



correspond to the proposition  $\neg p$ ? (There may be more than one correct answer.)

(a)

p is "Some people like Maths".

(a) "Some people dislike Maths"

**(b) "Everybody dislikes Maths"**

(c) "Everybody likes Maths"

b)

p is "The answer is either 2 or 3".

**(a) "Neither 2 nor 3 is the answer"**

(b) "The answer is not 2 or it is not 3"

**(c) "The answer is not 2 and it is not 3"**

c)

p is "All people in my class are tall and thin".

(a) "Someone in my class is short and fat"

(b) "No-one in my class is tall and thin"

**(c) "Someone in my class is short or fat"**

**Q4:**

**Construct truth tables for**

a)  $\neg p \vee \neg q$

<b>P</b>	<b>q</b>	$\neg p$	$\neg q$	$\neg p \vee \neg q$
<b>T</b>	<b>T</b>	<b>F</b>	<b>F</b>	<b>F</b>
<b>T</b>	<b>F</b>	<b>F</b>	<b>T</b>	<b>T</b>

F	T	T	F	T
F	F	T	T	T

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

p	q	$\neg p$	$\neg p \vee q$	$q \wedge (\neg p \vee q)$
T	T	F	T	T
T	F	F	F	F
F	T	T	T	T
F	F	T	T	F

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

p	q	r	$q \vee r$	$p \wedge (q \vee r)$
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T	T	T	T	T
T	T	F	T	T
T	F	T	T	T
T	F	F	F	F
F	T	T	T	F
F	T	F	T	F
F	F	T	T	F
F	F	F	F	F

d)  $(p \wedge q) \vee r$

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

**Q.5**

Use truth tables to show that:

$$\neg((p \vee \neg q) \vee (r \wedge (p \vee \neg q))) \equiv \neg p \wedge q$$

L.H.S:

p	q	r	$\neg p$	$\neg q$	$p \vee \neg q$	$r \wedge (p \vee \neg q)$	$(p \vee \neg q) \vee (r \wedge (p \vee \neg q))$	$\neg((p \vee \neg q) \vee (r \wedge (p \vee \neg q)))$
T	T	T	F	F	T	T	T	F
T	T	F	F	F	T	F	T	F
T	F	T	F	T	T	T	T	F
T	F	F	F	T	T	F	T	F
F	T	T	T	F	F	F	F	T
F	T	F	T	F	F	F	F	T
F	F	T	T	T	T	T	T	F
F	F	F	T	T	T	F	T	F

R.H.S:

p	q	$\neg p$	$\neg p \wedge q$
T	T	F	F
T	F	F	F

T	F	F	F
T	F	F	F
F	T	T	T
F	T	T	T
F	F	T	F
F	F	T	F

**L.H.S and R.H.S are equal.**

**Q.6**

Use the laws of logical propositions to prove that:

$$(z \wedge w) \vee (\neg z \wedge w) \vee (z \wedge \neg w) \equiv z \vee w$$

State carefully which law you are using at each stage.

$$(z \wedge w) \vee (\neg z \wedge w) \vee (z \wedge \neg w) \equiv z \vee w$$

$$(z \wedge w) \vee (z \wedge \neg w) \vee (\neg z \wedge w) = \text{Commutative law}$$

$$(z \wedge (w \vee \neg w)) \vee (\neg z \wedge w) \text{ Distributive law}$$

$$(z \wedge T) \vee (\neg z \wedge w) \text{ Complement law}$$

$$z \vee (\neg z \wedge w) \text{ Identity law}$$

$$(z \vee \neg z) \wedge (z \vee w) \text{ Distributive law}$$

$$T \wedge (z \vee w) \text{ Complement law}$$

$$(z \vee w) \wedge T \text{ Commutative law}$$

$$(z \vee w) \text{ Identity law}$$



### Q.6

Use the laws of logical propositions to prove that:

$$(z \wedge w) \vee (\neg z \wedge w) \vee (z \wedge \neg w) \equiv z \vee w$$

State carefully which law you are using at each stage.

$$(z \wedge w) \vee (\neg z \wedge w) \vee (z \wedge \neg w) \equiv z \vee w$$

$$(z \wedge w) \vee (z \wedge \neg w) \vee (\neg z \wedge w) = \text{Commutative law}$$

$$(z \wedge (w \vee \neg w)) \vee (\neg z \wedge w) \text{ Distributive law}$$

$$(z \wedge T) \vee (\neg z \wedge w) \text{ Complement law}$$

$$z \vee (\neg z \wedge w) \text{ Identity law}$$

$$(z \vee \neg z) \wedge (z \vee w) \text{ Distributive law}$$

$$T \wedge (z \vee w) \text{ Complement law}$$

$$(z \vee w) \wedge T \text{ Commutative law}$$

$$(z \vee w) \text{ Identity law}$$

### Q.5

Use truth tables to show that:

$$\neg((p \vee \neg q) \vee (r \wedge (p \vee \neg q))) \equiv \neg p \wedge q$$

L.H.S:

P	q	R	$\neg p$	$\neg q$	$p \vee \neg q$	$r \wedge (p \vee \neg q)$	$(p \vee \neg q) \vee (r \wedge (p \vee \neg q))$	$\neg ((p \vee \neg q) \vee (r \wedge (p \vee \neg q)))$
T	T	T	F	F	T	T	T	F
T	T	F	F	F	T	F	T	F
T	F	T	F	T	T	T	T	F
T	F	F	F	T	T	F	T	F
F	T	T	T	F	F	F	F	T
F	T	F	T	F	F	F	F	T
F	F	T	T	T	T	T	T	F
F	F	F	T	T	T	F	T	F

R.H.S:

p	q	$\neg p$	$\neg p \wedge q$
T	T	F	F
T	T	F	F
T	F	F	F

T	F	F	F
F	T	T	T
F	T	T	T
F	F	T	F
F	F	T	F

L.H.S and R.H.S are equal.