CIS102 Tutorial 2 Answers

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1. (a) $\{b \in \mathbb{Z} : -2 \leq b \leq 3\} = \{-2,-1,0,1,2,3\}$
   (b) $\{5^t : t \in \mathbb{Z}, t \geq 0\} = \{5^0, 5^1, 5^2, 5^3, \ldots\} = \{1, 5, 25, 125, \ldots\}$

2. (a) $\{8, 10, 12, 14, 16, 18, 20\} = \{2m : m \in \mathbb{Z}, 4 \leq m \leq 10\}$
   (b) $\{0, 3, -3, 6, -6, 9, -9, \ldots\} = \{3n : n \in \mathbb{Z}\}$

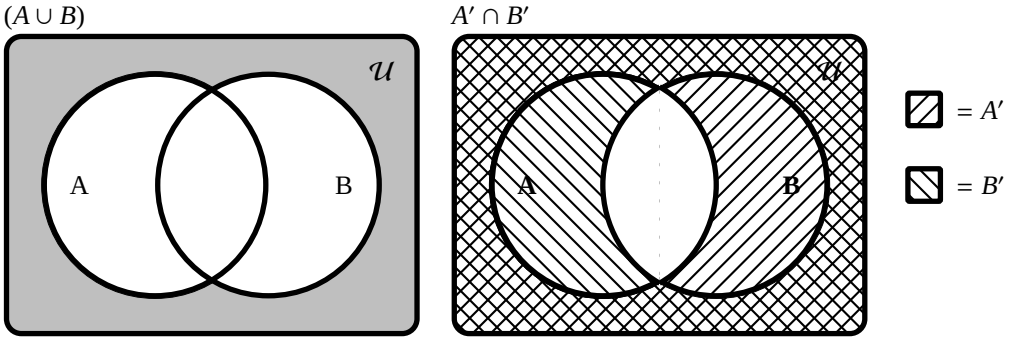
3. (a) $S = 0, 1, 2, 3, 4, 5$
   $|S| = 6$
   (b) $|\mathcal{P}(S)| = 2^{|S|} = 2^6 = 64$
   (c) $X = 1, 3, 5$
   $1 \in X$
   $X \subseteq S$
   $\emptyset \subseteq S$
   $X \in \mathcal{P}(X)$

4. $X = \{a, b, c\}$, $Y = \{a, c, d, f\}$, $\mathcal{U} = \{a, b, c, d, e, f\}$
   $X \subseteq \mathcal{U}$, $y \subseteq \mathcal{U}$

   $Y' = \{b, e\}$
   $X \cup Y = \{a, b, c, d, f\}$
   $X \cap Y' = \{b\}$

5. $A \subseteq \mathcal{U}$, $B \subseteq \mathcal{U}$

   (a)



   (b)

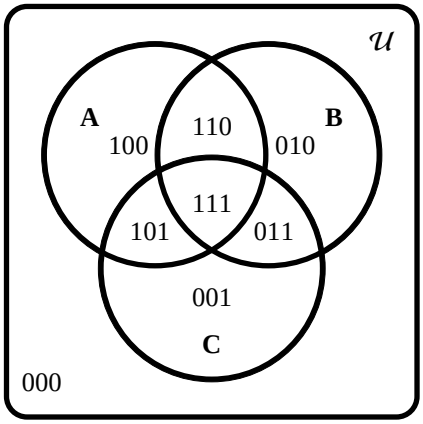
A	B	$A \cup B$	$(A \cup B)'$	A'	B'	$A' \cap B'$
0	0	0	1	1	1	1
0	1	1	0	1	0	0
1	0	1	0	0	1	0
1	1	1	0	0	0	0

   Coulumns $(A \cup B)'$ and $A' \cap B'$ are the same, therefore they are equivalent regions of $\mathcal{U}$, so $(A \cup B)' \equiv A' \cap B'$

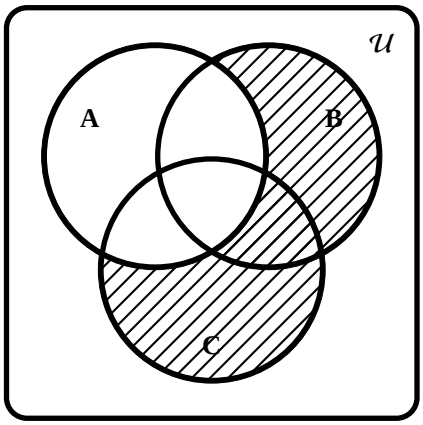
6. (a) $(A \cup B) \cup C \equiv A \cup (B \cup C)$
   (b) $\mathcal{U} = \{1, 2, 3, 4, 5\}$
   $[A \subseteq \mathcal{U}, B \subseteq \mathcal{U}, C \subseteq \mathcal{U} | (A - B) - C \neq A - (B - C)]$

   $A = \{1, 3, 5\}$, $B = \{2, 3, 4\}$, $c = \{1, 2, 3\}$
   (c) The binary operation *set difference* is not associative.

7. (a)



(b)



(c) $X = (B \cup C) \cap A'$