# A Book of Abstract Algebra | (2nd Edition)

Chapter AA, Problem 18E

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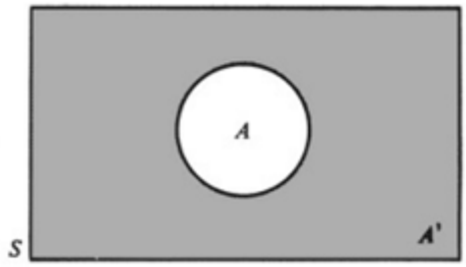
## Problem

If $S$ is a set, and $A$ is a subset of $S$, then the *complement* of $A$ in $S$ is the set of all the elements of $S$ which are not in $A$. The complement of $A$ is denoted by $A'$:




$$A' = \{x \in S : x \notin A\}$$

*Prove the following'.*

$A \cap A' = 0.$

## Step-by-step solution

**Step 1** of 2

**Objective:-**

The objective is to prove $A \cap A' = 0.$

Comment

**Step 2** of 2

Proof:-

Let $A$ and $B$ are two sets.

If $S$ is a set and $A$ is a subset of $S$, then complementary of set $A$ is defined as:-

$$A' = \{x \in S : x \notin A\}$$

Let $S$ is a set and $A$ is a subset of $S$. Let $x \in A \cap A'$.

$x \in A \cap A'$

$\Rightarrow x \in A \ \ and \ \ x \in A'$

$\Rightarrow x \in A \ \ and \ \ x \notin A$

$\Rightarrow x \in 0$

Since these two operations can never occur simultaneously.

So,

$$A \cap A' \subseteq 0 \qquad \text{......}(1)$$

The empty set is subset of each set.

So,

$$0 \subseteq A \cap A' \qquad \text{......}(2)$$

Let us consider the equation (1) and (2).

$$A \cap A' = 0$$

Proved

Comment