1. You are given an urn containing 10 balls, some black and some white. You are told that the number of white balls in the urn is equally likely to be any number between 0 and 10 inclusive. Thus in particular the probability that all 10 balls are white is $\frac{1}{11}$.

(a) You pick a ball uniformly at random and it is white. Given this event, what is now the probability that all 10 balls are white?

(b) You pick $k$ balls at random (with replacement) and all are white. What is now the probability that all 10 balls are white, as a function of $k$?

2. Consider an experiment involving two successive rolls of a fair die. Consider the following events.

$A$: event that the first roll results in a 1.

$B$: event that the second roll results in a 6.

$C$: event that the sum of two rolls is a 7.

$D$: event that the maximum of two rolls is 2.

$E$: event that the minimum of two rolls is 5.

Answer the following questions giving proper justification.

(a) Are events $A$ and $B$ independent?

(b) Are events $A$ and $C$ independent?

(c) Are events $B$ and $C$ independent?

(d) Are events $A$, $B$, and $C$ independent?

(e) Are events $D$ and $E$ independent?

3. A true-false question is to be posed to a husband and wife team on a quiz show. Both the husband and the wife will, independently, give the correct answer with probability $p$. Which of the following is a better strategy for this couple?

(a) Choose one of them and let the person answer the question; or

(b) have them both consider the question and then either give the common answer if they agree or, if they disagree, flip a coin to determine which answer to give.
4. A firm buys components from two suppliers: 60 percent from supplier A and the rest from supplier B. It so happens that 9 percent of the components from supplier A are defective and 15 percent of the components from supplier B are defective.

(a) What is the probability that the next component the firm buys is defective?
(b) What is the probability that the component that the firm buys is from supplier B if we know that it is defective?