

Thursday 24 May 2012 – Morning

AS GCE MATHEMATICS

4732 Probability and 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

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. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- 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**.
- This Printed Answer Book consists of **12** pages. The Question Paper consists of **4** pages. Any blank pages are indicated.

INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

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- 1 For each of the last five years the number of tourists, x thousands, visiting Sackton, and the average weekly sales, £ y thousands, in Sackton Stores were noted. The table shows the results.

Year	2007	2008	2009	2010	2011
x	250	270	264	290	292
y	4.2	3.7	3.2	3.5	3.0

- (i) Calculate the product moment correlation coefficient r between x and y . [4]
- (ii) It is required to estimate the average weekly sales at Sackton Stores in a year when the number of tourists is 280 000. Calculate the equation of an appropriate regression line, and use it to find this estimate. [4]
- (iii) Over a longer period the value of r is -0.8 . The mayor says, "This shows that having more tourists causes sales at Sackton Stores to decrease." Give a reason why this statement is not correct. [1]
- 2 The masses, x kg, of 50 bags of flour were measured and the results were summarised as follows.

$$n = 50 \quad \Sigma(x - 1.5) = 1.4 \quad \Sigma(x - 1.5)^2 = 0.05$$

Calculate the mean and standard deviation of the masses of these bags of flour. [6]

- 3 The test marks of 14 students are displayed in a stem-and-leaf diagram, as shown below.

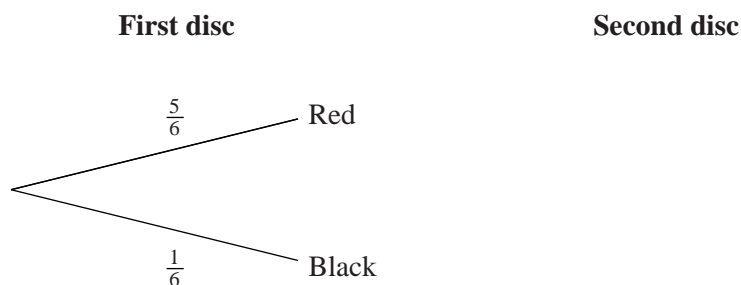
0	
1	2 6
2	1 3 5
3	w x 4 8 y z
4	6 7 7

Key: 1 | 6 means 16 marks

- (i) Find the lower quartile. [1]
- (ii) Given that the median is 32, find the values of w and x . [2]
- (iii) Find the possible values of the upper quartile. [2]
- (iv) State one advantage of a stem-and-leaf diagram over a box-and-whisker plot. [1]
- (v) State one advantage of a box-and-whisker plot over a stem-and-leaf diagram. [1]

- 4 A bag contains 5 red discs and 1 black disc. Tina takes two discs from the bag at random without replacement.

(i) The diagram shows part of a tree diagram to illustrate this situation.



Complete the tree diagram in your Answer Book showing all the probabilities. [2]

(ii) Find the probability that exactly one of the two discs is red. [3]

All the discs are replaced in the bag. Tony now takes three discs from the bag at random without replacement.

(iii) Given that the first disc Tony takes is red, find the probability that the third disc Tony takes is also red. [2]

- 5 (i) Write down the value of Spearman's rank correlation coefficient, r_s , for the following sets of ranks.

(a)

Judge A ranks	1	2	3	4
Judge B ranks	1	2	3	4

[1]

(b)

Judge A ranks	1	2	3	4
Judge C ranks	4	3	2	1

[1]

(ii) Calculate the value of r_s for the following ranks.

Judge A ranks	1	2	3	4
Judge D ranks	2	4	1	3

[3]

(iii) For each of parts (i)(a), (i)(b) and (ii), describe in everyday terms the relationship between the two judges' opinions. [3]

- 6 A six-sided die is biased so that the probability of scoring 6 is 0.1 and the probabilities of scoring 1, 2, 3, 4, and 5 are all equal. In a game at a fête, contestants pay £3 to roll this die. If the score is 6 they receive £10 back. If the score is 5 they receive £5 back. Otherwise they receive no money back. Find the organiser's expected profit for 100 rolls of the die. [5]

- 7 (i) 5 of the 7 letters A, B, C, D, E, F, G are arranged in a random order in a straight line.
- (a) How many different arrangements of 5 letters are possible? [2]
- (b) How many of these arrangements end with a vowel (A or E)? [3]
- (ii) A group of 5 people is to be chosen from a list of 7 people.
- (a) How many different groups of 5 people can be chosen? [1]
- (b) The list of 7 people includes Jill and Jo. A group of 5 people is chosen at random from the list. Given that either Jill and Jo are both chosen or neither of them is chosen, find the probability that both of them are chosen. [3]
- 8 (i) The random variable X has the distribution $B(30, 0.6)$. Find $P(X \geq 16)$. [2]
- (ii) The random variable Y has the distribution $B(4, 0.7)$.
- (a) Find $P(Y = 2)$. [2]
- (b) Three values of Y are chosen at random. Find the probability that their total is 10. [6]
- 9 (i) A clock is designed to chime once each hour, on the hour. The clock has a fault so that each time it is supposed to chime there is a constant probability of $\frac{1}{10}$ that it will not chime. It may be assumed that the clock never stops and that faults occur independently. The clock is started at 5 minutes past midnight on a certain day. Find the probability that the first time it does not chime is
- (a) at 0600 on that day, [3]
- (b) before 0600 on that day. [3]
- (ii) Another clock is designed to chime twice each hour: on the hour and at 30 minutes past the hour. This clock has a fault so that each time it is supposed to chime there is a constant probability of $\frac{1}{20}$ that it will not chime. It may be assumed that the clock never stops and that faults occur independently. The clock is started at 5 minutes past midnight on a certain day.
- (a) Find the probability that the first time it does not chime is at either 0030 or 0130 on that day. [2]
- (b) Use the formula for the sum to infinity of a geometric progression to find the probability that the first time it does not chime is at 30 minutes past some hour. [3]

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