



Unit 10: Parametric Tests

A. Class exercises

PHONE A multinational company is concerned about the monthly telephone expenditure, a variable that follows a normal distribution with $\sigma = 2,500$ euros. Thus, a sample of 36 receipts is analyzed, obtaining an average monthly expenditure of 15,000 euros.

- a) The manager states that the expected monthly cost of telephone calls is at least 20,000 euros. Test whether this claim is justified.
- b) The multinational considers that the proportion of international calls is 20% of the total. Given that, out of 50 calls listed on a receipt, 7 are international, what could be said about the opinion of the company?

CONGRESS The expenditure on typical products made by attendees at a conference is a variable that follows a normal model. The conference organizers select a random sample of 46 attendees and obtain a standard deviation of 19.3 euros.

- a) Previous studies claim that the spending variance is at least 400. Test this hypothesis.
- b) Given that 23 attendees have made a high expenditure on typical products, test the assumption that at least 70% of attendees make a high spending.

SPA The manager of a spa resort is analyzing the duration of treatment sessions in cabins (X , in minutes), a variable that follows a normal probability model. The manager states that the variance of duration is 30 minutes.

Given that a standard deviation of 4.089 has been observed in a sample of 36 randomly selected sessions, what could be said about the opinion of the manager?

BOOKSHOP The daily income (in euros) of a bookshop is a variable that follows a normal distribution. In a random sample of 36 days, a mean of 1,500 € and standard deviation of 200 € have been observed.

- a) Previous studies indicate that the average income is 1600 euros. Test this hypothesis.
- b) The manager of the bookshop considers that the variance of the daily income is at most 50,000. What could be said about the opinion of the manager?



B. Proposed Exercises

SALES The monthly sales of a cafe is a normally distributed random variable. In a random sample of 56 months the average sales are 8,500 € with standard deviation € 2,500.

- a) The cafe owner is concerned about the expected monthly sales, and thinks that they are below € 7,900. Is he right about his concern?
- b) The owner also believes that in, at most, 25% of months the level of sales is high. Is this admissible given that in the sample 15 months with high-sales were observed?

RESULTS

- a) $0.025 < p < 0.05$
- b) $p = 0.3783$

PARTS In a factory, quality controls require that the proportion of defective parts must be at most 5%.

- a) If in a random sample of 200 pieces 7 are defective justify what should be the conclusion of the test.
- b) In order to study the expected length of a piece, a random sample of 66 pieces is selected. The results show an average of 950 hours with a standard deviation of 100. The head of the factory claims that the expected duration of each piece is at least 1000 hours. Given that the length follows a normal distribution, is his claim admissible?

RESULTS

- a) $p = 0.8348$
- b) $p < 0.002$

RESTAURANT The manager of a restaurant is considering opening a new store in a certain city. In order to make his decision, he selects a random sample of 30 weeks and analyses weekly earnings (in thousands of €), obtaining an average income of 49 with standard deviation=14.7. The investment will be profitable if the expected weekly income is at least 45,000 euros. Assuming that the variable is normal what would the manager's decision be?

RESULTS

$$0.9 < p < 0.95$$

CAR A car manufacturer is carrying out a quality study. In a random sample of 40 owners, car duration (in thousands of km) is observed, obtaining a variance of 141.9. The managers believe that the length of the vehicle has a variance greater than 500. Assuming that the variable is normal what could be said about this statement?

RESULTS

$$p > 0.999$$