

NAME:

PAPER K

Date to be handed in:

MARK (out of 100):

Qu	1	2	3	4	5	6	7	8	9	10	11	12	13

# Mathematics

## Advanced Subsidiary

Paper 2: Statistics and Mechanics

Time 1 hour 15 minutes

Practice Paper J

Paper Reference

**8MA0/01**

You must have:

Mathematical Formulae and Statistical Tables, calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations.

Calculators must not have the facility for algebraic manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

### Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** the questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
  - *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.

**Questions to revise:**

## **SECTION A: Statistics**

**7** The table shows the daily mean temperatures in °C at Perth Airport for the first 20 days in May 1987. The data is taken from the large data set.

<b>Date</b>	<b>Daily mean temperature (°C)</b>
01/05/1987	14.9
02/05/1987	13.7
03/05/1987	15.3
04/05/1987	16.9
05/05/1987	18.4
06/05/1987	21.6
07/05/1987	20.4
08/05/1987	16.6
09/05/1987	14.6
10/05/1987	10.0
11/05/1987	11.5
12/05/1987	12.3
13/05/1987	12.9
14/05/1987	13.1
15/05/1987	13.8
16/05/1987	14.8
17/05/1987	14.5
18/05/1987	13.5
19/05/1987	14.5
20/05/1987	13.8

- a** Describe the type of data represented by daily mean temperature. **(1 mark)**  
Jennifer is investigating the daily temperature at Perth. She wants to select a sample of size 5 from the daily temperatures at Perth from the first 20 days in May 1987.
- b** Describe what Jennifer could use as the sampling frame. **(1 mark)**
- c** Describe the type of sample Jennifer could take and explain how she could collect her sample. **(2 marks)**  
Sally is investigating rainfall in Leeming in 1987. The large data set provides data for 184 consecutive days in 1987.
- d** Describe how Sally could take a systematic sample of 30 days from the data for Leeming in 1987. **(3 marks)**
- e** Explain why Sally's sample would not necessarily give her 30 data points for her investigation. **(1 mark)**

**2** A jar contains 2 red, 1 blue and 1 green bead. Two beads are drawn at random from the jar without replacement.

- a** Draw a tree diagram to illustrate all the possible outcomes and associated probabilities. Show your probabilities clearly. **(3 marks)**
- b** Find the probability that a blue bead and a green bead are drawn from the jar. **(2 marks)**

**1** The discrete random variable  $X$  has probability function

$$P(X=x) = \begin{cases} k(x^2 - 9) & x = 4, 5, 6 \\ 0 & \text{otherwise} \end{cases}$$

where  $k$  is a positive constant.

**a** Show that  $k = \frac{1}{50}$  (3 marks)

**b** Find the probability distribution of  $X$ . (2 marks)

**6** It is known from past records that 1 in 5 bowls produced in a pottery have minor defects. To monitor production a random sample of 25 bowls was taken and the number of such bowls with defects was recorded.

**a** Using a 5% level of significance, find critical regions for a 2-tail test of the hypothesis that 1 in 5 bowls have minor defects. The probability of rejection, in either tail, should be no more than 2.5%. (6 marks)

**b** State the actual significance level of the above test. (1 mark)

At a later date, a random sample of 20 bowls was taken and 2 of them were found to have minor defects.

**c** Test, at the 10% level of significance, whether or not there is evidence that the proportion of bowls with minor defects has decreased. State your hypotheses clearly. (5 marks)

## SECTION B: Mechanics

**9.** A particle  $P$  moves in a straight line. At time  $t$  s the displacement  $s$  cm from a fixed point  $O$  is given by  $s = \frac{1}{6}(8t^3 - 105t^2 + 144t + 540)$ .

Find the distance between the points at which the particle is instantaneously at rest.

**(Total 7 marks)**

**7.** A body moves in a straight line such that its velocity,  $v$  m s<sup>-1</sup>, at time  $t$  s is given by

$$v = -\frac{1}{3}(2t^2 - 9t - 18), t \geq 0.$$

**(a)** Find the initial velocity of the body. (2)

**(b)** Find the value of  $t$  when the body is instantaneously at rest. (3)

(c) Find the greatest speed of the body in the first seven seconds of motion.

**(5)**

**(Total 10 marks)**

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Find 14 mark question here