

## Numerical characteristics of samples

### Examples with answers:

1. The population is the weight of six pumpkins (in pounds) displayed in a carnival "guess the weight" game booth. You are asked to guess the average weight of the six pumpkins by taking a random sample without replacement from the population.

Pumpkin	A	B	C	D	E	F
Weight (in pounds)	19	14	15	9	10	17

Calculate the population mean  $\mu$ . **(14 pounds)**

2. Assume that the probability of a student in a class being male is a half. Let the random variable  $X$  be the number of male students in a group from the class of size 5. What is  $E(X)$ , the expected number of males in the group, and what is the variance of  $X$ ? **( $E(X)=2.5$ ,  $V(X)=1.25$ ,  $\sigma=1.12$ )**

3. A survey was done on sleeping hours of students in America. A sample of 10 students was found to be (in hours) as follows: 7, 6, 8, 4, 2, 7, 6, 7, 6, 5. Calculate the mean, median and variance of the sample. **( $E(X)=5.8$ ,  $V(X)=3.067$ ,  $Me=6$ )**.

4. Find an estimate of the variance and standard deviation of the following data for the marks obtained in a test by 88 students.

Marks (x)	$0 \leq x < 10$	$10 \leq x < 20$	$20 \leq x < 30$	$30 \leq x < 40$	$40 \leq x < 50$
Frequency (f)	6	16	24	25	17

**( $E(X)=2510/88$ ;  $V(X)= 138.73$ ;  $\sigma= 11.78$ )**

5. The grouped frequency table shows the length of service in years of employees who have been working for a company for at least ten years. Calculate an estimate of the standard deviation of the length of service of these employees.

Length of Service (x)	$10 \leq x < 15$	$15 \leq x < 20$	$20 \leq x < 25$	$25 \leq x < 30$	$30 \leq x < 40$	$40 \leq x < 50$
Frequency (f)	30	42	23	13	8	4

(7.70 years)

**Problems:**

1. Construct an empirical distribution function and histogram for the sample given in a table of frequencies:

a)

$y_i$	2	5	7	8
$m_i$	1	3	2	8

b)

$y_i$	0	1	2	3	4	5	7
$m_i$	4	21	13	13	6	2	1

2. Construct an empirical distribution function and histogram for the sample given in a table of frequencies

a)

Interval	$[-3;-2)$	$[-2;-1)$	$[-1;0)$	$[0;1)$	$[1;2)$	$[2;3)$	$[3;4)$	$[4;5)$
$m_i$	3	10	15	24	25	13	7	3

b)

Interval	$[0.2;2.2)$	$[2.2;4.2)$	$[4.2;6.2)$	$[6.2;8.2)$	$[8.2;12.2)$
$m_i$	70	20	4	3	3

3. Calculate mean, unbiased variance, median for sample:

$y_i$	12	14	16	18	20	22
$m_i$	5	15	50	16	10	4

4. Calculate mean, unbiased variance, median for sample:

Interval	[2, 4)	[4, 6)	[6, 10)	[10, 16)	[16, 20)
$m_i$	2	8	35	40	15

5. Construct an empirical distribution function and histogram for the sample given in a table of frequencies, find mean and unbiased variance, median.

$y_i$	0	1	3	5	6
$m_i$	5	2	4	4	5

6. Two companies have such forecast scenarios for the next year:

<b>A</b>		<b>B</b>	
<b>Profit, USD</b>	<b>Probability</b>	<b>Profit, USD</b>	<b>Probability</b>
0	0.1	100	0.2
200	0.1	500	0.2
1000	0.2	2000	0.25
2000	0.5	4000	0.3
10000	0.1	8000	0.05

Choose the company, which is worth your investing. Give the necessary explanation.

7. You asked your workers to report about their workload per week. You received such results:

<b>Worker</b>	<b>Workload, minutes</b>
1	505
2	520
3	450
4	575
5	380
6	311
7	507
8	482

<b>Worker</b>	<b>Workload, minutes</b>
9	499
10	504

Define, if there is an exploitation at your firm. Prepare propositions for improving workload at the firm.