EXAMPLE

A coal merchant sells coal in bags marked '50 kg'. The merchant claims that the bags have a mean weight of 50 kg with a standard deviation of 1·2 kg. To test this claim, a random selection of 72 of these bags was weighed and found to have a mean weight of 49·7 kg.

(i) Write down H_0 and H_A.

(ii) Calculate the test statistic for the sample mean.

(iii) Calculate a p-value for this sample mean.

(iv) At the 5% level of significance, is there evidence to show that the mean weight of the bags of coal is not 50 kg? Justify your answer.

Solution

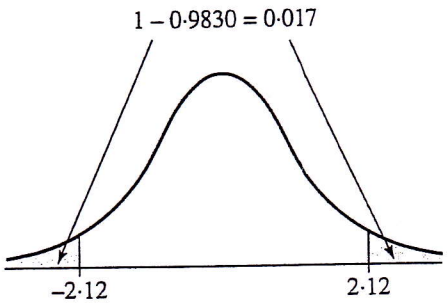
(i) $H_0 : \mu = 50$ and $H_A : \mu \neq 50$.

(ii) $\bar{x} = 49{\cdot}7$, $\mu = 50$, $\sigma = 1{\cdot}2$ and $n = 72$.

The test statistic is given by:

$$T = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{49{\cdot}7 - 50}{\frac{1{\cdot}2}{\sqrt{72}}} = -2{\cdot}12$$

(iii)



p-value

$P(T < -2{\cdot}12)$

$= 1 - P(z \leq -2{\cdot}12)$

$= 1 - P(z \leq 2{\cdot}12) = 1 - 0{\cdot}9830 = 0{\cdot}017$ (tables)

$\therefore$ p-value $= 2(0{\cdot}017) = 0{\cdot}034 = 3{\cdot}4\%$

(iv) $0{\cdot}034 < 0{\cdot}05$ or $3{\cdot}4\% < 5\%$

Thus, there is strong evidence to reject the null hypothesis, H_0. Therefore, we conclude there is strong evidence to reject the claim by the coal merchant that the average weight of these bags of coal is 50 kg.