OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

MATHEMATICS 4732

Probability & Statistics 1

QUESTION PAPER

Candidates answer on the printed answer book.

OCR supplied materials:
- Printed answer book 4732
- List of Formulae (MF1)

Other materials required:
- Scientific or graphical calculator

Wednesday 26 January 2011
Afternoon

Duration: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

These instructions are the same on the printed answer book and the question paper.

- The question paper will be found in the centre of the printed answer book.
- Write your name, centre number and candidate number in the spaces provided on the printed answer book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the printed answer book.** Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are permitted to use a scientific or graphical calculator in this paper.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.

INFORMATION FOR CANDIDATES

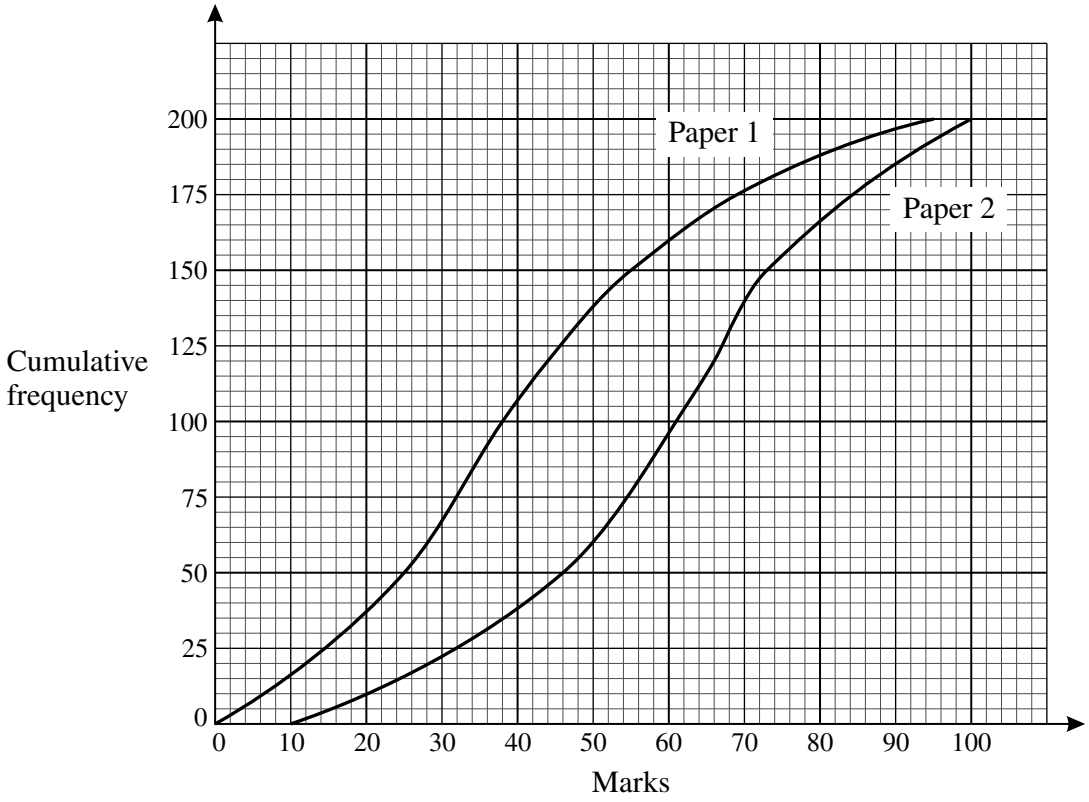
This information is the same on the printed answer book and the question paper.

- The number of marks is given in brackets **[ ]** at the end of each question or part question on the question paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The printed answer book consists of **12** pages. The question paper consists of **4** pages. Any blank pages are indicated.

INSTRUCTION TO EXAMS OFFICER / INVIGILATOR

- Do not send this question paper for marking; it should be retained in the centre or destroyed.

1 200 candidates took each of two examination papers. The diagram shows the cumulative frequency graphs for their marks.



(i) Estimate the median mark for each of the papers. **[2]**

(ii) State, with a reason, which of the two papers was the easier one. **[2]**

(iii) It is suggested that the marks on Paper 2 were less varied than those on Paper 1. Use interquartile ranges to comment on this suggestion. **[4]**

(iv) The minimum mark for grade A, the top grade, on Paper 1 was 10 marks lower than the minimum mark for grade A on Paper 2. Given that 25 candidates gained grade A in Paper 1, find the number of candidates who gained grade A in Paper 2. **[2]**

(v) The mean and standard deviation of the marks on Paper 1 were 36.5 and 28.2 respectively. Later, a marking error was discovered and it was decided to add 1 mark to each of the 200 marks on Paper 1. State the mean and standard deviation of the new marks on Paper 1. **[2]**

2 The random variable X has the distribution Geo(0.2). Find

(i) $P(X = 3)$, **[2]**

(ii) $P(3 \leqslant X \leqslant 5)$, **[3]**

(iii) $P(X > 4)$. **[3]**

Two independent values of X are found.

(iv) Find the probability that the total of these two values is 3. **[3]**

3 A firm wishes to assess whether there is a linear relationship between the annual amount spent on advertising, £x thousand, and the annual profit, £y thousand. A summary of the figures for 12 years is as follows.

$$n = 12 \quad \Sigma x = 86.6 \quad \Sigma y = 943.8 \quad \Sigma x^2 = 658.76 \quad \Sigma y^2 = 83\,663.00 \quad \Sigma xy = 7351.12$$

(i) Calculate the product moment correlation coefficient, showing that it is greater than 0.9. **[3]**

(ii) Comment briefly on this value in this context. **[1]**

(iii) A manager claims that this result shows that spending more money on advertising in the future will result in greater profits. Make two criticisms of this claim. **[2]**

(iv) Calculate the equation of the regression line of y on x. **[4]**

(v) Estimate the annual profit during a year when £7400 was spent on advertising. **[2]**

4 Jenny and Omar are each allowed two attempts at a high jump.

(i) The probability that Jenny will succeed on her first attempt is 0.6. If she fails on her first attempt, the probability that she will succeed on her second attempt is 0.7. Calculate the probability that Jenny will succeed. **[3]**

(ii) The probability that Omar will succeed on his first attempt is p. If he fails on his first attempt, the probability that he will succeed on his second attempt is also p. The probability that he succeeds is 0.51. Find p. **[4]**

5 30% of packets of Natural Crunch Crisps contain a free gift. Jan buys 5 packets each week.

(i) The number of free gifts that Jan receives in a week is denoted by X. Name a suitable probability distribution with which to model X, giving the value(s) of any parameter(s). State any assumption(s) necessary for the distribution to be a valid model. **[4]**

Assume now that your model is valid.

(ii) Find

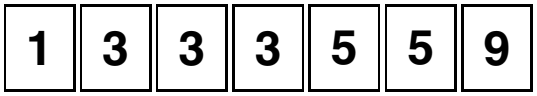
(a) $\mathrm{P}(X \leqslant 2)$, **[1]**

(b) $\mathrm{P}(X = 2)$. **[2]**

(iii) Find the probability that, in the next 7 weeks, there are exactly 3 weeks in which Jan receives exactly 2 free gifts. **[3]**

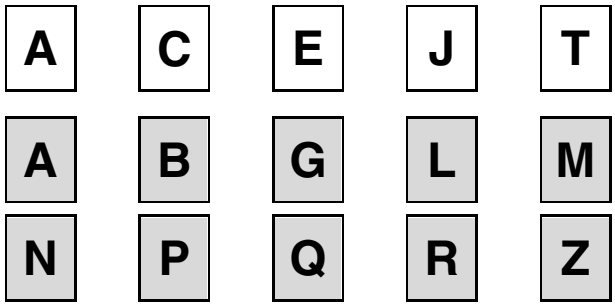
[Questions 6, 7 and 8 are printed overleaf.]

6 **(i)** The diagram shows 7 cards, each with a digit printed on it. The digits form a 7-digit number.



How many different 7-digit numbers can be formed using these cards? **[3]**

(ii) The diagram below shows 5 white cards and 10 grey cards, each with a letter printed on it.



From these cards, 3 white cards and 4 grey cards are selected at random **without** regard to order.

(a) How many selections of seven cards are possible? **[3]**

(b) Find the probability that the seven cards include exactly one card showing the letter A. **[4]**

7 The probability distribution of a discrete random variable, X, is shown below.

x	0	2
$P(X = x)$	a	$1 - a$

(i) Find $E(X)$ in terms of a. **[2]**

(ii) Show that $\text{Var}(X) = 4a(1 - a)$. **[3]**

8 Five dogs, A, B, C, D and E, took part in three races. The order in which they finished the first race was $ABCDE$.

(i) Spearman's rank correlation coefficient between the orders for the 5 dogs in the first two races was found to be -1. Write down the order in which the dogs finished the second race. **[1]**

(ii) Spearman's rank correlation coefficient between the orders for the 5 dogs in the first race and the third race was found to be 0.9.

(a) Show that, in the usual notation (as in the List of Formulae), $\Sigma d^2 = 2$. **[2]**

(b) Hence or otherwise find a possible order in which the dogs could have finished the third race. **[2]**

OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

MATHEMATICS 4732

Probability & Statistics 1

PRINTED ANSWER BOOK

Candidates answer on this printed answer book.

OCR supplied materials:
- Question paper 4732 (inserted)
- List of Formulae (MF1)

Other materials required:
- Scientific or graphical calculator

Wednesday 26 January 2011
Afternoon

Duration: 1 hour 30 minutes

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

These instructions are the same on the printed answer book and the question paper.

- The question paper will be found in the centre of the printed answer book.
- Write your name, centre number and candidate number in the spaces provided on the printed answer book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the printed answer book.** Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are permitted to use a scientific or graphical calculator in this paper.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.

INFORMATION FOR CANDIDATES

This information is the same on the printed answer book and the question paper.

- The number of marks is given in brackets **[ ]** at the end of each question or part question on the question paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The printed answer book consists of **12** pages. The question paper consists of **4** pages. Any blank pages are indicated.

1 (i)	
1 (ii)	
1 (iii)	
1 (iv)	
1 (v)	

2 (i)	
2 (ii)	
2 (iii)	
2 (iv)	

3 (i)

3 (ii)

3 (iii)

3 (iv)	
3 (v)	

4 (i)	
4 (ii)	

5 (i)	
5 (ii) (a)	
5 (ii) (b)	
5 (iii)	

6 (i)	
6 (ii) (a)	
6 (ii) (b)	

7 (i)

7 (ii)

8 (i)	
8 (ii) (a)	
8 (ii) (b)	

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE