

The blood types among Canadians have the following probabilities: 37% type A, 13% type B, 44% type O, and 6% type AB. Suppose that the blood types of married couples are independent.

An individual with type B blood can safely receive transfusions only from persons with type B or type O blood.

- 1) What is the probability that the husband of a woman with type B blood is an acceptable blood donor for her?
- 2) What is the probability that in a randomly chosen couple the wife has type B blood and the husband has type A?
- 3) What is the probability that in a randomly chosen couple the husband and the wife have different blood types?

John practices for the fast-shooting competition in the Olympics. In his training he uses three targets labeled A , B and C and he is allowed to take three shots. Once a target is hit it is destroyed and John cannot shoot at it again. Each time he chooses at random from the remaining targets the one to shoot at. The first hit, that is the hit which is not preceded by any another hit, is the most difficult and has probability of success equal to 60%. If he has been successful at least once the chance of a new hit increases to 80%. We exclude the possibility that John aims at one target and hits a different one (he is not that bad!)

1) If John has hit target A in his first attempt, what is the probability to hit target C next?

2) John purchases a new gun for which the probabilities to strike are 65% (first shot) and 90% (second shot), respectively. Assume that he picks at random which of the two guns to use. Given that he hits a target from his first attempt what is the probability that he used his new gun for the shot?

Suppose that the distribution function $F(t) = P(X \leq t)$ of a discrete random variable X is:

$$F(t) = \begin{cases} 0 & \text{if } t < -1 \\ 1/8 & \text{if } -1 \leq t < -0.25 \\ 1/6 & \text{if } -0.25 \leq t < 1 \\ 1/3 & \text{if } 1 \leq t < 3.3 \\ 3/4 & \text{if } 3.3 \leq t < 4 \\ 5/6 & \text{if } 4 \leq t < 16 \\ 1 & \text{if } 16 \leq t \end{cases}$$

- 1) What is the probability function of X ?
- 2) What is the probability $P(X < 0)$?
- 3) Calculate $Var(\sqrt{|X|})$.

Consider three independent tosses of a fair coin. Let A be the event that the second toss is a head, B the event that the third toss is a head and C is the event that all three coins land on the same side. Are A^c , B^c and C independent?

Three cabinets are identical in appearance and each has 3 drawers. In each drawer there is only one medal which is either in gold or silver. The first cabinet contains three gold medals, one in each drawer; the second cabinet has two drawers with a gold coin each and one drawer with a silver coin; the third cabinet has three drawers each containing a silver medal.

Adam tries to find a gold coin but he is allowed to investigate the drawers of only one cabinet. His strategy is to pick at random one cabinet and to randomly open one of the cabinet's drawers. If the medal inside is gold he stops his search, otherwise he picks at random one of the unopened drawers of the same cabinet. If there are no more drawers to open he stops.

2) Given that Adam has found a gold in the first drawer he opened what is the chance that the second drawer opened will also contain gold?

3) Knowing that Adam has found gold in the first drawer he opened what is the chance that the drawer belongs to the first cabinet?

You ask your neighbor to feed your fish while you are on vacation. Without food it will die with probability .6, otherwise it will die with probability .05. You are 80% sure that the neighbor will remember to feed your fish.

- 1) What is the probability that the fish will be alive when you return?
- 2) If it is dead, what is the probability that the neighbor forgot to feed it?