

CIE
Probability & Statistics 2
分类真题
2020-2022 册

A Level Clouds 出品

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Chapter 1

Hypothesis Testing

Q1: 9709/62/M20

- 7 A national survey shows that 95% of year 12 students use social media. Arvin suspects that the percentage of year 12 students at his college who use social media is less than the national percentage. He chooses a random sample of 20 students at his college and notes the number who use social media. He then carries out a test at the 2% significance level.

- (a) Find the rejection region for the test.

[4]

- (b) Find the probability of a Type I error.

[1]

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- (c) Jimmy believes that the true percentage at Arvin's college is 70%. Assuming that Jimmy is correct, find the probability of a Type II error.

[3]

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Q2: 9709/61/S20

- 4 A fair spinner has five sides numbered 1, 2, 3, 4, 5. The score on one spin is denoted by X .

- (a) Show that $\text{Var}(X) = 2$. [1]

Fiona has another spinner, also with five sides numbered 1, 2, 3, 4, 5. She suspects that it is biased so that the expected score is less than 3. In order to test her suspicion, she plans to spin her spinner 40 times. If the mean score is less than 2.6 she will conclude that her spinner is biased in this way.

- (b) Find the probability of a Type I error. [4]

- (c) State what is meant by a Type II error in this context. [1]

Q3: 9709/62/S20

- 2 A shop obtains apples from a certain farm. It has been found that 5% of apples from this farm are Grade A. Following a change in growing conditions at the farm, the shop management plan to carry out a hypothesis test to find out whether the proportion of Grade A apples has increased. They select 25 apples at random. If the number of Grade A apples is more than 3 they will conclude that the proportion has increased.

- (a) State suitable null and alternative hypotheses for the test. [1]

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- (b) Find the probability of a Type I error. [3]

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In fact 2 of the 25 apples were Grade A.

- (c) Which of the errors, Type I or Type II, is possible? Justify your answer. [2]

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Q4: 9709/62/W20

- 6** A biscuit manufacturer claims that, on average, 1 in 3 packets of biscuits contain a prize offer. Gerry suspects that the proportion of packets containing the prize offer is less than 1 in 3. In order to test the manufacturer's claim, he buys 20 randomly selected packets. He finds that exactly 2 of these packets contain the prize offer.

- (a) Carry out the test at the 10% significance level.

[5]

- (b) Maria also suspects that the proportion of packets containing the prize offer is less than 1 in 3. She also carries out a significance test at the 10% level using 20 randomly selected packets. She will reject the manufacturer's claim if she finds that there are 3 or fewer packets containing the prize offer.

Find the probability of a Type II error in Maria's test if the proportion of packets containing the prize offer is actually 1 in 7. [3]

- (c) Explain what is meant by a Type II error in this context. [1]

Q5: 9709/62/M21

- 6** It is known that 8% of adults in a certain town own a Chantor car. After an advertising campaign, a car dealer wishes to investigate whether this proportion has increased. He chooses a random sample of 25 adults from the town and notes how many of them own a Chantor car.

- (a) He finds that 4 of the 25 adults own a Chantor car.

Carry out a hypothesis test at the 5% significance level.

[5]

- (b) Explain which of the errors, Type I or Type II, might have been made in carrying out the test in part (a). [2]

Later, the car dealer takes another random sample of 25 adults from the town and carries out a similar hypothesis test at the 5% significance level.

- (c) Find the probability of a Type I error. [3]