

1. P: I pass the test

Q: I pass the course

R: I make the dean's list.

(a) i. I pass the test or I don't pass the course.

ii. If I don't pass the test then I don't pass the course.

iii. If I pass the course then I pass the test.

iv. If I don't pass the test then I don't make the dean's list.

v. I don't pass the test and I pass the class.

vi. If I pass the test then I pass the class and if I pass the class then I make the Dean's list.

vii. I pass the class and I don't make the Dean's list.

viii. If I pass the class then I make the Dean's list.

ix. If I pass the test then I make the Dean's list and if I make the Dean's list then I pass the test.

(b) i.  $P \Rightarrow R$

ii.  $Q \vee \sim R$

iii.  $\sim Q \Rightarrow \sim R$

iv.  $Q \Rightarrow P$

v.  $Q \wedge \sim R$

vi.  $P \Rightarrow Q$

	(a)	(b)	(c)	(d)	(e)	
2. P	Q	$P \wedge Q$	$(P \Rightarrow Q) \vee P$	$(\sim P) \vee (\sim Q)$	$(P \Rightarrow Q) \Rightarrow (\sim P)$	$P \Rightarrow (\sim(P \Rightarrow Q))$
T	T	T	T	F	F	F
T	F	F	T	T	T	T
F	T	F	T	T	T	T
F	F	F	T	T	T	T

3.	$P$	$Q$	$P \Rightarrow Q$	$Q \Rightarrow P$	$(P \Rightarrow Q) \Rightarrow P$	$P \Rightarrow (Q \Rightarrow P)$	$((P \Rightarrow Q) \Rightarrow P) \Rightarrow (P \Rightarrow (Q \Rightarrow P))$
	T	T	T	T	T	T	T
	T	F	F	T	T	T	T
	F	T	T	F	F	T	T
	F	F	T	T	F	T	T

This is a tautology.

4.  $A = \{4, 5, 6, 7, 8, 9\}$

$P(B) : B \cap \{4, 6, 8\} = \emptyset$

$Q(B) : B \neq \emptyset$

(a)  $\{B_i\} = \{\{5\}, \{7\}, \{9\}, \{5, 7\}, \{5, 9\}, \{7, 9\}, \{5, 7, 9\}\}$

(b)  $\{B_i\} = \{\emptyset, \{5\}, \{7\}, \{9\}, \{5, 7\}, \{5, 9\}, \{7, 9\}, \{5, 7, 9\}\}$

(c)  $\{B_i\} = \{\emptyset, \{4\}, \{6\}, \{8\}, \{4, 6\}, \{4, 8\}, \{6, 8\}, \{4, 6, 8\}\}$

5.  $S = \{1, 2\}$

$P(n) : n < 3$

$Q(n) : n < 4$

$R(n) : n < 5$

$a=1, b=1, c=2$

$P(a) : T$

$Q(a) : T$

$Q(b) : T$

$R(b) : T$

$R(c) : T$

$P(c) : T$

$P(a) \Rightarrow Q(a) : T$

$Q(a) \Rightarrow P(a) : T$

$Q(b) \Rightarrow R(b) : T$

$R(b) \Rightarrow Q(b) : T$

$R(c) \Rightarrow P(c) : T$

$P(c) \Rightarrow R(c) : T$