Z \wedge W)$ Identity law
$= (Z \vee \neg Z) \wedge (Z \vee W)$ Distributive law
$= T \wedge (Z \vee W)$ Complement law
$= (Z \wedge W) \wedge T$ Commutative law
$= Z \vee W$ Identify law