

Q9 This is a contradiction - statement inconsistent with assumption everyone tells the truth or lies.

- Q1 a) $(1,0), (0,1), (-1,0)$.
 b) $\{0,1,2\}$
 c) $\{1\}$ d) $\{\emptyset, \{1\}, \mathbb{Z}\}$.

Q2 b) is a counterexample.

Q3 Thm: The square of an odd number is odd.

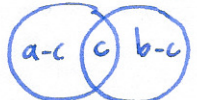
Proof Let n be an odd number, then $n = 2a+1$ for some $a \in \mathbb{Z}$.

Then $n^2 = (2a+1)^2 = 4a^2 + 4a + 1 = 2(2a^2 + 2a) + 1$. As $a \in \mathbb{Z}$, $2a^2 + 2a \in \mathbb{Z}$, and so n^2 is odd, as required. $\square$.

Q4 $P(\{1\}) = \{\emptyset, \{1\}\}$. $P(P(\{1\})) = \{\emptyset, \{\emptyset\}, \{\{1\}\}, \{\emptyset, \{1\}\}\}$.

Q5 No.  Counterexample $A = B = \{1\}$ $C = \emptyset$.
 $A \cup B = \{1\}$ - $A \cup C = \{1\}$ but $B \neq C$.

Q6 a) true b) vacuously true c) false

Q7  a) $a-c$ b) $(b)(c) = bc$ c) 2^c

Q8

A	B	C	A's statement ^{>2T} not consistent	A is lying	consistent	B is lying	consistent
T	T	T	T ✓	F	x		
T	T	F	T ✓	F	x		
T	F	T	T ✓	F	✓	T	✓
T	F	F	F ✗	T			
F	T	T	T ✗	F			
F	T	F	F ✓	T	✓	F	✓
F	F	T	F ✓	T	x		
F	F	F	F ✓	T	x		

↑ possibilities for truth sayers/liars.

two possibilities

TFT and FTF