PAPER 2

ADVANCED SUBSIDIARY

CM

Practice Paper A

Time allowed: 1 hour and 15 minutes

Instructions to candidates:

• In the boxes above, write your centre number, candidate number, your surname, other names and signature.

• Answer ALL of the questions.

• You must write your answer for each question in the spaces provided.

• You may use a calculator.

Information to candidates:

• Full marks may only be obtained for answers to ALL of the questions.

• The marks for individual questions and parts of the questions are shown in round brackets.

• There are 8 questions in this question paper. The total mark for this paper is 60.

Advice to candidates:

• You should ensure your answers to parts of the question are clearly labelled.

• You should show sufficient working to make your workings clear to the Examiner.

• Answers without working may not gain full credit.

Section A: Statistics

1 Josh is going to use the large data set to investigate the cloud cover in Heathrow in 1987. He takes a simple random sample of all of the data points available.

(a) Write down the unit that the Large Data Set measures cloud cover in. **(1)**

The large data set has 184 data points for the daily mean total cloud in Heathrow in 1987.

(b) Explain how Josh can use simple random sampling to obtain 30 of these data points for analysis. **(3)**

(c) State one advantage of Josh using a sample of the available data points as opposed to all of the data points. **(1)**

2 Henry collects information about the salaries, £P, of employees at a company with y years of experience. He collects data from 8 randomly selected individuals. His data is shown in the table below.

Salary (£P)	19000	22000	27000	56000	34000	37000	60000	80000
Experience (y years)	1	3	2	8	5	4	2	10

(a) Explain why Henry should have put experience on the first row rather than the second. **(1)**

(b) Find the mean salary of the 8 employees and the standard deviation in these salaries. **(3)**

A data point is considered an outlier if it is more than one standard deviation **above** the mean.

(c) Determine which salary is considered an outlier. **(1)**

Henry wants to calculate the equation of a regression line for P on y.

(d) Give one reason why Henry should

   (i) include

  (ii) exclude

the outlier in this calculation. **(2)**

Henry excludes the outlier and calculates the equation of the regression line.

The regression line has equation $P = 24000 + 3400y$.

(e) Predict the salary of an employee that has worked at the company for 9 years. **(2)**

(f) Comment on the reliability of your prediction in (e). **(1)**

3 Mollie is the manager of a popular department store. Previous statistics show that 60% of customers that make purchases in the department store spend at least £20.

35 customers are selected at random.

(a) Using these statistics, find the probability that more than 18 of the customers spend at least £20. **(2)**

To see if the probability has changed, Mollie takes a random sample of the amount spent by her next 35 customers. No customer in her sample spent more than £100. The histogram below shows her results.
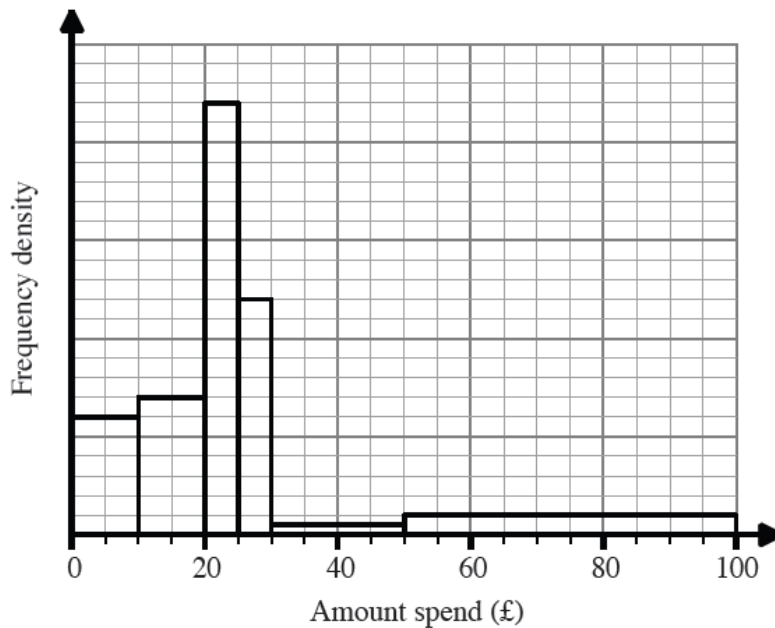
(b) Use the histogram to find the number of customers in the sample that spent at least £20. **(3)**

(b) Use Mollie's data to test, at the 5% level of significance, whether the probability that a customer spends at least £20 in the store has changed. **(5)**
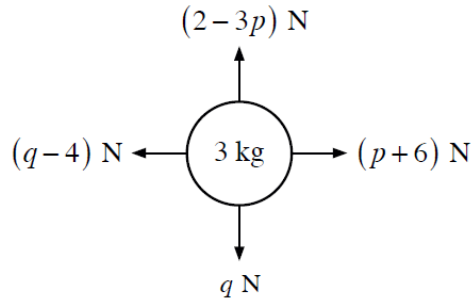
4 Two events A and B are independent. Given that
$$P(A \text{ and } B) = 0.06 \text{ and } P(\text{not } A \text{ and not } B) = 0.51$$
find the maximum possible value of $P(\text{not } A)$. Show clearly where you have used the fact that A and B are independent events. **(6)**

Section B: Mechanics

5 The diagram below shows the forces that act on a particle of mass 3 kg.

The particle accelerates to the left at 5 m/s².

Find the values of the constants p and q. **(5)**

6 A 2 kg particle P is projected vertically upwards from the ground at 26 m s⁻¹. As P moves freely through the air under the influence of gravity, it is subject to a constant resistance, R N, that directly opposes its motion. The particle reaches its maximum height above the ground 2.5 seconds after being projected.

(a) Find the magnitude of R. **(4)**

(b) Find the maximum height reached by the particle above the ground. **(2)**

Alice says, "the total time the particle is in the air is $2.5 \times 2 = 5$ seconds."

(c) Explain, with reference to the forces acting on P, why Alice is wrong. **(2)**

(d) Find the total time the particle is in the air. **(4)**

7 Two particles, A and B, of mass $3m$ kg and $5m$ kg respectively, are attached to the ends of a light inextensible string. The string passes over a small smooth pulley that is fixed to the edge of a smooth table. The particle A lies on the table and the particle B hangs freely. The system is released from rest with the string taut.

(a) Find, in terms of m and g,

(i) the magnitude of the acceleration of each particle

(ii) the magnitude of the tension in the string. **(3)**

(b) Find the magnitude and direction of the force exerted by the string on the pulley. **(3)**

8 A particle moves on the x axis. The velocity of the particle at time t s is v m s⁻¹, where

$$v = kt^2 + 2t + (4 - k), \; t \geq 0$$

and k is an integer.

The particle is never at rest.

Using the largest possible value of k, find the distance travelled by the particle in the third second of its motion. **(7)**