

Solutions to short-answer questions

1 True: d, e

2 a It is not raining.

b It is raining.

c $2 + 3 \leq 4$

d $x \neq 5$ or $y \neq 5$

e $x \neq 3$ and $x \neq 5$ (i.e. $x \notin \{3, 5\}$)

f It is raining and windy.

3 a

A	B	$A \oplus B$	$A \oplus (A \oplus B)$
T	T	F	T
T	F	T	F
F	T	T	T
F	F	F	F

Note:

■ $A \oplus (A \oplus B) \equiv B$

b

A	B	$A \vee B$	$A \oplus (A \vee B)$
T	T	T	F
T	F	T	F
F	T	T	T
F	F	F	F

4

A	B	$\neg A$	$A \rightarrow B$	$\neg A \rightarrow (A \rightarrow B)$
T	T	F	T	T
T	F	F	F	T
F	T	T	T	T
F	F	T	T	T

5 a i

x	y	x'	$x' \wedge y$	$f(x, y)$
0	0	1	0	0
0	1	1	0	0
1	0	0	0	1
1	1	0	1	1

ii
$$\begin{aligned} x \vee (x' \wedge y) &= (x \vee x') \wedge (x \vee y) \\ &= 1 \wedge (x \vee y) \\ &= x \vee y \end{aligned}$$

b i

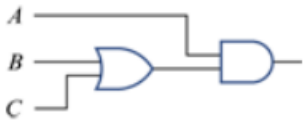
x	y	x'	$x \vee y$	$x' \vee y$	$f(x, y)$
0	0	1	0	1	0
0	1	1	1	1	1
1	0	0	1	0	0
1	1	0	1	1	1

ii $(x \vee y) \wedge (x' \vee y) = (x \wedge x') \vee y$
 $= 0 \vee y$
 $= y$

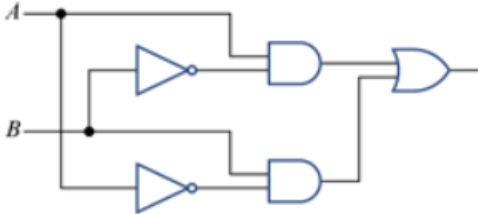
6 a



b



c



7 a If $a^3 < b^3$, then $a < b$.

b If $a^3 \geq b^3$, then $a \geq b$.

Solutions to multiple-choice questions

1 B

2 C

3 D

4 C

5 A

6 D

7 E

8 B

9 A

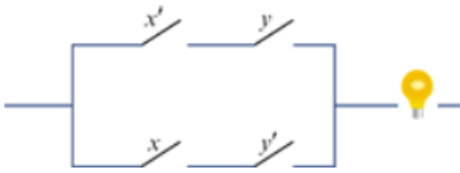
Solutions to extended-response questions

1 a

x	y	
0	0	0
0	1	1
1	0	1
1	1	0

b $(x' \wedge y) \vee (x \wedge y')$

c



2 a i $\ell = 1$

ii $h = 30$

b $\text{LCM}(x, x') = 30 = h$, for all $x \in B$; $\text{HCF}(x, x') = 1 = \ell$, for all $x \in B$

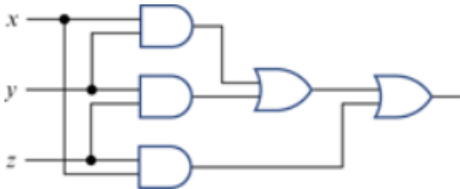
3 a

x	y	z	Light
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

b $(x' \wedge y \wedge z) \vee (x \wedge y' \wedge z) \vee (x \wedge y \wedge z') \vee (x \wedge y \wedge z)$

c $(x \wedge y) \vee (y \wedge z) \vee (z \wedge x)$

d



4 a i d

ii 1

iii 0

b $d \vee d' = d \neq 1$ and $d \wedge d' = d \neq 0$