

7.2 Cardinality

Definition: If A is a finite set, then its cardinality is $n(A)$ = number of elements in A .

Union Rule of Counting: If A and B are finite sets, then $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

Definition: If S is a finite universal set and A is a subset of S , then $n(A') = n(S) - n(A)$ and $n(A) = n(S) - n(A')$.

Definition: If A and B are finite sets, then $n(A \times B) = n(A)n(B)$.

Examples: Let $A = \{\text{Dirk, Johan, Frans, Sarie}\}$, $B = \{\text{Frans, Sarie, Tina, Klaas, Henrika}\}$, and $C = \{\text{Hans, Frans}\}$. Find the numbers indicated.

$$1. n(A) + n(B) = 4 + 5 = 9$$

4 elements in A

5 elements in B

$$2. n(A \cup B) = 7$$

$$A \cup B = \{\text{Dirk, Johan, Frans, Sarie, Tina, Klaas, Henrika}\}$$

$$3. n(A \cup (B \cap C)) = 4$$

$$B \cap C = \{\text{Frans}\}$$

$$A \cup (B \cap C) = \{\text{Dirk, Johan, Frans, Sarie}\}$$

Example: Let $C = \{\text{Head, Tail}\}$, $D = \{1, 2, 3, 4, 5, 6\}$, and $P = \{\text{red, yellow, blue}\}$. Find the numbers indicated.

$$1. n(C \times C) = 2 \times 2 = 4$$

$$2. n(D \times D) = 6 \times 6 = 36$$

$$3. n(C \times P) = 2 \times 3 = 6$$

$$4. n(C \times D \times P) = 2 \times 6 \times 3 = 36$$

This allows us to know when we have found all the elements of the set.