5.1a) $\{4, 6\}$

5.1b) $\{\{8\}, \{7, 8\}, \{8, 9\}, \{7, 8, 9\}\}$

5.1c) $\{\emptyset\}$

5.1d) $\{(1, 0), (3, 0), (5, 0)\}$

5.1e) $\emptyset$

5.1f) $\{(\emptyset, \emptyset), (\emptyset, 1), (0, \emptyset), (0, 1)\}$

5.1g) $\{\emptyset, \{\emptyset\}, \{\{2\}\}, \{\emptyset, \{2\}\}\}$

5.3) When $n = 1$, the power set of A has 2 elements:

$$\begin{aligned} A &= \{1, 2, 3\} \\ |A| &= 3 \\ \mathcal{P}(A) &= \{\{\emptyset\}, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}\} \\ |\mathcal{P}(A)| &= 2^3 \end{aligned}$$

5.5a) Let $x = |A|$, $y = |B|$:

$$\begin{aligned} |\mathcal{P}(A * B)| &= 2^{xy} \\ |\mathcal{P}(A) * \mathcal{P}(B)| &= 2^{x+y} \end{aligned}$$

5.5b) Since there is no element that belongs to and does not belong to set A, the same statement applies to set B, so the equation is true.

5.7a) False, the left set is empty while the right has one element.

5.7b) False, an empty set has no element.

5.7c) True, an empty set has a cardinality of 0.

5.7d) False, the power set of an empty element has one element, $\emptyset$.

5.7e) False, an empty set is a set, not an element.

5.7f) True, there is no integer that is a non-positive and greater than 0.

5.9a) Divide all elements into three sets. A' contains all elements that are exclusive to set A, B' contains all elements that are exclusive to set B, and S contains all elements that are shared between A and B.

$$\begin{aligned} A \cap (A \cup B) &= \{A', S\} \cap \{A', B', S\} \\ &= \{A', S\} \\ &= A \end{aligned}$$

5.9b) Let X' represent a set that contains all the elements exclusive to set X. Let $S_{X,Y}$ represent a set that contains all the elements shared by set X and Y.

$$
\begin{aligned}
A &= A' \cup S_{A,B} \cup S_{A,C} \cup S_{A,B,C} \\
B &= B' \cup S_{B,C} \cup S_{A,B} \cup S_{A,B,C} \\
C &= C' \cup S_{A,C} \cup S_{B,C} \cup S_{A,B,C}
\end{aligned}
$$

$$
\begin{aligned}
B \cap C &= S_{B,C} \cup S_{A,B,C} \\
A - (1) &= A' \cup S_{A,B} \cup S_{A,C}
\end{aligned}
$$

$$
\begin{aligned}
A - B &= A' \cup S_{A,C} \\
A - C &= A' \cup S_{A,B} \\
2 \cup 3 &= A' \cup S_{A,B} \cup S_{A,C}
\end{aligned}
$$

5.11) If $\langle x, y \rangle = \langle u, v \rangle$, then the two sets must be equal. The first and second elements of the two sets should equal to one another and can be applied to the sets of $\{x, y\}$ and $\{u, v\}$.