Probability

Q1 - A box contains 35 products 4 of them are bad.
The event is „Randomly we have chosen 5 products,
what is the probability that among them are two bad products".

Q2 - Two dice are rolled.
The event is „ Find the probability that the sum is equal to 10".

Q3 - Four players are given each of them 8 cards.
The event „ What is the probability that one of them will get
Three kings"

Q4 - A box contains 8 white balls and 15 red balls.
The event is „ Randomly we have chosen 4 balls, what is the probability
That all the balls will be of the same color".

Q5 - A class of 32 students and the teacher of Mathematics wants to examine
4 students. The event is „ what is the probability that student peter
will not be examined".

Q6 - In an institute there are 45% men and 55% women. There are 5% men more than
190cm and 1% women. The event is "rodomly we have chosen one has more than
190cm, what is the probability that this person is woman".

Q7 - Except KLImo and Lacho in the parliament there four other members of parliament
want to raise point of order. Head of meeting randomly chose the order of delegation.
The event is „ what is the probability that Klim raises immediately after Lacho.

Q8 - A parliament helds if the attendence of the party VPRED is 40%. To put a suggestion
The voices should be 36% from the present congreesmen. Where this percentage does
not include any congressman form party VPRED.
The event is " what is the probability of the suggestion of a congressman from the
present party , from 40%, could be pass (accepted).

Statistics

Here are some we will use throughout this report:

$\sum$ denotes the summation of a group of values (this means add them all up)

x denotes the variable, usually used to represent the individual data values

n represents the number of values in a *sample*

N represents the number of values in a *population*

$\bar{x} = \dfrac{\sum x}{n}$ is the **mean of a sample**

$\mu = \dfrac{\sum x}{N}$ is the **mean of a population**

Consider the data given below:

10	12	13	14	489
15	13	8	14	12
11	12	13	16	9

Here are the calculations:

$$\bar{x} = \frac{\sum x}{n} = \frac{10 + 12 + 13 + 14 + 489 + 15 + 13 + 8 + 14 + 12 + 11 + 12 + 13 + 16 + 9}{15} = 40.1$$

Median - first sort the data

8	9	10	11	12
12	12	13	13	13
14	14	15	16	489

Now since the data is odd choose the middle value (there are 15 values - this value #8) which is 13. The data is bimodal with modes of 12 and 13. The midrange is (8+489)/2 = 248.5

Standard Deviation and variance

A more accurate measure of variation can be given by the standard deviation of the data.

The standard deviation of a set of sample scores is a measure of variation of scores about the mean. It is calculated by

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Your calculator most likely has a button for standard deviation, but calculating at least one by hand gives you an idea of why this is such a valid measure for variation. Notice that each the distance from each data point to the mean is calculated (this is $x - \bar{x}$ in the formula) If we were to add these all up some would be positive and some would be negative and the sum would be zero. To avoid this not so useful number we square each difference (this is $(x - \bar{x})^2$ in the formula) and add them all up (this gives $\sum(x - \bar{x})^2$ in the formula). We divide by n-1 to average these variations, then we take the square root to account for the squaring we did earlier. The procedure for finding the standard deviation is as follows:

1. Find the mean of the scores $(\bar{x})$
2. Subtract the mean from each individual score $(x - \bar{x})$
3. Square each of the values in step 2
4. Add up all the squares obtained in step 3
5. Divide the total in step 4 by n-1
6. Find the square root of step 5.

Here is an example using the data given above (the steak example):

First calculate the mean of this data, it is 19.35

X	$(X - \bar{X})$	$(X - \bar{X})^2$
17	-2.35	5.5225
20	0.65	0.4225
21	1.65	2.7225
18	-1.35	1.8225
20	0.65	0.4225
20	0.65	0.4225

20	0.65	0.4225
18	-1.35	1.8225
19	-0.35	0.1225
19	-0.35	0.1225
20	0.65	0.4225
19	-0.35	0.1225
20	0.65	0.4225
22	2.65	7.0225
18	-1.35	1.8225
20	0.65	0.1225
18	-1.35	1.8225
19	-0.35	0.1225
20	0.65	0.4225
19	-0.35	0.1225

The sum of the last column is 26.55, dividing this by n-1 = 19 yields 1.397368. Finally taking the square root gives 1.182

The sample variance is the standard deviation squared. To calculate all you do all the steps for the standard deviation except taking the final square root. Here is the formula

$$s^2 = \frac{\sum (x - \bar{x})^2}{n-1}$$

There is an alternative form for calculating the standard deviation, you can read this if you want - but usually you will be using your technology (calculator) to calculate this value, so this formula is probably not useful.

What is useful however is a formula for estimating the standard deviation from a frequency table. The estimation formula used for this is

$$s = \sqrt{\frac{n[\sum (f \cdot x^2)] - [\sum (f \cdot x)^2]}{n(n-1)}}$$