

Topic: Set Properties, Cardinality, and Complements

Instructions: Answer all questions in the spaces provided. Show clear working where applicable. Use proper set roster notation { } when listing elements.

SECTION A: Set Cardinality [8 Marks]

1. Write the cardinal number $n(X)$ for each of the following given sets:

- a) $A = \{m, a, t, h, e, m, a, t, i, c, s\}$ $n(A) = \underline{\hspace{2cm}}$
- b) $B = \{ \}$ $n(B) = \underline{\hspace{2cm}}$
- c) $C = \{\text{Months in a year starting with the letter 'J'}\}$ $n(C) = \underline{\hspace{2cm}}$
- d) $D = \{\text{Vowels in the English alphabet}\}$ $n(D) = \underline{\hspace{2cm}}$

2. State whether each statement is **True** or **False**:

- a) If $E = \{2, 4, 6, 8, 10\}$, then $n(E) = 5$.
- b) The cardinality of an empty set $\emptyset$ is equal to 1.

SECTION B: Set Complements [9 Marks]

3. Given the universal set $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$:

- a) If $P = \{2, 3, 5, 7\}$, list the elements of set P' :
- $P' = \{ \underline{\hspace{4cm}} \}$
- b) If $Q = \{1, 3, 5, 7, 9\}$, list the elements of set Q' :
- $Q' = \{ \underline{\hspace{4cm}} \}$
- c) Determine the value of $n(P')$:
- $n(P') = \underline{\hspace{2cm}}$

4. Consider the universal set $W = \{\text{Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday}\}$:

- a) If $S = \{\text{Saturday, Sunday}\}$, write the complement set S' :
- $S' = \{ \underline{\hspace{4cm}} \}$
- b) If $D = \{\text{Days ending in 'y'}\}$, write the complement set D' :
- $D' = \{ \underline{\hspace{4cm}} \}$
- c) Find $n(D')$:
- $n(D') = \underline{\hspace{2cm}}$

SECTION C: Problem Solving & Reasoning [8 Marks]

5. Let the universal set be $N = \{\text{Natural numbers less than 10}\}$ and let $K = \{4, 5, 6, 8, 9\}$:

a) List all elements of the universal set N :

$$N = \{ \underline{\hspace{10cm}} \}$$

b) List the elements of the complement set K' :

$$K' = \{ \underline{\hspace{10cm}} \}$$

c) Find $n(K)$ and $n(K')$:

$$n(K) = \underline{\hspace{2cm}}, \quad n(K') = \underline{\hspace{2cm}}$$

d) Calculate $n(K) + n(K')$ and compare it with $n(N)$. What pattern do you observe?

$$n(K) + n(K') = \underline{\hspace{2cm}}$$

Observation: _____