



QUESTION WORKBOOK

Testing variances: chi-squared and the F-distribution

Further Statistics 2 · Year FM

7 questions · 25 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

- A1** Write down the test statistic for a claimed population variance from a sample of size n , and its distribution. [2]

- A2** A sample of 25 gives $s^2 = 6.4$. Test at 5% whether the population variance exceeds 4, given a critical value of 36.415. [3]

SECTION B · Standard

- B1** A sample of 25 taken from a normal population gives $s^2 = 6.4$. Find a 95% confidence interval for σ^2 , given chi-squared values of 39.364 and 12.401 on 24 degrees of freedom. [4]

- B2** A sample of 13 gives $s^2 = 24.5$ and an independent sample of 9 gives $s^2 = 8.2$. Test at 5% whether the first population is more variable, given a critical value of 3.284.

[4]

- B3** Explain what determines which sample variance is placed on top in an F test, and what happens to the degrees of freedom.

[2]

- B4** A sample of 16 gives $s^2 = 2.5$. Test at 5% in two tails whether the population variance is 5, given critical values of 6.262 and 27.488.

[4]

SECTION C · Stretch

- C1** Two independent random samples are taken from normal populations. A sample of 10 from the first gives $s^2 = 4.2$, and a sample of 16 from the second gives $s^2 = 12.6$. Test at the 10% level whether the two population variances differ, given that the 5% upper critical value of F on 15 and 9 degrees of freedom is 3.006. Explain what goes wrong if the ratio is taken the other way up. [6]