Test - Hypothesis tests: correlation and Normal mean

Year: Year 13 · Duration: 40 minutes · /20

Name:	Date:	**Mark: /20**

Question	1	2	3	4	5	Total
marks	4	4	5	4	3	**20**
Mark						

Show your working.

Question 1 (4 marks)

Question 1 – Testing for correlation

A café owner records the daily temperature and the sales of ice lollies over 12 days and finds $r = 0.58$. The 5% two-tailed critical value for $n = 12$ is 0.5760.

a. Write down suitable hypotheses for a test for correlation. [2 marks]
b. Carry out the test and state the conclusion in context. [2 marks]

Question 2 (4 marks)

Question 2 – Sampling distribution

$X \sim N(75, 15^2)$. A random sample of 25 observations is taken.

a. State the distribution of $\bar{X}$. [1 mark]
b. Find $P(\bar{X}$. [1 mark]
c. Find $P(\bar{X} > 80)$. [2 marks]

Question 3 (5 marks)

Question 3 – Bottles of lemonade

A drinks company says its bottles contain a mean of 330 ml with standard deviation 3 ml. A trading standards officer takes a random sample of 40 bottles and finds a mean of 328.9 ml.

a. Test at the 5% level whether the mean volume is less than 330 ml. [4 marks]
b. State whether the conclusion changes at the 1% level. [1 mark]

Question 4 (4 marks)

Question 4 – Critical region

A population is $N(\mu, 6^2)$. A sample of 16 is used to test $H_0 : \mu = 80$ against $H_1 : \mu \neq 80$ at the 5% level.

a. Find the critical region for $\bar{X}$. [3 marks]
b. A sample has mean 83.5. State the conclusion. [1 mark]

Question 5 (3 marks)

Question 5 – Correlation and the hypotheses

For $n = 20$ the 5% critical values are 0.3783 (one-tailed) and 0.4438 (two-tailed). A sample gives $r = 0.41$.

a. State the conclusion of a one-tailed test for positive correlation and of a two-tailed test. [2 marks]
b. Explain why the choice of alternative hypothesis matters. [1 mark]