1. A fruit basket has 20 fruits, out of which 5 are apples. If 7 fruits are picked at random from the basket, what is the probability that the sample contains at least one apple?

2. A card player is dealt a 13 card hand from a well-shuffled, standard deck of 52 cards. What is the probability that the hand is void in at least one suit ("void in a suit" means having no cards of that suit)?

3. Show that for any events A and B,

$$\mathbf{P}(A) + \mathbf{P}(B) - 1 \leq \mathbf{P}(A \cap B) \leq \mathbf{P}(A \cup B) \leq \mathbf{P}(A) + \mathbf{P}(B).$$

   For each of these three inequalities, give a simple criterion for when the inequality is actually an equality (e.g., give a simple condition such that $\mathbf{P}(A \cap B) = \mathbf{P}(A \cup B)$ if and only if the condition holds).