

CSE 16
Summer 2020
Quiz 1

Solutions

1. (15 Points) Let $A \subseteq U$ and $B \subseteq U$. Suppose $A \cap B = \emptyset$, $|A| = 5$, $|B| = 12$ and $|U| = 20$. Determine

$$|\mathbb{P}(\mathbb{P}(\overline{A \cup B}))|$$

Solution:

$$|A \cup B| = |A| + |B| = 5 + 12 = 17 \quad (\text{since } A \cap B = \emptyset)$$

$$|\overline{A \cup B}| = 20 - 17 = 3$$

$$|\mathbb{P}(\overline{A \cup B})| = 2^3 = 8$$

$$|\mathbb{P}(\mathbb{P}(\overline{A \cup B}))| = 2^8 = 256$$

Answer: (c) 256

2. (20 Points) Let $S = \{\{1, 2\}, \{\{3\}, 4\}\}$. Determine $\mathbb{P}(S)$.

Answer: (b) $\{\emptyset, \{\{1, 2\}\}, \{\{\{3\}, 4\}\}, \{\{1, 2\}, \{\{3\}, 4\}\}\}$

3. (15 Points) Determine whether the logical expression $(P \oplus Q) \vee (Q \Rightarrow \sim R)$ is a tautology. If it is not a tautology, determine an assignment of truth values to the propositional variables P , Q , R that makes the expression false.

Solution:

P	Q	R	$P \oplus Q$	$Q \Rightarrow \sim R$	$(P \oplus Q) \vee (Q \Rightarrow \sim R)$
0	0	0	0	1	1
0	0	1	0	1	1
0	1	0	1	1	1
0	1	1	1	0	1
1	0	0	1	1	1
1	0	1	1	1	1
1	1	0	0	1	1
1	1	1	0	0	0

Answer: (d) not a tautology: $P = Q = R = T$