OCR
Oxford Cambridge and RSA

AS Level Mathematics A

H230/01 Pure Mathematics and Statistics

Question Set 4

1 **(a)** Joseph drew a histogram to show information about one Local Authority. He used data from the "Age structure by LA 2011" tab in the large data set. The table shows an extract from the data that he used.

Age group	0 to 4
Frequency	2143

Joseph used a scale of 1 cm = 1000 units on the frequency density axis.

Calculate the height of the histogram block for the 0 to 4 class. $\frac{2143}{1000} = 2.143\text{cm}$ **[2]**

(b) Magdalene wishes to draw a statistical diagram to illustrate some of the data from the "Method of travel by LA 2011" tab in the large data set.

State why she cannot draw a histogram. **[1]**

This is discrete data and histograms are for continuous data

2 The table shows information about the number of days absent last year by students in class 2A at a certain school.

Number of days absent	0	1	2 to 4	5 to 10	11 to 20	21 to 30	More than 30
Number of students	7	12	9	1	0	1	0

(a) Calculate an estimate of the mean for these data. $12+3\times9+7.5\times1+25.5\times1=2.4$ **[2]**

(b) Find the median of these data. Students = 30. Looking for student 15 **[1]**

which is student 8 of 12 ∴ = 1

The headteacher is writing a report on the numbers of absences at her school. She wishes to include a figure for the average number of absences in class 2A. A governor suggests that she should quote the mean. The class teacher suggests that she should quote the median, because it is lower than the mean.

(c) Give another reason for using the median rather than the mean for the average number of absences in class 2A. **[1]**

median doesn't include outliers

3 The table shows extracts from the "Method of travel by LA" tabs for 2001 and 2011 in the large data set.

Local authority (LA)	All people in employment	Underground, metro, light rail, tram	Train	Bus, minibus or coach	Motorcycle, scooter or moped	Driving a car or van
LA1 2001	79 226	14 369	5235	20 575	1227	16 052
LA1 2011	118 556	22 486	8336	30 541	1220	12 445
LA2 2001	203 614	190	1062	15 327	1256	121 690
LA2 2011	227 894	323	1865	13 732	1038	146 644
LA3 2001	42 993	35	482	4363	274	24 105
LA3 2011	49 014	33	828	3380	191	28 981
LA4 2001	101 697	65	693	21 758	846	45 407
LA4 2011	123 218	2495	1315	24 275	763	54 020

(a) In one of these four LAs a new tram system was opened in 2004.

LA4 as large increase from 65 to 2495 for category with tram

Suggest, with a reason taken from the data, which LA this could have been. **[2]**

(b) Julian suggests that the figures for "Bus, minibus or coach" for LA1 show that some new bus routes were probably introduced in this LA between 2001 and 2011.

Probably true as LA1 has the largest increase in this category (up by 9966)

Use data from the table to comment on this suggestion. to a large extent **[2]**

(c) In one of these four LAs a congestion charge on vehicles was introduced in 2003.

Suggest, with a reason taken from the data, which LA this could have been. **[2]**

LA1 as was only LA where this category got smaller (by 3607)

4 It is known that, under the standard treatment for a certain disease, 9.7% of patients with the disease experience side effects within one year.

In a trial of a new treatment, a random sample of 450 patients with this disease was selected and the number X who experienced side effects within one year was noted.

(a) State one assumption needed in order to use a binomial model for X. **[1]**

Each patient is independent

It was found that 51 of the 450 patients experienced side effects within one year.

(b) Test, at the 10% significance level, whether the proportion of patients experiencing side effects within one year is greater under the new treatment than under the standard treatment. **[7]**

$X \sim B(450, 0.097)$ $P(X \geq 51)$ 0.138701

$H_0: p = 0.097$

$H_1: p > 0.097$

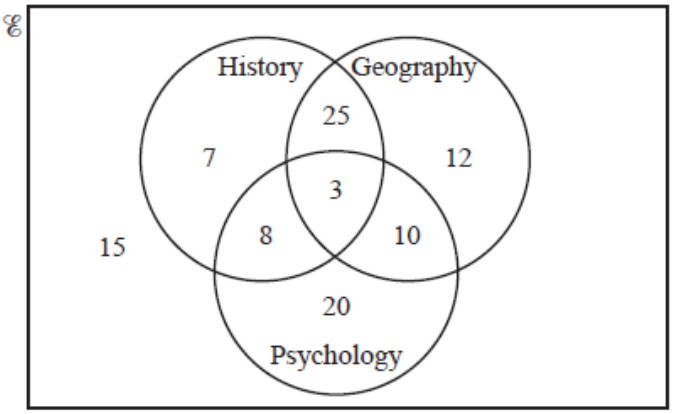
$= 1 - P(X \leq 50)$

$= 1 - 0.861699$

$= 0.138$

$\therefore$ do not reject H_0 as insufficient evidence to suggest the proportion has increased

5 The Venn diagram shows the numbers of students studying various subjects, in a year group of 100 students.



A student is chosen at random from the 100 students. Then another student is chosen from the remaining students.

Find the probability that the first student studies History and the second student studies Geography but not Psychology. **[4]**

$\frac{7+8}{100} \times \frac{37}{99} + \frac{25}{100} \times \frac{36}{99} + \frac{3}{100} \times \frac{37}{99} = 0.158$

Total Marks for Question Set 4: 25