Example -5

1) At a certain college new students are weighed when they join the college. The distribution of weights of students at the college when they enroll is normal, with a standard deviation of 7.5 kg and a mean of 70 kg. A random sample of 90 students from the new entry were weighted and their mean weight was 71.6 kg. Assuming that the standard deviation has not changed and that the weights of the new class were also normally distributed, test, at the 5% level, whether or not there is evidence that the mean of the new entry is more that 70 kg.

2) A machine produces bolts of diameter D, where D has a normal distribution with mean 0.580 cm and standard deviation 0.015 cm. The machine is serviced and after the service a random sample of 50 bolts from the next production run is taken to see if the mean diameter of the bolts has changed from 0.580 cm. The distribution of the diameters of bolts after the service is still normal with a standard deviation of 0.015 cm. The mean diameter of the 50 bolts is 0.577 cm. Test, at the 1% level, whether or not there is evidence that the mean diameter of the bolts has changed.

3) The weights of boys and girls in a certain school are known to be normally distributed with standard deviation of 5 kg and 8 kg respectively. A random sample of 25 boys had a mean weight of 48 kg and a random sample of 30 girls had a mean weight of 45 kg. Is there any evidence that the mean weight of boys in the school is greater than the mean weight of the girls?

4) A manufacturer of personal stereos can use batteries made by two different manufacturers. The standard deviation of lifetimes for *Never Die* batteries is 3.1 hours and *Everlasting* batteries it is 2.9 hours. A random sample of 80 *Never Die* batteries and a random sample of 90 *Everlasting* batteries were tested and their mean lifetimes were 7.9 hours and 8.2 hours respectively. Test at 5% level whether or not there is any evidence of a difference between the mean lifetimes of the two makes of batteries.

5) An experiment was conducted to compare the drying properties to two paints, Quickdry and Speedicover. In the experiment, two hundred similar pieces of metal were painted, hundred randomly allocated to Quickdry and the rest to Speedicover.
The table below summarizes the times, in minutes, taken for these pieces of metal to become touch-dry.

	Quickdry	Speedicover
Mean	28.7	30.6
Standard Deviation	7.32	3.51

It is believed that the time taken for paint to become touch-dry is normally distributed.
A manufacturer of Quickdry claims that on average this paint takes 25 minutes to become touch-dry.

a) Stating clearly your hypothesis and using a 5% significance level, test whether or not these data are consistent with the claim of the manufacturer.
b) Using a 5% significance level, test whether or not the mean time for Quickdry to become touch-dry is less than that for Speedicover. State your hypothesis clearly.
c) Suggest two reasons why the time for each paint to become touch-dry is not constant.