

Note:

(2)

The question is unfortunately rather ambiguous, and there are different ways to interpret it. One way is to say that we're testing the Dublin mark against 385 purely using our sample. The other is to use the standard deviation of 45 from the whole country as a "known" standard deviation (it still should be interpreted as a sample, but the number of data points is huge, so we're OK). Handily there is no disagreement between these two interpretations, and in both cases we cannot reject the hypothesis that the Dublin mark is the same as the country's.

Question 2

(50 marks)

The principal of a large school claims that the average distance from a student's home to the school is 3.5 km. In order to test this claim, a sample of 60 students from the school was randomly selected. The students were asked how far from the school they lived. The mean distance from these students' homes to the school is 3.7 km with a standard deviation of 0.5 km.

- (a) Test the principal's claim using a 5% level of significance. Clearly state your null hypothesis, your alternative hypothesis and your conclusion.

Solution:

Method 1: (Using the test statistic Z)

$$H_0: \mu = 3.5$$

$$H_1: \mu \neq 3.5$$

$$Z = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{3.7 - 3.5}{\frac{0.5}{\sqrt{60}}} = 3.10$$

At the 5% level of significance the critical value is $Z = 1.96$.

$3.10 > 1.96$, thus we reject H_0 .

(Reject the principal's claim).

Method 2: (Using a confidence interval)

$$\bar{x} - 1.96 \frac{s}{\sqrt{n}} \leq \mu \leq \bar{x} + 1.96 \frac{s}{\sqrt{n}}$$

$$3.5 - 1.96 \left(\frac{0.5}{\sqrt{60}} \right) \leq \mu \leq 3.5 + 1.96 \left(\frac{0.5}{\sqrt{60}} \right)$$

$$3.5 - 0.13 \leq \mu \leq 3.5 + 0.13$$

$$3.37 \leq \mu \leq 3.63$$

As 3.7 does not lie in the confidence interval above, we reject H_0 (reject the principal's claim).