7.9. Find the mathematical expectation and the dispersion of random variable $Z = 4X - 2Y$ if $M(X) = 5$, $M(Y) = 3$, $D(X) = 4$, $D(Y) = 6$. The random variables X and Y are independent.

The answer: $M(Z) = 14$; $D(Z) = 88$.

7.10. A total of 4 buses carrying 148 students from the same school arrives at a football stadium. The buses carry, respectively, 40, 33, 25, and 50 students. One of the students is randomly selected. Let X denote the number of students that were on the bus carrying this randomly selected student. One of the 4 bus drivers is also randomly selected. Let Y denote the number of students on his bus. Which of $M(X)$ or $M(Y)$ do you think is larger? Why? Compute $M(X)$ and $M(Y)$.

Exercises for Homework 7

7.11. Two dice are rolled. Let X equal the sum of the 2 dice. What are the possible values of X, and what are the probabilities associated with each value?

7.12. The probability that a buyer will make a purchase in a shop is equal to 0,4. Compose the law of distribution of a random variable X – the number of buyers who have made a purchase if the shop was visited by 3 buyers. Find the mathematical expectation, the dispersion and the mean square deviation of the random variable X.

The answer: $M(X) = 1,2$; $D(X) = 0,72$; $\sigma(X) = 0,85$.

7.13. A buyer attends shops for purchasing the necessary goods. The probability that the goods are in a certain shop is equal to 0,4. Compose the law of distribution of a random variable X – the number of shops which will be attended by the buyer from four possible. Find the most probable number of shops which will be visited by the buyer.

The answer: $1 \le k_0 \le 2$.

7.14. A sample of 3 items is selected at random from a box containing 20 items of which 4 are defective. Find the expected number (mathematical expectation) of defective items in the sample.

The answer: 0,6.

7.15. A box contains 5 red and 5 blue marbles. Two marbles are withdrawn randomly. If they are the same color, then you win \$1.10; if they are different colors, then you win – \$1.00 (that is, you lose \$1.00). Calculate the mathematical expectation and the dispersion of the amount you win (marble – мрамор; to withdraw – извлекать).

The answer: $M(X) = -1/15$; $D(X) = 49/45$.

7.16. The mathematical expectation of a random variable X is equal to 7. Find the mathematical expectation of the following random variables:

a) $X + 6$; b) $4X - 3$.

7.17. The dispersion of a random variable X is equal to 9. Find the dispersion of the following random variables: a) $X + 6$; b) $2X - 7$.

7.18. Independent random variables X and Y have the following distributions:

X	2	4	6
p	0,3	0,5	0,2

Y	3	4
p	0,4	0,6

Compose the law of distribution of the random variable $V = XY$. Find the mathematical expectation, the dispersion and the mean square deviation of the random variable V.

The answer: $M(V) = 13,68$; $D(V) = 29,3376$.

7.19. Find the mathematical expectation and the dispersion of random variables:

a) $Z = 2X - 4Y$; b) $Z = 3X + 5Y$

if $M(X) = 5$, $M(Y) = 3$, $D(X) = 4$, $D(Y) = 6$. The random variables X and Y are independent.

The answer: a) $M(Z) = -2$; $D(Z) = 112$; b) $M(Z) = 30$; $D(Z) = 186$.