

QUANTITATIVE METHODS

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Name:

Quiz 22 SOLUTIONS

Question 1 (10 points)

A study group maintains that the average student must travel for at least 25 minutes in order to reach college each day. The college admissions office obtained a random sample of 31 one-way travel times from students. The sample had a mean of 22.3 minutes and a standard deviation of 9.6 minutes. Does the admissions office have sufficient evidence to reject the student's claim, and conclude that students take less than 25 minutes to reach the college? Use the p -value approach with a 1% level of significance.

Step 1 Assumptions: $n = 31 \geq 30$

Step 2 $H_o: \mu = 25$

$H_a: \mu < 25$

Step 3 Left-tailed test with $\alpha = 0.01$

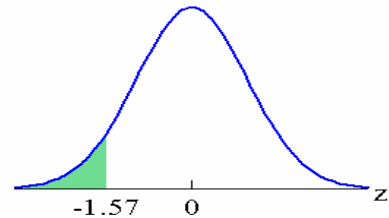
Step 4
$$z = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{22.3 - 25}{\frac{9.6}{\sqrt{31}}} = -1.57$$

$P\text{-value} = P(z < -1.57) = 0.0582$

Step 5 $P\text{-value} = 0.0582 > \alpha = 0.01$

Fail to reject H_o .

\therefore There is not sufficient evidence at the 1% level of significance to conclude that students take less than 25 minutes to reach the college



Question 2 (10 points)

According to the last census on the Canadian population, the mean age of Quebecers is 38.8 years. A random sample of 15 residents from Ste-Foy revealed that they had a mean age of 42.2 years with a standard deviation of 11.9 years. Is this sufficient evidence, at the 5% level of significance, to conclude that the average age of downtown Quebec city residents is different than that of the general Canadian population? Assume that ages are normally distributed.

Step 1 Assumptions: Population is normally distributed

Step 2 $H_o : \mu = 38.8$

$H_a : \mu \neq 38.8$

Step 3 Two-tailed test with $\alpha = 0.05$

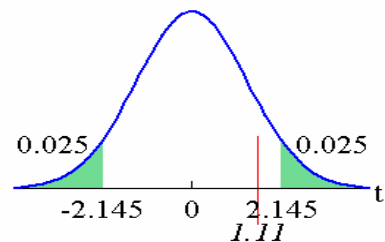
Step 4 $t_o = \pm 2.145$ $df = 14$

Step 5 $t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{42.2 - 38.8}{\frac{11.9}{\sqrt{15}}} = 1.11$

t is not in the critical region

Fail reject H_o .

\therefore There is not sufficient evidence at the 5% level of significance to conclude that the average age of downtown Quebec city residents is different than that of the general Canadian population.

**Question 3** (10 points)

A recent survey of 79 college students showed that 68 of them think QM is the best course they have ever taken. Is this sufficient evidence, at the 2% level of significance, to conclude that more than three quarters of college students think QM is the best course they have ever taken? Use the p -value approach.

Step 1 Assumptions: $np = 79 \cdot 0.75 = 59.25 > 5$

$$n(1 - p) = 19.75 > 5$$

Step 2 $H_o : p = 0.75$

$H_a : p > 0.75$

Step 3 Right-tailed test with $\alpha = 0.02$

Step 4 $z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{\frac{68}{79} - 0.75}{\sqrt{\frac{0.75 \cdot 0.25}{79}}} = 2.27$

$$p\text{-value} = P(z > 2.27) = 1 - P(z < 2.27) = 1 - 0.9884 = 0.0116$$

Step 5 $P\text{-value} = 0.0116 < \alpha = 0.02$

Reject H_o .

\therefore There is sufficient evidence at the 5% level of significance to conclude that more than three quarters of college students think QM is the best course they have ever taken.

