Exercises for Seminar 5

5.1. There are 20 skiers, 6 bicyclists and 4 runners in a group of sportsmen. The probability to fulfil the corresponding qualifying norm is: for a skier – 0,9, for a bicyclist – 0,8, and for a runner – 0,75. Find the probability that a randomly chosen sportsman will fulfil the norm (to fulfil – выполнить).

The answer: 0,86.

5.2. The first box contains 20 items and 15 of them are standard; the second – 30 items and 24 of them are standard; the third – 10 items and 6 of them are standard. Find the probability that a randomly extracted item from a randomly taken box is standard.

The answer: 43/60.

5.3. There are radio lamps in two boxes. The first box contains 12 lamps, and 1 of them is non-standard; the second box contains 10 lamps, and 1 of them is non-standard. A lamp is randomly taken from the first box and placed in the second. Find the probability that a randomly extracted lamp from the second box will be non-standard.

The answer: 13/132.

5.4. At a deviation of an automatic device from the normal operating mode the signaling device C-1 acts with the probability 0,8, and the signaling device C-11 acts with the probability 1. The probabilities that the automatic device is supplied with C-1 or C-11 are equal to 0,6 and 0,4 respectively. A signal about cutting the automatic device has been received. What is more probable: the automatic device is supplied with the signaling device C-1 or C-11?

The answer: The probability that the automatic device is supplied with C-1, is equal to 6/11, and C-11 – 5/11.

5.5. The probability for products of a certain factory to satisfy the standard is equal to 0,96. A simplified system of checking on standardness gives positive result with the probability 0,98 for products satisfying the standard, and with the probability 0,05 – for products non-satisfying the standard. A randomly taken product has been recognized as standard at checking. Find the probability that it really satisfies the standard.

The answer: 0,998.

5.6. A digit is firstly randomly chosen from the digits {1, 2, 3, 4, 5}, and then the second digit – from the remaining four digits. Find the probability that an odd digit will be chosen:

a) for the first time; b) for the second time; c) in both times. The answer: a) 3/5; b) 3/5; c) 3/10.

5.7. Three cards are randomly selected without replacement from an ordinary deck of 52 playing cards. Compute the conditional probability that the first card selected is a spade, given that the second and third cards are spades.

The answer: 0,22.

5.8. Urn A contains 2 white balls and 1 black ball, whereas urn B contains 1white ball and 5 black balls. A ball is drawn at random from urn A and placed in urn B. A ball is then drawn from urn B. It happens to be white. What is the probability that the ball transferred was white?

The answer: 0,8.

5.9. The store received new products from three enterprises. The percentage composition of these products is as follows: 20% - products of the first enterprise, 30% - products of the second enterprise, 50% - products of the third enterprise; further, 10% of the products of the first enterprise of the highest grade, at the second enterprise - 5% and at the third - 20% of the products of the highest grade. Find the probability that a randomly purchased new product will be of the highest quality.

5.10. One of the three shooters is called to the line of fire and fires two shots. The probability of hitting the target with one shot for the first shooter is 0.3, for the second - 0.5; for the third - 0.8. The target is not hit. Find the probability that the shots were fired by the first shooter.

5.11. In the group of athletes there are 2 times more skiers than runners, and 3 times more runners than cyclists. The probability of fulfilling the norm for a skier is 0.9, for a runner 0.75, for a cyclist - 0.8. Find the probability that an athlete, chosen at random, will fulfill the norm.

5.12. Two urns contain 4 and 5 white and 6 and 3 black balls, respectively. One ball is drawn at random from each urn, and then one is taken at random from the two. What is the probability that it will be a white ball?

5.13. Out of 30 shooters, 12 hit the target with a probability of 0.6, 8 with a probability of 0.5 and 10 with a probability of 0.7. A randomly chosen shooter fired a shot, hitting the target. Which group most likely belonged to this shooter?

5.14. Two machines produce parts. The probability of manufacturing a standard part by the first automaton is 0.8, by the second - 0.9. The productivity of the first automaton is five times higher than the productivity of the second one. The worker took a part at random, and it turned out to be standard. What is the probability that this part was made by the second machine?

5.15. There are the same number of students in the first and third groups, and in the second – 1.5 times less than in the first. The number of excellent students is 9% in the first, 4% in the second and 6% in the third group.

a) Find the probability that a randomly called student is an excellent student.

b) The accidentally called student turned out to be an excellent student. Find the probability that a student studies in the third group.

5.16. There are k clean and l canceled stamps in the album. From them, m stamps are randomly extracted (among which there may be both clean and cancelled), subjected to special cancellation and returned to the album. After that, n stamps are drawn at random again. Determine the probability that all n stamps are clean. If k=11; l=8; m=2; n=5