

NAME:

Problem 1 (5 points): Describe the following shaded region using the set operations of union, intersection, complement, and the sets A , B , and C :

Solution: $((A \cap (B \cup C)') \cup (B \cap (A \cup C)') \cup (C \cap (A \cup B)')) \cup (A \cap B \cap C)$

Problem 2 (5 points): Let $A = \{a, b\}$, $B = \{1, 2, 3\}$, and $C = \{a, 1, 2\}$. Then

$$(A \times B) \cap (C \times B) = ?$$

Solution:

$$\{(a, 1), (a, 2), (a, 3)\}$$

Problem 3 (5 points): A set X that has 70 elements is partitioned into subsets X_1 , X_2 , X_3 , and X_4 . If $n(X_1) = n(X_4) + 5$, $n(X_2) = 2 \cdot n(X_4)$, and $n(X_3) = n(X_1) + n(X_4)$, what is $n(X_3)$?

Solution:

$$\begin{aligned} 70 &= n(X) \\ &= (n(X_4) + 5) + (2 \cdot n(X_4)) + (n(X_1) + n(X_4)) + n(X_4) \\ &= (n(X_4) + 5) + (2 \cdot n(X_4)) + ((n(X_4) + 5) + n(X_4)) + n(X_4) \\ &= 6 \cdot n(X_4) + 10. \end{aligned}$$

Thus,

$$\begin{aligned} 60 &= 6 \cdot n(X_4) \\ 10 &= n(X_4). \end{aligned}$$

Finally,

$$n(X_3) = n(X_1) + n(X_4) = (n(X_4) + 5) + n(X_4) = 2 \cdot n(X_4) + 5 = 2 \cdot 10 + 5 = 25.$$