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Revision Set 1

1. (a) $q \vee r \wedge \sim p$

$2^3 = 8$ rows

q	r	p	$\sim p$	$q \vee r$	$q \vee r \wedge \sim p$
T	T	T	F	T	F
T	T	F	T	T	T
T	F	T	F	T	F
T	F	F	T	T	T
F	T	T	F	T	F
F	T	F	T	T	T
F	F	T	F	F	F
F	F	F	T	F	F

(b) $(P \rightarrow q) \wedge (q \rightarrow r) \vee \sim r$

$2^3 = 8$ rows

P	q	r	$\sim r$	$(P \rightarrow q)$	$(q \rightarrow r)$	$(P \rightarrow q) \wedge (q \rightarrow r)$	$(P \rightarrow q) \wedge (q \rightarrow r) \vee \sim r$
T	T	T	F	T	T	T	T
T	T	F	T	T	F	F	T
T	F	T	F	F	T	F	F
T	F	F	T	F	T	F	T
F	T	T	F	T	T	T	T
F	T	F	T	T	F	F	T
F	F	T	F	T	T	T	T
F	F	F	T	T	T	T	T

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2. ③ → ④ ↻

↓

⑤ ← ⑥ ↻

$R: \{(3,4), (4,4), (4,6), (6,6), (6,5)\}$ ✓

Reflexive

R is not reflexive since $(3,3)$ and $(5,5) \notin R$. ✓

Symmetric

R is not symmetric since $(3,4) \in R$ but $(4,3) \notin R$ ✓

Transitive

R is not transitive since $(4,6)$ and $(6,5) \in R$ but $(4,5) \notin R$ ✓

∴ R is not equivalence because R is not reflexive, not symmetric and not transitive.

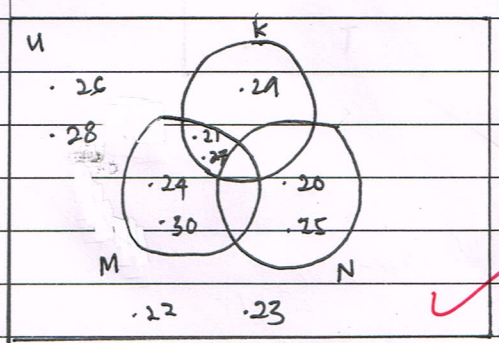
3. $U = \{x \mid 20 \leq x \leq 30\}$ ✓

$\{20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30\}$

$K = \{21, 27, 29\}$ ✓

$M = \{21, 24, 27, 30\}$ ✓

$N = \{20, 25\}$ ✓



✓

i) $(K \cup M') \cap N$

$\{21, 27, 29, 26, 28, 22, 23, 20, 25\}$ ✓

$(K \cup M') \cap N = \{20, 25\}$ ✓

iii) $(M-K)' \cup N$

$M = \{21, 27, 24, 30\}$ ✓

$K = \{29, 21, 27\}$ ✓

$M-K = \{24, 30\}$ ✓

$(M-K)' = \{20, 21, 22, 23, 25, 26, 27, 28, 29\}$ ✓

$N = \{20, 25\}$ ✓

$(M-K)' \cup N = \{20, 21, 22, 23, 25, 26, 27, 28, 29\}$ ✓

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$(M \cup K) - (N \cup K)$

$M \cup K = \{21, 24, 27, 29, 30\}$

$N \cup K = \{20, 21, 25, 27, 29\}$

$(M \cup K) - (N \cup K) = \{24, 30\}$

4. P : He is rich

q : He is happy

(a) if he is rich, then he is unhappy.

$P \rightarrow \sim q$ ✓

(b) He is neither rich nor happy

$\sim P \wedge \sim q$ ✓

(c) It is necessary to be poor in order to be happy.

$q \rightarrow \sim p$ (change sentence structure)

= If I am happy, then I am poor. ✓

(d) He is unhappy if and only if he is poor.

$\sim q \leftrightarrow \sim p$ ✓

(e) To be poor is to be unhappy (if I am poor, then I am unhappy)

$\sim p \rightarrow \sim q$ ✓