

Answer on Question #42118 – Math – Set Theory

Consider the sample space $S = \{\text{copper, sodium, nitrogen, potassium, uranium, oxygen, zinc}\}$, and the events $A = \{\text{copper, sodium, zinc}\}$, $B = \{\text{uranium, nitrogen, potassium}\}$, $C = \{\text{oxygen}\}$.

List the elements of the sets corresponding the following events:

i) $A \cup C$

ii) $(A \cap B') \cup C'$

iii) $(A' \cup B') \cap (A' \cap C)$

Solution:

Rename the elements of S the figures for convenience:

Copper $\Rightarrow 0$,

Sodium $\Rightarrow 1$,

Nitrogen $\Rightarrow 2$,

Potassium $\Rightarrow 3$,

Uranium $\Rightarrow 4$,

Oxygen $\Rightarrow 5$,

Zinc $\Rightarrow 6$,

Then:

$$S = \{0,1,2,3,4,5,6\}; A = \{0,1,6\}; B = \{2,3,4\}; C = \{5\}$$

1) $A \cup C = \{0,1,5,6\}$ or $A \cup C = \{\text{copper, sodium, oxygen, zinc}\}$

2) $B' = \{0,1,5,6\}$

$$C' = \{0,1,2,3,4,6\}$$

$$A \cap B' = \{0,1,6\} = D$$

$$D \cup C' = (A \cap B') \cup C' = \{0,1,2,3,4,6\} \text{ or } (A \cap B') \cup C' = \{\text{copper, sodium, nitrogen, potassium, uranium, zinc}\}$$

3) $A' = \{2,3,4,5\}$

$$B' = \{0,1,5,6\}$$

$$A' \cup B' = \{0,1,2,3,4,5,6\} = S$$

$$A' \cap C = \{5\}$$

$$(A' \cup B') \cap (A' \cap C) = S \cap \{5\} = \{5\} \text{ or } (A' \cup B') \cap (A' \cap C) = \{\text{oxygen}\}$$

Answer:

1) $A \cup C = \{\text{copper, sodium, oxygen, zinc}\}$

2) $(A \cap B') \cup C' = \{\text{copper, sodium, nitrogen, potassium, uranium, zinc}\}$

3) $(A' \cup B') \cap (A' \cap C) = \{\text{oxygen}\}$