1.) Let A, B, C be three events. Find set–theoretic expressions for the following events:

(i) from A, B, C only A occurs,
(ii) both A and B but not C occur,
(iii) at least one of the given events occurs,
(iv) at least two of the given events occurs,
(v) all three given events occur,
(vi) none of the given events occurs,
(vii) at most one of the given events occurs,
(viii) at most two of the given events occur,
(ix) exactly two of the given events occur,
(x) at most three of the given events occur.

2.) Prove *Bonferroni*'s inequality:

$$\Pr(A \cap B) \;\geq\; \Pr(A) \;+\; \Pr(B) \;-\; 1$$

3.) Suppose that distinct integer values are written on each of three cards labelled A, B, and C.

The values on cards A and B are then compared. If the smaller of these values is finally compared with the value on card C, what is the probability that it is also smaller than the value on card C?

4.) You are allowed to throw a die for at most three times in order to win: Six up

What is the chance (probability p) to win?

5.) A batch of 100000 resistors contains 2000 pieces with values outside of the range of tolerance. A random sample of 100 resistors is drawn from the batch. Determine the probability p that exactly two of the resistors from the sample have values outside of the range of tolerance.

6.) Solve problem 29 from [Ross, p.84]:

7.) Solve problem 30 from [Ross, p.84]:

Two balls, each equally likely to be colored either red or blue, are put in an urn. At each stage one of the balls is randomly chosen, its color is noted, and it is then returned to the urn. If the first two balls chosen are colored red, what is the probability that

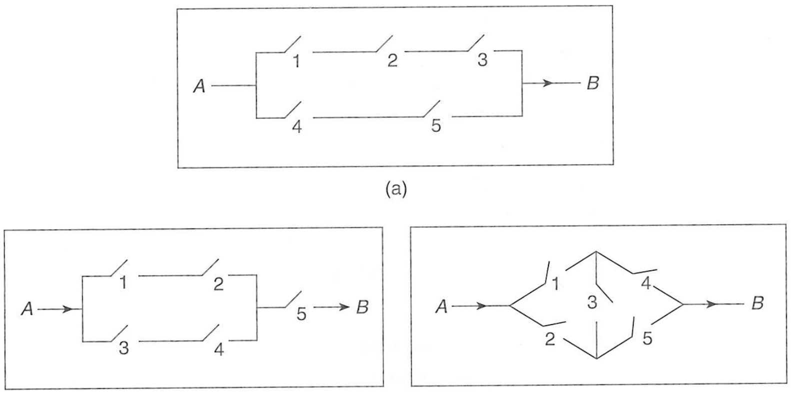
(a) both balls in the urn are colored red;
(b) the next ball chosen will be red?

8.) Define a suitable sample space to model the random experiments considered in the last problem (problem 30 from [Ross, p.84]).

9.) Solve problem 34 from [Ross, p.85].

10.) Solve problem 37 from [Ross, p.86]:

The probability of the closing of the ith relay in the circuits shown is given by p_i, $i = 1, 2, 3, 4, 5$. If all relays function independently, what is the probability that a current flows between A and B for the respective circuits?



(a) (b) (c)

11.) Consider a system of n components, where the i-th component functions with probability p_i $(i = 1, ..., n)$ and all components function independently of each other.
For $k < n$, such a system is said to be a k-out-of-n system, if the system functions if and only if at least k of the n components function.

(a) Determine the probability that a 2-out-of-4 system functions.

(b) Determine the probability that a 3-out-of-5 system functions.

12.) A parallel system functions whenever at least one of its components works. Consider a parallel system of n components, and suppose that each component independently works with probability $\frac{1}{2}$. Find the conditional probability that component 1 works, given that the system is functioning.

13.) Solve problem 42 from [Ross, p.87].

14.) Let A, B and C be events with

$$P(A) = 0.2, P(B) = 0.3, P(C) = 0.4 .$$

Find the probability that at least one of the events A, B and C occurs if

(i) A, B, C are mutually exclusive,

(ii) A, B, C are independent.

15.) Find an example of three events A, B, C, which are pairwise independent, but not independent.