1. Let \( S = \{a, b, c, 1, 3, 9\} \) and \( T = \{b, c, 3, *\} \). Determine the cardinality of each set below.
(a) \( S \cup T \)
\[
= \{a, b, c, 1, 3, 9, b, c, 3, *\} = \{a, b, c, 1, 3, 9, *\} \quad \text{hence} \quad |S \cup T| = 7
\]
(b) \( S \cap T \)
\[
= \{b, c, 3\} \quad \text{hence} \quad |S \cap T| = 3
\]
(c) \( S \setminus T \)
\[
= \{a, 1, 9\} \quad \text{hence} \quad |S \setminus T| = 3
\]

2. List all the elements of the set \( A \times \mathcal{P}(A) \) where \( A = \{x, z\} \) and \( \mathcal{P}(A) \) is its power set.
\[
\mathcal{P}(A) = \{ \emptyset, \{x\}, \{z\}, \{x, z\}\}
\]
Elements of \( A \times \mathcal{P}(A) \):
\[
(x, \emptyset), (x, \{x\}), (x, \{z\}), (x, \{x, z\}),
\]
\[
(z, \emptyset), (z, \{x\}), (z, \{z\}), (z, \{x, z\})
\]

3. Draw a Venn diagram for sets \( A, B, C \) and shade the region corresponding to \( (A \cap B)^c \cap C \).