1 Problem 3.6:

Proof. $B_i \cap B_j = \emptyset \; \forall i \neq j$, so $(A \cap B_i) \cap (A \cap B_j) = \emptyset \; \forall i \neq j$, i.e. $\{A \cap B_i\}_{i \in I}$ is a collection of pairwise-disjoint events. Since it is indexed by a finite or countable set I, then, we have that:

$$\begin{aligned}
\sum_{i \in I} P(A \cap B_i) &= P(\bigcup_{i \in I} A \cap B_i) \\
&= P(A \cap (\bigcup_{i \in I} B_i)) && \text{by the distributive property of } \cap \\
&= P(A \cap \Omega) && \text{by assumption} \\
&= P(A) && \text{since } A \subseteq \Omega
\end{aligned}$$

□