QUESTION The diameters of ball bearings produced by a process are normally distributed with standard deviation fo 0.04mm. A random sample of 7 is taken and their measurements are:
7.99 8.01 7.98 8.07 8.00 8.02 7.93 mm.
Calculate a 95% confidence interval for μ, the true mean diameter of the ball bearings produced by this process.
The process is modified in a way that is likely to change both the mean and the standard deviation of the ball bearings produced. A random sample of 6 is taken and the measurements are
8.03 8.09 7.94 7.89 8.15 8.08
Calculate a 95% confidence interval for μ, the new mean diameter. Test whether the standard deviation has been changed by the new process.
ANSWER

7.99	8.01	7.98	8.07	8.00	8.02	7.93

$\overline{x} = 8.00 \quad n = 7 \quad \sigma = 0.04$
$95\% CI \quad 8.03 \pm 2.571 \times \frac{0.0982}{\sqrt{6}} = 8.03 \pm 0.103$
$H_0 : \sigma^2 = (0.04)^2 \quad H_1 : \sigma^2 \neq (0.04)^2 \quad \alpha = 5\%$
Test of single variance is test 3. Assume normal distribution, z= $\frac{(n-1)s^2}{\sigma_0^2} \sim \chi^2_{n-1}$
$z = \frac{5 \times 0.09826^2}{0.046^2} = 30.125 \quad s = 0.0982 \quad n = 6$

Hence reject H_0 and accept standard deviation changed.