

## 1.1

### Exercise 14

- (a) If you have flu then you will miss the final examination.
- (b) You won't miss the final examination if and only if you pass the course.
- (c) If you miss the examination then you will be failing the course.
- (d) You have the flu or you miss the final examination or you pass the course.
- (e) If you have the flu then you'll not pass the course or If you miss the final examination then you'll fail the course.
- (f) You have the flu and you miss the examination or You will not miss the final examination and you pass the course.

### Exercise 16

- (a)  $r \wedge \neg q$
- (b)  $p \wedge q \wedge r$
- (c)  $p \Rightarrow r$
- (d)  $p \wedge \neg q \wedge r$
- (e)  $(p \wedge q) \Rightarrow r$
- (f)  $r \Leftrightarrow (p \vee q)$

### Exercise 20

- (a) True

(b) True

(c) False

(d) True

## Exercise 22

(a) Inclusive or

(b) Exclusive or

(c) Inclusive or

(d) Exclusive or

## Exercise 34

(a)

$P$	$\neg P$	$P \Rightarrow \neg P$
T	F	F
F	T	T

(b)

$P$	$\neg P$	$P \Leftrightarrow \neg P$
T	F	F
F	T	F

(c)

$P$	$Q$	$(P \vee Q)$	$P \oplus (P \vee Q)$
T	T	T	F
T	F	T	T
F	T	T	T
F	F	F	F

(d)

$P$	$Q$	$(P \vee Q)$	$(P \wedge Q)$	$(P \wedge Q) \Rightarrow (P \vee Q)$
T	T	T	T	T
T	F	T	F	T
F	T	T	F	T
F	F	F	F	T

(e)

$P$	$Q$	$\neg P$	$(Q \Rightarrow \neg P)$	$(P \Leftrightarrow Q)$	$(Q \Rightarrow \neg P) \Leftrightarrow (P \Leftrightarrow Q)$
T	T	F	F	T	F
T	F	F	T	F	F
F	T	T	T	F	F
F	F	T	T	T	T

(f)

$P$	$Q$	$\neg Q$	$(Q \Leftrightarrow P)$	$(P \Leftrightarrow \neg Q)$	$(p \Leftrightarrow Q) \oplus (P \Leftrightarrow \neg Q)$
T	T	F	T	F	T
T	F	T	F	T	T
F	T	F	F	T	T
F	F	T	T	F	T

## 1.3

### Exercise 4

(a)	$P$	$Q$	$R$	$P \vee Q$	$Q \vee R$	$(P \vee Q) \vee R$	$P \vee (Q \vee R)$
	T	T	T	T	T	T	T
	T	T	F	T	T	T	T
	T	F	T	T	T	T	T
	T	F	F	T	F	T	T
	F	T	T	T	T	T	T
	F	T	F	T	T	T	T
	F	F	T	F	T	T	T
	F	F	F	F	F	F	F
(b)	$P$	$Q$	$R$	$P \wedge Q$	$Q \wedge R$	$(P \wedge Q) \wedge R$	$P \wedge (Q \wedge R)$
	T	T	T	T	T	T	T
	T	T	F	T	F	F	F
	T	F	T	F	F	F	F
	T	F	F	F	F	F	F
	F	T	T	F	F	F	F
	F	T	F	F	F	F	F
	F	F	T	F	F	F	F
	F	F	F	F	F	F	F

result:they are verify the associative laws.