

1.

- a) is a true proposition
- b) is a false proposition
- c) is a true proposition
- d) is a false proposition
- e) not a proposition
- f) not a proposition

2.

- a) not a proposition
- b) not a proposition
- c) is a false proposition
- d) not a proposition
- e) is a false proposition
- f) is a false proposition

3.

- a) Today is not Thursday
- b) There is pollution in New Jersey
- c)  $2 + 1 \neq 3$
- d) The summer in Maine is not hot and sunny

4.

- a) I didn't buy a lottery ticket this week
- b) I bought a lottery ticket this week, or I won the million dollar jackpot on friday.
- c) If I bought a lottery ticket this week, then I won the million dollar jackpot on friday.
- d) I bought a lottery ticket this week, and I won the million dollar jackpot on friday.
- e) I'll win the million dollar jackpot on friday if and only if I bought a lottery ticket this week.
- f) If I didn't buy a lottery ticket this week, then I didn't win the million dollar jackpot on friday.
- g) I didn't buy a lottery ticket this week, and I didn't win the million dollar jackpot on friday.
- h) Either I didn't buy a lottery ticket this week, or I did and I won the million dollar jackpot on friday

5.

- a) Sharks haven't been spotted near the shore.
- b) Swimming at the New Jersey shore is allowed, and Sharks have been spotted near the shore.
- c) Swimming at the New Jersey shore is not allowed, or Sharks have been spotted near the shore.
- d) If Swimming at the New Jersey shore is allowed, then Sharks haven't been spotted near the shore.
- e) If Sharks haven't been spotted near the shore, then swimming at the New Jersey shore is allowed.
- f) If Swimming at the New Jersey shore is not allowed, then sharks haven't been spotted near the shore.
- g) Swimming at the New Jersey shore is allowed if and only if sharks haven't been spotted near the shore.
- h) Either Swimming at the New Jersey shore is allowed, or Sharks have been spotted near the shore

6.

- a) The election hasn't been decided yet.
- b) The election is decided, or the votes have been counted.
- c) The election hasn't been decided yet, and the votes have been counted.
- d) If the votes have been counted, then the election is decided.
- e) If the votes haven't been counted yet, then the election is not decided.
- f) If the election is not decided yet, then the votes haven't been counted.
- g) The election is decided if and only if the votes have been counted.
- h) Either the election is decided, or the votes haven't been counted.

10.

- a)  $r$  and  $\neg q$
- b)  $p$  and  $r$  and  $q$
- c)  $r \rightarrow p$
- d)  $p$  and  $\neg q$  and  $r$

- e)  $p \text{ and } q \rightarrow r$
- f)  $r \leftrightarrow p \text{ and } q$

12.

- a) true
- b) false
- c) true
- d) false

13.

- a) false
- b) true
- c) true
- d) true

15.

- a) exclusive - you only get coffee or tea, not both -
- b) inclusive - password must have either least three digits or be at least eight characters long -
- c) inclusive - either of them is required -
- d) inclusive - one can pay both -

16.

- a) inclusive - either of them is enough -
- b) exclusive - just one on the table -
- c) inclusive - a passport or voter card is enough to enter the country-
- d) exclusive

21.

- a) You buy an ice cream cone if and only if it is hot outside.
- b) You win the contest if and only if you have the only winning ticket.
- c) You get promoted if and only if you have connections.
- d) Your mind will decay if and only if you watch television.
- e) The trains run late if and only if it's on exactly those days when I take it.

27.

a)

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

b)

$p$	$\neg p$	$p \vee \neg p$
T	F	T
F	T	T

c)

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

d)

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

e)

p	q	$\neg p$	$\neg q$	$p \rightarrow q$	$\neg q \rightarrow \neg p$	$(p \rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p)$
T	T	F	F	T	T	T
T	F	F	T	F	F	T
F	T	T	F	T	T	T
F	F	T	T	T	T	T

f)

p	q	$p \rightarrow q$	$q \rightarrow p$	$(p \rightarrow q) \rightarrow (q \rightarrow p)$
T	T	T	T	T
T	F	F	T	T
F	T	T	F	F
F	F	T	T	T

28.

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	T

c)

p	q	$p \vee q$	$p (+) (p \vee q)$
T	T	T	F
T	F	T	F
F	T	T	T
F	F	F	F

d)

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

e)

p	q	$\neg p$	$p \leftrightarrow q$	$q \rightarrow \neg p$	$(q \rightarrow \neg p) \leftrightarrow (p \leftrightarrow q)$
T	T	F	T	F	T
T	F	F	F	T	F
F	T	T	F	T	F
F	F	T	T	T	T

f)

p	q	$\neg q$	$p \leftrightarrow q$	$p \leftrightarrow \neg q$	$(p \leftrightarrow q) (+) (p \leftrightarrow \neg q)$
T	T	F	T	F	T
T	F	T	F	T	T
F	T	F	F	T	T
F	F	T	T	F	T

50.

### SOL

1-Whenever the system software is being upgraded, users cannot access the file system.

p : the system software is being upgraded.

q : users cannot access the file system.

$p \rightarrow \neg q$

---

2- If users can access the file system, then they can save new files.

q : If users can access the file system

s : then they can save new files

$q \rightarrow s$

---

3- If users cannot save new files, then the system software is not being upgraded.

$\neg s$  : users cannot save new files

$\neg q$  : the system software is not being upgraded.

$\neg s \rightarrow \neg q$

---

p	q	s	$\neg q$	$\neg s$	$p \rightarrow \neg q$	$q \rightarrow s$	$\neg s \rightarrow \neg q$	$(p \rightarrow \neg q) \wedge (q \rightarrow s) \wedge (\neg s \rightarrow \neg q)$
T	T	T	F	F	F	T	T	F
T	T	F	F	T	F	F	F	F
T	F	T	T	F	T	T	T	T
T	F	F	T	T	T	T	T	T
F	T	T	F	F	T	T	T	T
F	T	F	F	T	T	F	F	F
F	F	T	T	F	T	T	T	T
F	F	F	T	T	T	T	T	T