Statistical Hypothesis Testing – 2021/20 GCE Statistics Mathematics A

1. Nov/2021/Paper_H240/02/No.10

A researcher plans to carry out a statistical investigation to test whether there is linear correlation between the time (T weeks) from conception to birth, and the birth weight (W grams) of new-born babies.

(a) Explain why a 1-tail test is appropriate in this context. **[1]**

The researcher records the values of T and W for a random sample of 11 babies. They calculate Pearson's product-moment correlation coefficient for the sample and find that the value is 0.722.

(b) Use the table below to carry out the test at the 1% significance level. **[5]**

Critical values of Pearson's product-moment correlation coefficient.

	1-tail test	5%	2.5%	1%	0.5%
	2-tail test	10%	5%	2.5%	1%
n	10	0.5494	0.6319	0.7155	0.7646
	11	0.5214	0.6021	0.6851	0.7348
	12	0.4973	0.5760	0.6581	0.7079
	13	0.4762	0.5529	0.6339	0.6835

2. Nov/2021/Paper_H240/02/No.11(d)

Zac is planning to write a report on the music preferences of the students at his college. There is a large number of students at the college.

(d) Layla claims that, during term, each student spends on average 20 hours per week listening to music. Zac believes that the true figure is higher than 20 hours. He uses his results to carry out a hypothesis test at the 5% significance level.

Assume that the time spent listening to music is normally distributed with standard deviation 4.20 hours.

Carry out the test. **[7]**

3. Nov/2020/Paper_H240/02/No.10

Pierre is a chef. He claims that 90% of his customers are satisfied with his cooking. Yvette suspects that Pierre is over-confident about the level of satisfaction amongst his customers. She talks to a random sample of 15 of Pierre's customers, and finds that 11 customers say that they are satisfied. She then performs a hypothesis test.

Carry out the test at the 5% significance level. **[7]**

4. Nov/2020/Paper_H240/02/No.12

In the past, the time for Jeff's journey to work had mean 45.7 minutes and standard deviation 5.6 minutes. This year he is trying a new route. In order to test whether the new route has reduced his journey time, Jeff finds the mean time for a random sample of 30 journeys using the new route. He carries out a hypothesis test at the 2.5% significance level.

Jeff assumes that, for the new route, the journey time has a normal distribution with standard deviation 5.6 minutes.

(a) State appropriate null and alternative hypotheses for the test. **[2]**

(b) Determine the rejection region for the test. **[4]**