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ANSWERS:

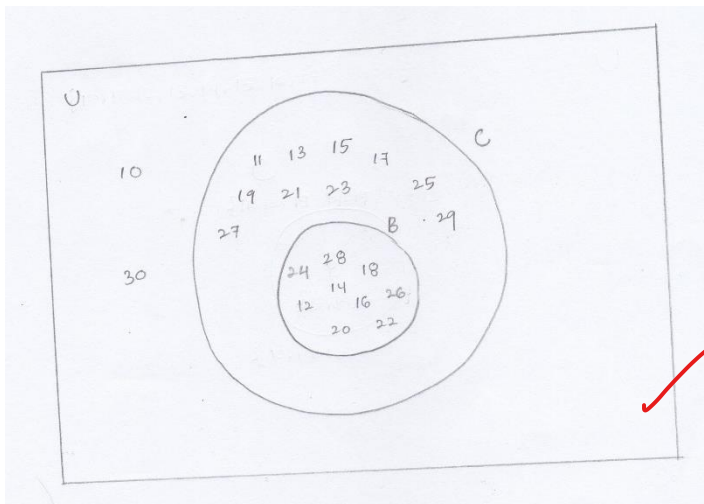
1. a) Possible proper subsets for $C = \{\}, \{12\}, \{13\}, \{14,15,16\}, \{17,18,19\}, \{20,21\}, \dots$

$$|C| = 19$$

b) Possible proper subsets for $B = \{\}, \{12\}, \{14\}, \{16,18,20\}, \{18,20,22\}, \{24,28\}, \dots$

$$|B| = 9$$

c) Venn Diagram



d) Cardinality of symmetric difference of set B and set C $= |C| - |B|$
 $= 10$

2.a) $|P(A)| = 2^3$

$$= 8$$

b) $A \cup B \cap C = \{e, t\}$

c) $A \cap B \cup C = \{s, n, e, t\}$

d) $A - B = \{u, b\}$

e) $B \times C = \{(s,n), (s,e), (s,t), (e,n), (e,e), (e,t), (t,n), (t,e), (t,t)\}$

3.

- a) It is a true proposition. ✓
- b) It is a true proposition. ✓
- c) It is a false proposition. ✓
- d) It is not a proposition because it is not a declarative sentence. ✗
- e) It is not a proposition because it is not a declarative sentence. ✗

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first two depend on the value of a and b

4. a)

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

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b)

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

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5.

p	q	r	$\neg p$	$\neg q$	$\neg r$	$\neg q \vee \neg r$	$\neg p \wedge (\neg q \vee \neg r)$	$q \wedge r$	$p \vee (q \wedge r)$
T	T	T	F	F	F	F	F	T	T
T	T	F	F	F	T	T	F	F	T
T	F	T	F	T	F	T	F	F	T
T	F	F	F	T	T	T	F	F	T
F	T	T	T	F	F	F	F	T	T
F	T	F	T	F	T	T	T	F	F
F	F	T	T	T	F	T	T	F	F
F	F	F	T	T	T	T	T	F	F

$\therefore A \neq B$

✓

of 14

6.

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

$\therefore A \equiv B$

7. a) $\exists x P(x) \wedge \exists x R(x)$

b) $\forall x (Q(x) \rightarrow \neg R(x))$

8. Let $A(x)$: x is a negative integer.

Let $B(x)$: x is a positive integer.

$\forall x (A(x) \rightarrow B(x))$

The domain of discourse is set Z for all integer.

When $x = -2$,

$$x^2 = (-2)^2$$

$$= (-2)(-2)$$

$$= 4 \text{ (positive)}$$

9. $A \cap (B \cap A') = \{\}$

$A \cap (B \cap A') \neq \{\}$ by contradiction

$(A \cap B) \cap A'$

$(A \cap A') \cap B$ associative law

$\{\} \cap B$ complement law

$\{\} \cap B = \{\}$