Task 1. According to the technical standard, processing a workpiece should take a worker 20 minutes. The researchers randomly selected 36 workstations for which the average processing time was 22 minutes. At the same time, the previous general audit showed that the standard deviation of the processing time is 4 minutes. Assuming that the distribution of processing time is normal, verify, at a significance level 0.05, the hypothesis that average processing time is equal to the assumed technical standard.

gretl:

Task 2. Average meat consumption per 1 person in Poland in 2003 is 70 kg. Researchers randomly selected 300 people from Gdynia, whose average annual meat consumption was equal to 72 kg, with a standard deviation of 10 kg. Assuming that the distribution of meat consumption in Gdynia is normal, verify the hypothesis that the average meat consumption in Gdynia is greater than the average consumption in the whole country. Accept the level of significance 0.01.

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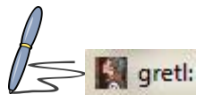
Task 3. A chocolate machine in chocolate factory produces chocolate bars with a nominal weight of 250 g. It is known that the weight distribution of chocolate bars is normal N(250,5). Technical inspection randomly selected 16 chocolate bars with the average weight of 245 g. Can we say that the machine is broken and produces lighter chocolate bars than the standard? At the level of 0.05 significance, verify proper statistical hypothesis.

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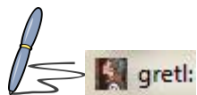
Task 4. The researchers randomly selected10 individual farms near Gdynia. The yields (in q / ha) are shown in the table. At the level of significance 0.05, verify the hypothesis that the average yield near Gdynia is 31 q / ha.

Farm	Yield x_i	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$
1	28	-2	4
2	27	-3	9
3	29	-1	1
4	31	1	1
5	33	3	9
6	32	2	4
7	30	0	0
8	29	-1	1
9	31	1	1
10	30	0	0
Sum	300	X	30

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Task 5. It is believed that in the banking sector the average earnings of men are higher than women's earnings. In order to determine the average earnings, the researchers randomly selected 100 men and 150 women, to give the following statistics: the average monthly wage of a man in the analyzed month was 4 thousand zł, and the average salary of women was equal to 3 thousand. zł, with standard deviations: 1000 zł and 800 zł. The distribution of wages of women and men is normal. Verify, at the significance level 0.05, the hypothesis that the in banking sector the average earnings of men are larger than women's earnings.

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Task 6. It is assumed that in the banking sector the service time in the conventional system is longer than the service time using a computer system. Researchers randomly selected 10 clients served in the traditional system and 15 operated using computer system. The average service time in the conventional system was 5 min, and using the computer system 4 min. Variances for both trials were as follows: 2 min and 1 min. In addition, it can be assumed that there is $\sigma_1^2 = \sigma_2^2$. The distribution of customer service time in both systems is normal. Verify at the significance level 0.01, that the average time of customer service system is longer than a traditional computer system.

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Task 7. In order to investigate whether the cuckoo throws more balls to the nests of larger birds, the reaserchers randomly selected cuckoo eggs, one of the alpine's nests and one of the wren's nests (alpines are much larger than wrens). Length [mm] of the eggs is following:

Alpines: 22; 23.9; 20.9; 23.8; 25; 24; 21.7; 23.8; 22, 8; 23

Wrens: 19.8; 22.1; 21.5; 20.9; 22; 21; 20.3; 20.9; 22; 20

Formulate appropriate hypothesis and check it at the significance level of 0.05. Assume that the tested feature is normally distributed in both populations and the variances of these populations are the same.

STATISTICA -
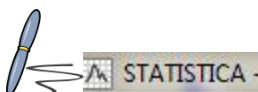
Task 8. The study of certain characteristics are shown below. The feature has a normal distribution. The results are: 305; 321; 282; 295; 300; 280; 260; 271.

Verify the hypothesis that the $\mu = 280$ at the significance level:

 a) $\alpha = 0,01$
 b) $\alpha = 0,05$.

Task 9. Certain feature in general population has a distribution $N(\mu,2)$. The researchers investigate the feature and get the results: 3.22; 3.12; 2.98; 2.91; 3.25; 3.28. Verify the hypothesis that $\mu = 3$ at the significance level $\alpha = 0,02$.

Task 10. The general population has a distribution $N(\mu,2)$. The researchers randomly selected 10 elements 14, 16, 15, 15, 20, 11, 13, 13, 12, 15. At the significance level $\alpha = 0,02$, verify hypothesis that $\mu = 14$.