



3. Consider an urn containing four balls, labeled 110, 101, 011, and 000. One ball is drawn at random. For  $k = 1, 2, 3$ , let  $A_k$  be the event that the  $k^{\text{th}}$  digit is a 1 on the ball that is drawn.
- (a) Are the events  $A_1$ ,  $A_2$ , and  $A_3$  pairwise independent? Why or why not?
- (b) Are the events  $A_1$ ,  $A_2$ , and  $A_3$  mutually independent? Why or why not?
4. If  $A$  and  $B$  are independent events each with positive probability, show that they cannot be mutually exclusive.
5. Create an example of three events  $A, B, C$  such that  $P(A \cap B \cap C) = P(A)P(B)P(C)$  but the events are not mutually independent. (One way to do this is to draw a Venn diagram, specifying probabilities of  $A, B, C$  and their intersections.)