

AQA – Statistical hypothesis testing – A2 Mathematics P3

1. **June/2020/Paper_3/No.14**

It is known that a hospital has a mean waiting time of 4 hours for its Accident and Emergency (A&E) patients.

After some new initiatives were introduced, a random sample of 12 patients from the hospital's A&E Department had the following waiting times, in hours.

- 4.25 3.90 4.15 3.95 4.20 4.15
- 5.00 3.85 4.25 4.05 3.80 3.95

Carry out a hypothesis test at the 10% significance level to investigate whether the mean waiting time at this hospital's A&E department has changed.

You may assume that the waiting times are normally distributed with standard deviation 0.8 hours.

[7 marks]

2. June/2020/Paper_3/No.16

An educational expert found that the correlation coefficient between the hours of revision and the scores achieved by 25 students in their A-level exams was 0.379

Her data came from a bivariate normal distribution.

Carry out a hypothesis test at the 1% significance level to determine if there is a positive correlation between the hours of revision and the scores achieved by students in their A-level exams.

The critical value of the correlation coefficient is 0.4622

[4 marks]

3. June/2020/Paper_3/No.18(b)

(b) Tiana wants to investigate the proportion, p , of defective shirts with a fabric defect.

She wishes to test the hypotheses

$$H_0 : p = 0.3$$

$$H_1 : p < 0.3$$

She takes a random sample of 60 shirts with a defect and finds that x of them have a fabric defect.

(b) (i) Using a 5% level of significance, find the critical region for x .

[5 marks]

(b) (ii) In her sample she finds 13 shirts with a fabric defect.

Complete the test stating her conclusion in context.

[2 marks]

4. June/2019/Paper_3/No.15

Jamal, a farmer, claims that the larger the rainfall, the greater the yield of wheat from his farm.

He decides to investigate his claim, at the 5% level of significance.

He measures the rainfall in centimetres and the yield in kilograms for a random sample of ten years.

He correctly calculates the product moment correlation coefficient between rainfall and yield for his sample to be 0.567

The table below shows the critical values for correlation coefficients for a sample size of 10 for different significance levels, for both 1- and 2-tailed tests.

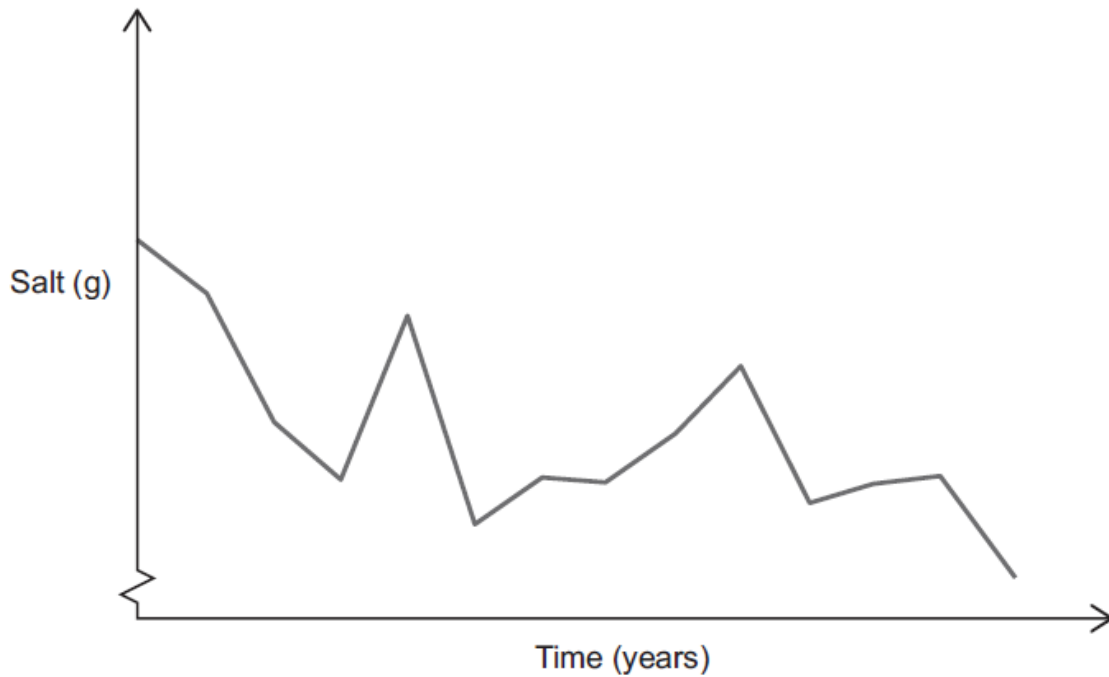
1-tailed test significance level	5%	2.5%	1%	0.5%
2-tailed test significance level	10%	5%	2%	1%
Critical value	0.549	0.632	0.716	0.765

Determine what Jamal's conclusion to his investigation should be, justifying your answer.

[3 marks]

5. June/2019/Paper_3/No.16

- (a) The graph below shows the amount of salt, in grams, purchased per person per week in England between 2001–02 and 2014, based upon the Large Data Set.



Meera and Gemma are arguing about what this graph shows.

Meera believes that the amount of salt consumed by people decreased greatly during this period.

Gemma says that this is not the case.

Using your knowledge of the Large Data Set, give **two** reasons why Gemma may be correct.

[2 marks]

- (c) Another test is performed to determine whether the mean amount of fat purchased per person has changed between 2014 and 2018.

At the 10% significance level, the null hypothesis is rejected.

With reference to the 10% significance level, explain why it is not necessarily true that there has been a change.

[2 marks]
