

# Math-270: Ten Levels Toward Logic

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## Level Zero:

- Question # 1

- Given: J results in G
- Answer (Set Theory):  $J \subseteq G$
- Answer (Venn Diagram): J is the inner circle, G is the outer circle.
- Answer (Comp Sci Style): if J then G

- Question # 2

- Given: V implies J
- Answer (Set Theory):  $V \subseteq J$
- Answer (Venn Diagram): V is the inner circle, J is the outer circle.
- Answer (Comp Sci Style): if V then J

- Question # 3

- Given: The set of V is a subset of the set of D
- Answer (Set Theory):  $V \subseteq D$
- Answer (Venn Diagram): V is the inner circle, D is the outer circle.
- Answer (Comp Sci Style): if V then D

- Question # 4

- Given: K results in L
- Answer (Set Theory):  $K \subseteq L$
- Answer (Venn Diagram): K is the inner circle, L is the outer circle.
- Answer (Comp Sci Style): if K then L

- Question # 5

- Given: If V then A

- Answer (Set Theory):  $V \subseteq A$

- Answer (Venn Diagram): V is the inner circle, A is the outer circle.

- Answer (Comp Sci Style): if V then A

- Question # 6

- Given: The set of C is a superset of the set of Y

- Answer (Set Theory):  $Y \subseteq C$

- Answer (Venn Diagram): Y is the inner circle, C is the outer circle.

- Answer (Comp Sci Style): if Y then C

## Level One:

- Question # 1

- Given: B is sufficient for G

- Answer (Set Theory):  $B \subseteq G$

- Answer (Venn Diagram): B is the inner circle, G is the outer circle.

- Answer (Comp Sci Style): if B then G

- Question # 2

- Given: If D then N

- Answer (Set Theory):  $D \subseteq N$

- Answer (Venn Diagram): D is the inner circle, N is the outer circle.

- Answer (Comp Sci Style): if D then N

- Question # 3

- Given: S requires A
  - Answer (Set Theory):  $S \subseteq A$
  - Answer (Venn Diagram): S is the inner circle, A is the outer circle.
  - Answer (Comp Sci Style): if S then A
- Question # 4
    - Given: C implies E
    - Answer (Set Theory):  $C \subseteq E$
    - Answer (Venn Diagram): C is the inner circle, E is the outer circle.
    - Answer (Comp Sci Style): if C then E
- Question # 5
    - Given: Not N requires not G
    - Answer (Set Theory):  $G \subseteq N$
    - Answer (Venn Diagram): G is the inner circle, N is the outer circle.
    - Answer (Comp Sci Style): if G then N
- Question # 6
    - Given: W requires D
    - Answer (Set Theory):  $W \subseteq D$
    - Answer (Venn Diagram): W is the inner circle, D is the outer circle.
    - Answer (Comp Sci Style): if W then D
- Question # 7
    - Given: The set of Q is a superset of the set of A
    - Answer (Set Theory):  $A \subseteq Q$
    - Answer (Venn Diagram): A is the inner circle, Q is the outer circle.
    - Answer (Comp Sci Style): if A then Q
- Question # 8
    - Given: D is implied by T
    - Answer (Set Theory):  $T \subseteq D$
- Answer (Venn Diagram): T is the inner circle, D is the outer circle.
  - Answer (Comp Sci Style): if T then D
- Question # 9
    - Given: M requires Q
    - Answer (Set Theory):  $M \subseteq Q$
    - Answer (Venn Diagram): M is the inner circle, Q is the outer circle.
    - Answer (Comp Sci Style): if M then Q
- Question # 10
    - Given: Not S implies not J
    - Answer (Set Theory):  $J \subseteq S$
    - Answer (Venn Diagram): J is the inner circle, S is the outer circle.
    - Answer (Comp Sci Style): if J then S
- Question # 11
    - Given: Not K requires not D
    - Answer (Set Theory):  $D \subseteq K$
    - Answer (Venn Diagram): D is the inner circle, K is the outer circle.
    - Answer (Comp Sci Style): if D then K
- Question # 12
    - Given: All T are Z
    - Answer (Set Theory):  $T \subseteq Z$
    - Answer (Venn Diagram): T is the inner circle, Z is the outer circle.
    - Answer (Comp Sci Style): if T then Z

## Level Two:

- Question # 1
  - Given #1: C implies N
  - Given #2:  $x \in N$
  - Query: Is  $x \in C$  certainly true, certainly false, or not certain?

- Answer: not certain
  - Question # 2
    - Given #1: F , whenever D
    - Given #2:  $x \notin F$
    - Query: Is  $x \in D$  certainly true, certainly false, or not certain?
    - Answer: certainly false
  - Question # 3
    - Given #1: If P then J
    - Given #2:  $x \in P$
    - Query: Is  $x \in J$  certainly true, certainly false, or not certain?
    - Answer: certainly true
  - Question # 4
    - Given #1: Y , whenever L
    - Given #2:  $x \in Y$
    - Query: Is  $x \in L$  certainly true, certainly false, or not certain?
    - Answer: not certain
  - Question # 5
    - Given #1: V , whenever C
    - Given #2:  $x \in V$
    - Query: Is  $x \in C$  certainly true, certainly false, or not certain?
    - Answer: not certain
  - Question # 6
    - Given #1: Q requires G
    - Given #2:  $x \notin G$
    - Query: Is  $x \in Q$  certainly true, certainly false, or not certain?
    - Answer: certainly false
  - Question # 7
    - Given #1: All W are Y
    - Given #2:  $x \in Y$
    - Query: Is  $x \in W$  certainly true, certainly false, or not certain?
    - Answer: not certain
  - Question # 8
    - Given #1: J implies L
    - Given #2:  $x \in L$
    - Query: Is  $x \in J$  certainly true, certainly false, or not certain?
    - Answer: not certain
- Level Three:**
- Question # 1
    - Given #1: Not C implies not S
    - Given #2:  $x \notin S$
    - Query: Is  $x \in C$  certainly true, certainly false, or not certain?
    - Answer: not certain
  - Question # 2
    - Given #1: Not W requires not P
    - Given #2:  $x \notin P$
    - Query: Is  $x \in W$  certainly true, certainly false, or not certain?
    - Answer: not certain
  - Question # 3
    - Given #1: Not L implies not J
    - Given #2:  $x \notin J$
    - Query: Is  $x \notin L$  certainly true, certainly false, or not certain?
    - Answer: not certain
  - Question # 4
    - Given #1: E is necessary for B

- Given #2:  $x \notin B$
- Query: Is  $x \notin E$  certainly true, certainly false, or not certain?
- Answer: not certain
- Question # 5
  - Given #1: If not N then not V
  - Given #2:  $x \in V$
  - Query: Is  $x \notin N$  certainly true, certainly false, or not certain?
  - Answer: certainly false
- Question # 6
  - Given #1: Not Y implies not P
  - Given #2:  $x \notin P$
  - Query: Is  $x \notin Y$  certainly true, certainly false, or not certain?
  - Answer: not certain
- Question # 7
  - Given #1: A implies W
  - Given #2:  $x \in W$
  - Query: Is  $x \notin A$  certainly true, certainly false, or not certain?
  - Answer: not certain
- Question # 8
  - Given #1: Y , whenever J
  - Given #2:  $x \notin Y$
  - Query: Is  $x \notin J$  certainly true, certainly false, or not certain?
  - Answer: certainly true
- Question # 9
  - Given #1: M implies B
  - Given #2:  $x \in M$
  - Query: Is  $x \in B$  certainly true, certainly false, or not certain?
  - Answer: certainly true
- Question # 10
  - Given #1: B implies D
  - Given #2:  $x \in D$
  - Query: Is  $x \notin B$  certainly true, certainly false, or not certain?
  - Answer: not certain
- Question # 11
  - Given #1: The set of C is a subset of the set of M
  - Given #2:  $x \notin M$
  - Query: Is  $x \in C$  certainly true, certainly false, or not certain?
  - Answer: certainly false
- Question # 12
  - Given #1: The set of N is a superset of the set of C
  - Given #2:  $x \in N$
  - Query: Is  $x \notin C$  certainly true, certainly false, or not certain?
  - Answer: not certain
- Question # 13
  - Given #1: Not Y requires not R
  - Given #2:  $x \in Y$
  - Query: Is  $x \in R$  certainly true, certainly false, or not certain?
  - Answer: not certain
- Question # 14
  - Given #1: If not Y then not C
  - Given #2:  $x \in Y$
  - Query: Is  $x \notin C$  certainly true, certainly false, or not certain?
  - Answer: not certain
- Question # 15
  - Given #1: H is implied by M

- Given #2:  $x \notin M$
- Query: Is  $x \notin H$  certainly true, certainly false, or not certain?
- Answer: not certain

- Question # 16

- Given #1: E is implied by C
- Given #2:  $x \notin C$
- Query: Is  $x \notin E$  certainly true, certainly false, or not certain?
- Answer: not certain

## Level Four:

- Question # 1

- Given #1: G implies R
- Given #2: If R then N
- Answer (Set Theory):  $G \subseteq R \subseteq N$
- Answer (Venn Diagram): G is the inner circle, R is the middle circle, and N is the outer circle.
- Answer (Comp Sci Style): if G then R ; If R then N

- Question # 2

- Given #1: The set of C is a superset of the set of N
- Given #2: The set of V is a superset of the set of C
- Answer (Set Theory):  $N \subseteq C \subseteq V$
- Answer (Venn Diagram): N is the inner circle, C is the middle circle, and V is the outer circle.
- Answer (Comp Sci Style): if N then C ; If C then V

- Question # 3

- Given #1: If W then Z
- Given #2: W , whenever K
- Answer (Set Theory):  $K \subseteq W \subseteq Z$

- Answer (Venn Diagram): K is the inner circle, W is the middle circle, and Z is the outer circle.
- Answer (Comp Sci Style): if K then W ; If W then Z

- Question # 4

- Given #1: The set of Y is a subset of the set of R
- Given #2: The set of Q is a superset of the set of R
- Answer (Set Theory):  $Y \subseteq R \subseteq Q$
- Answer (Venn Diagram): Y is the inner circle, R is the middle circle, and Q is the outer circle.
- Answer (Comp Sci Style): if Y then R ; If R then Q

- Question # 5

- Given #1: S results in Q
- Given #2: S , whenever G
- Answer (Set Theory):  $G \subseteq S \subseteq Q$
- Answer (Venn Diagram): G is the inner circle, S is the middle circle, and Q is the outer circle.
- Answer (Comp Sci Style): if G then S ; If S then Q

- Question # 6

- Given #1: C results in B
- Given #2: All G are C
- Answer (Set Theory):  $G \subseteq C \subseteq B$
- Answer (Venn Diagram): G is the inner circle, C is the middle circle, and B is the outer circle.
- Answer (Comp Sci Style): if G then C ; If C then B

- Question # 7

- Given #1: The set of N is a subset of the set of G

- Given #2: The set of G is a subset of the set of P
- Answer (Set Theory):  $N \subseteq G \subseteq P$
- Answer (Venn Diagram): N is the inner circle, G is the middle circle, and P is the outer circle.
- Answer (Comp Sci Style): if N then G ; If G then P

• Question # 8

- Given #1: K requires C
- Given #2: The set of M is a subset of the set of K
- Answer (Set Theory):  $M \subseteq K \subseteq C$
- Answer (Venn Diagram): M is the inner circle, K is the middle circle, and C is the outer circle.
- Answer (Comp Sci Style): if M then K ; If K then C

## Level Five:

• Question # 1

- Given #1: Not R implies not W
- Given #2: All M are W
- Answer (Set Theory):  $M \subseteq W \subseteq R$
- Answer (Venn Diagram): M is the inner circle, W is the middle circle, and R is the outer circle.
- Answer (Comp Sci Style): if M then W ; If W then R

• Question # 2

- Given #1: All V are D
- Given #2: If E then V
- Answer (Set Theory):  $E \subseteq V \subseteq D$
- Answer (Venn Diagram): E is the inner circle, V is the middle circle, and D is the outer circle.
- Answer (Comp Sci Style): if E then V ; If V then D

• Question # 3

- Given #1: B , whenever Z
- Given #2: Not T implies not B
- Answer (Set Theory):  $Z \subseteq B \subseteq T$
- Answer (Venn Diagram): Z is the inner circle, B is the middle circle, and T is the outer circle.
- Answer (Comp Sci Style): if Z then B ; If B then T

• Question # 4

- Given #1: D is sufficient for Z
- Given #2: Not C implies not Z
- Answer (Set Theory):  $D \subseteq Z \subseteq C$
- Answer (Venn Diagram): D is the inner circle, Z is the middle circle, and C is the outer circle.
- Answer (Comp Sci Style): if D then Z ; If Z then C

• Question # 5

- Given #1: M implies B
- Given #2: Q requires M
- Answer (Set Theory):  $Q \subseteq M \subseteq B$
- Answer (Venn Diagram): Q is the inner circle, M is the middle circle, and B is the outer circle.
- Answer (Comp Sci Style): if Q then M ; If M then B

• Question # 6

- Given #1: J is sufficient for V
- Given #2: The set of J is a superset of the set of D
- Answer (Set Theory):  $D \subseteq J \subseteq V$
- Answer (Venn Diagram): D is the inner circle, J is the middle circle, and V is the outer circle.
- Answer (Comp Sci Style): if D then J ; If J then V

• Question # 7

- Given #1: If H then V
- Given #2: N results in H
- Answer (Set Theory):  $N \subseteq H \subseteq V$
- Answer (Venn Diagram): N is the inner circle, H is the middle circle, and V is the outer circle.
- Answer (Comp Sci Style): if N then H ; If H then V

• Question # 8

- Given #1: If not P then not M
- Given #2: P implies S
- Answer (Set Theory):  $M \subseteq P \subseteq S$
- Answer (Venn Diagram): M is the inner circle, P is the middle circle, and S is the outer circle.
- Answer (Comp Sci Style): if M then P ; If P then S

• Question # 9

- Given #1: Z requires B
- Given #2: C implies Z
- Answer (Set Theory):  $C \subseteq Z \subseteq B$
- Answer (Venn Diagram): C is the inner circle, Z is the middle circle, and B is the outer circle.
- Answer (Comp Sci Style): if C then Z ; If Z then B

• Question # 10

- Given #1: All N are S
- Given #2: Q requires N
- Answer (Set Theory):  $Q \subseteq N \subseteq S$
- Answer (Venn Diagram): Q is the inner circle, N is the middle circle, and S is the outer circle.
- Answer (Comp Sci Style): if Q then N ; If N then S

• Question # 11

- Given #1: The set of E is a superset of the set of Z
- Given #2: C results in Z
- Answer (Set Theory):  $C \subseteq Z \subseteq E$
- Answer (Venn Diagram): C is the inner circle, Z is the middle circle, and E is the outer circle.
- Answer (Comp Sci Style): if C then Z ; If Z then E

• Question # 12

- Given #1: P results in F
- Given #2: P is implied by D
- Answer (Set Theory):  $D \subseteq P \subseteq F$
- Answer (Venn Diagram): D is the inner circle, P is the middle circle, and F is the outer circle.
- Answer (Comp Sci Style): if D then P ; If P then F

• Question # 13

- Given #1: A is implied by C
- Given #2: M , whenever A
- Answer (Set Theory):  $C \subseteq A \subseteq M$
- Answer (Venn Diagram): C is the inner circle, A is the middle circle, and M is the outer circle.
- Answer (Comp Sci Style): if C then A ; If A then M

• Question # 14

- Given #1: The set of S is a superset of the set of T
- Given #2: All Y are T
- Answer (Set Theory):  $Y \subseteq T \subseteq S$
- Answer (Venn Diagram): Y is the inner circle, T is the middle circle, and S is the outer circle.
- Answer (Comp Sci Style): if Y then T ; If T then S

- Question # 15
  - Given #1: Not G implies not B
  - Given #2: B is implied by N
  - Answer (Set Theory):  $N \subseteq B \subseteq G$
  - Answer (Venn Diagram): N is the inner circle, B is the middle circle, and G is the outer circle.
  - Answer (Comp Sci Style): if N then B ; If B then G
- Question # 16
  - Given #1: D is implied by R
  - Given #2: G implies R
  - Answer (Set Theory):  $G \subseteq R \subseteq D$
  - Answer (Venn Diagram): G is the inner circle, R is the middle circle, and D is the outer circle.
  - Answer (Comp Sci Style): if G then R ; If R then D
- Question # 5
  - Hypothesis: T requires R
  - Given:  $x \notin R$  and  $x \in T$
  - Answer: Counter-Example!
- Question # 6
  - Hypothesis: S requires B
  - Given:  $x \in S$  and  $x \in B$
  - Answer: Consistent.
- Question # 7
  - Hypothesis: The set of A is a subset of the set of Y
  - Given:  $x \in Y$  and  $x \in A$
  - Answer: Consistent.

## Level Six:

- Question # 1
  - Hypothesis: P results in K
  - Given:  $x \in K$  and  $x \in P$
  - Answer: Consistent.
- Question # 2
  - Hypothesis: The set of Y is a subset of the set of L
  - Given:  $x \in Y$  and  $x \in L$
  - Answer: Consistent.
- Question # 3
  - Hypothesis: If L then T
  - Given:  $x \in T$  and  $x \in L$
  - Answer: Consistent.
- Question # 4
  - Hypothesis: T requires R
  - Given:  $x \notin R$  and  $x \in T$
  - Answer: Counter-Example!
- Question # 5
  - Hypothesis: S requires B
  - Given:  $x \in S$  and  $x \in B$
  - Answer: Consistent.
- Question # 6
  - Hypothesis: E , whenever G
  - Given:  $x \notin E$  and  $x \in G$
  - Answer: Counter-Example!
- Question # 7
  - Hypothesis: The set of A is a subset of the set of Y
  - Given:  $x \in Y$  and  $x \in A$
  - Answer: Consistent.
- Question # 8
  - Hypothesis: The set of L is a subset of the set of Y
  - Given:  $x \notin L$  and  $x \in Y$
  - Answer: Consistent.

## Level Seven:

- Question # 1
  - Hypothesis: If not Q then not L
  - Given:  $x \notin L$  and  $x \notin Q$
  - Answer: Consistent.
- Question # 2
  - Hypothesis: J is implied by K
  - Given:  $x \in J$  and  $x \notin K$
  - Answer: Consistent.



- Question # 3
  - Hypothesis: If not A then not J
  - Given:  $x \in A$  and  $x \in J$
  - Answer: Consistent.
- Question # 4
  - Hypothesis: M is implied by Z
  - Given:  $x \notin M$  and  $x \in Z$
  - Answer: Counter-Example!
- Question # 5
  - Hypothesis: Not A implies not P
  - Given:  $x \in A$  and  $x \in P$
  - Answer: Consistent.
- Question # 6
  - Hypothesis: The set of Z is a subset of the set of B
  - Given:  $x \notin B$  and  $x \in Z$
  - Answer: Counter-Example!
- Question # 7
  - Hypothesis: The set of H is a subset of the set of Y
  - Given:  $x \in Y$  and  $x \notin H$
  - Answer: Consistent.
- Question # 8
  - Hypothesis: The set of B is a subset of the set of Q
  - Given:  $x \notin Q$  and  $x \in B$
  - Answer: Counter-Example!
- Question # 9
  - Hypothesis: If not G then not Y
  - Given:  $x \notin G$  and  $x \in Y$
  - Answer: Counter-Example!
- Question # 10
  - Hypothesis: All L are S
  - Given:  $x \notin S$  and  $x \notin L$
  - Answer: Consistent.
- Question # 11
  - Hypothesis: G requires L
  - Given:  $x \in L$  and  $x \notin G$
  - Answer: Consistent.
- Question # 12
  - Hypothesis: All T are F
  - Given:  $x \notin T$  and  $x \notin F$
  - Answer: Consistent.
- Question # 13
  - Hypothesis: If R then D
  - Given:  $x \in R$  and  $x \notin D$
  - Answer: Counter-Example!
- Question # 14
  - Hypothesis: Not F requires not Y
  - Given:  $x \in Y$  and  $x \in F$
  - Answer: Consistent.
- Question # 15
  - Hypothesis: The set of G is a superset of the set of Q
  - Given:  $x \notin Q$  and  $x \in G$
  - Answer: Consistent.
- Question # 16
  - Hypothesis: B is necessary for S
  - Given:  $x \in S$  and  $x \in B$
  - Answer: Consistent.

## Level Eight:

- Question # 1
  - Given #1: L results in Z
  - Given #2: The set of F is a superset of the set of Z
  - Given #3:  $x \notin Z$
  - Query: Is  $x \in F$  certainly true, certainly false, or not certain?
  - Answer: not certain
- Question # 2
  - Given #1: The set of K is a subset of the set of E
  - Given #2: A , whenever E
  - Given #3:  $x \in K$
  - Query: Is  $x \in E$  certainly true, certainly false, or not certain?
  - Answer: certainly true
- Question # 3
  - Given #1: H , whenever R
  - Given #2: Y , whenever H
  - Given #3:  $x \in H$
  - Query: Is  $x \in Y$  certainly true, certainly false, or not certain?
  - Answer: certainly true
- Question # 4
  - Given #1: The set of W is a subset of the set of C
  - Given #2: All C are M
  - Given #3:  $x \in W$
  - Query: Is  $x \in C$  certainly true, certainly false, or not certain?
  - Answer: certainly true
- Question # 5
  - Given #1: S implies Z
  - Given #2: All E are S
  - Given #3:  $x \in E$
  - Query: Is  $x \in S$  certainly true, certainly false, or not certain?
  - Answer: certainly true
- Question # 6
  - Given #1: B requires Y
  - Given #2: The set of R is a superset of the set of Y
  - Given #3:  $x \notin R$
  - Query: Is  $x \in B$  certainly true, certainly false, or not certain?
  - Answer: certainly false
- Question # 7
  - Given #1: If P then N
  - Given #2: The set of T is a subset of the set of P
  - Given #3:  $x \notin T$
  - Query: Is  $x \in P$  certainly true, certainly false, or not certain?
  - Answer: not certain
- Question # 8
  - Given #1: If T then J
  - Given #2: J requires A
  - Given #3:  $x \in A$
  - Query: Is  $x \in T$  certainly true, certainly false, or not certain?
  - Answer: not certain
- Question # 9
  - Given #1: The set of D is a subset of the set of P
  - Given #2: The set of K is a subset of the set of D
  - Given #3:  $x \in K$
  - Query: Is  $x \in P$  certainly true, certainly false, or not certain?
  - Answer: certainly true

- Question # 10
  - Given #1: G requires Q
  - Given #2: The set of Q is a subset of the set of W
  - Given #3:  $x \in G$
  - Query: Is  $x \in W$  certainly true, certainly false, or not certain?
  - Answer: certainly true
  
- Question # 11
  - Given #1: All V are L
  - Given #2: All K are V
  - Given #3:  $x \notin L$
  - Query: Is  $x \in K$  certainly true, certainly false, or not certain?
  - Answer: certainly false
  
- Question # 12
  - Given #1: W requires T
  - Given #2: T requires P
  - Given #3:  $x \in T$
  - Query: Is  $x \in P$  certainly true, certainly false, or not certain?
  - Answer: certainly true
  
- Question # 13
  - Given #1: N , whenever Y
  - Given #2: N implies Z
  - Given #3:  $x \in Y$
  - Query: Is  $x \in N$  certainly true, certainly false, or not certain?
  - Answer: certainly true
  
- Question # 14
  - Given #1: The set of S is a subset of the set of H
  - Given #2: If D then S
  - Given #3:  $x \notin S$
  
- Query: Is  $x \in D$  certainly true, certainly false, or not certain?
- Answer: certainly false
  
- Question # 15
  - Given #1: The set of L is a subset of the set of S
  - Given #2: The set of J is a subset of the set of L
  - Given #3:  $x \notin S$
  - Query: Is  $x \in L$  certainly true, certainly false, or not certain?
  - Answer: certainly false
  
- Question # 16
  - Given #1: C requires Q
  - Given #2: All S are C
  - Given #3:  $x \in Q$
  - Query: Is  $x \in C$  certainly true, certainly false, or not certain?
  - Answer: not certain

## Level Nine:

- Question # 1
  - Given #1: If C then G
  - Given #2: Not C requires not V
  - Given #3:  $x \notin V$
  - Query: Is  $x \in G$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 2
  - Given #1: K is implied by S
  - Given #2: M is implied by K
  - Given #3:  $x \in S$
  - Query: Is  $x \notin M$  certainly true, certainly false, or not certain?
  - Answer: certainly false

- Question # 3
  - Given #1: Not D requires not A
  - Given #2: A , whenever W
  - Given #3:  $x \notin A$
  - Query: Is  $x \in D$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 4
  - Given #1: V is sufficient for E
  - Given #2: The set of B is a superset of the set of E
  - Given #3:  $x \in E$
  - Query: Is  $x \in B$  certainly true, certainly false, or not certain?
  - Answer: certainly true
  
- Question # 5
  - Given #1: The set of V is a subset of the set of C
  - Given #2: Q is necessary for C
  - Given #3:  $x \notin Q$
  - Query: Is  $x \notin V$  certainly true, certainly false, or not certain?
  - Answer: certainly true
  
- Question # 6
  - Given #1: H , whenever K
  - Given #2: If not K then not G
  - Given #3:  $x \in K$
  - Query: Is  $x \in G$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 7
  - Given #1: V is sufficient for Z
  - Given #2: If not V then not S
  - Given #3:  $x \in Z$
  
- Query: Is  $x \in V$  certainly true, certainly false, or not certain?
- Answer: not certain
  
- Question # 8
  - Given #1: The set of R is a subset of the set of H
  - Given #2: H implies S
  - Given #3:  $x \in S$
  - Query: Is  $x \notin H$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 9
  - Given #1: All M are D
  - Given #2: Not N implies not D
  - Given #3:  $x \notin M$
  - Query: Is  $x \in N$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 10
  - Given #1: If not D then not E
  - Given #2: E is necessary for C
  - Given #3:  $x \notin C$
  - Query: Is  $x \notin D$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 11
  - Given #1: All W are R
  - Given #2: R results in V
  - Given #3:  $x \in V$
  - Query: Is  $x \notin W$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 12
  - Given #1: If R then E

- Given #2: E implies L
  - Given #3:  $x \in R$
  - Query: Is  $x \in E$  certainly true, certainly false, or not certain?
  - Answer: certainly true
- Question # 13
    - Given #1: The set of N is a subset of the set of K
    - Given #2: G results in N
    - Given #3:  $x \notin G$
    - Query: Is  $x \notin N$  certainly true, certainly false, or not certain?
    - Answer: not certain
- Question # 14
    - Given #1: Not N requires not Z
    - Given #2: If not Z then not R
    - Given #3:  $x \notin R$
    - Query: Is  $x \in Z$  certainly true, certainly false, or not certain?
    - Answer: not certain
- Question # 15
    - Given #1: Not T requires not W
    - Given #2: If not W then not B
    - Given #3:  $x \in W$
    - Query: Is  $x \notin B$  certainly true, certainly false, or not certain?
    - Answer: not certain
- Question # 16
    - Given #1: If not L then not G
    - Given #2: The set of Y is a superset of the set of L
    - Given #3:  $x \in L$
    - Query: Is  $x \notin Y$  certainly true, certainly false, or not certain?
    - Answer: certainly false
- Question # 17
    - Given #1: If not D then not W
    - Given #2: P is necessary for D
    - Given #3:  $x \notin D$
    - Query: Is  $x \in W$  certainly true, certainly false, or not certain?
    - Answer: certainly false
- Question # 18
    - Given #1: Q results in Z
    - Given #2: K is necessary for Z
    - Given #3:  $x \in Q$
    - Query: Is  $x \in Z$  certainly true, certainly false, or not certain?
    - Answer: certainly true
- Question # 19
    - Given #1: All J are C
    - Given #2: N is sufficient for J
    - Given #3:  $x \in J$
    - Query: Is  $x \notin N$  certainly true, certainly false, or not certain?
    - Answer: not certain
- Question # 20
    - Given #1: If not Z then not S
    - Given #2: If not S then not R
    - Given #3:  $x \notin R$
    - Query: Is  $x \notin S$  certainly true, certainly false, or not certain?
    - Answer: not certain
- Question # 21
    - Given #1: J is necessary for R
    - Given #2: R is implied by L
    - Given #3:  $x \in R$
    - Query: Is  $x \in L$  certainly true, certainly false, or not certain?
    - Answer: not certain

- Question # 22
  - Given #1: D , whenever Z
  - Given #2: K is necessary for D
  - Given #3:  $x \in D$
  - Query: Is  $x \in K$  certainly true, certainly false, or not certain?
  - Answer: certainly true
  
- Question # 23
  - Given #1: If R then B
  - Given #2: Not C implies not B
  - Given #3:  $x \notin R$
  - Query: Is  $x \notin C$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 24
  - Given #1: J requires D
  - Given #2: The set of J is a superset of the set of R
  - Given #3:  $x \in R$
  - Query: Is  $x \in D$  certainly true, certainly false, or not certain?
  - Answer: certainly true
  
- Question # 25
  - Given #1: Not V implies not J
  - Given #2: V results in Q
  - Given #3:  $x \notin J$
  - Query: Is  $x \in Q$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 26
  - Given #1: S is implied by G
  - Given #2: S requires Y
  - Given #3:  $x \notin G$
  - Query: Is  $x \in S$  certainly true, certainly false, or not certain?
  
- Answer: not certain
  
- Question # 27
  - Given #1: E , whenever F
  - Given #2: C is necessary for E
  - Given #3:  $x \notin F$
  - Query: Is  $x \in E$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 28
  - Given #1: P is necessary for A
  - Given #2: Not A requires not L
  - Given #3:  $x \notin P$
  - Query: Is  $x \notin L$  certainly true, certainly false, or not certain?
  - Answer: certainly true
  
- Question # 29
  - Given #1: E results in G
  - Given #2: Not M requires not G
  - Given #3:  $x \in M$
  - Query: Is  $x \notin G$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 30
  - Given #1: The set of E is a superset of the set of M
  - Given #2: All E are J
  - Given #3:  $x \in J$
  - Query: Is  $x \notin E$  certainly true, certainly false, or not certain?
  - Answer: not certain
  
- Question # 31
  - Given #1: A requires B
  - Given #2: M is sufficient for A

- Given #3:  $x \notin A$
- Query: Is  $x \notin B$  certainly true, certainly false, or not certain?
- Answer: not certain

- Question # 32

- Given #1:  $Z$ , whenever  $R$
- Given #2:  $Z$  requires  $H$
- Given #3:  $x \in R$
- Query: Is  $x \notin Z$  certainly true, certainly false, or not certain?
- Answer: certainly false