

# OCR

Oxford Cambridge and RSA

## Wednesday 3 June 2015 – Morning

### AS GCE MATHEMATICS

**4732/01** Probability & Statistics 1**QUESTION PAPER**

Candidates answer on the Printed Answer Book.

**OCR supplied materials:**

- Printed Answer Book 4732/01
- 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 inside 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**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **8** pages. Any blank pages are indicated.

### INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

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## 2

- 1 For the top 6 clubs in the 2010/11 season of the English Premier League, the table shows the annual salary, £ $x$  million, of the highest paid player and the number of points scored,  $y$ .

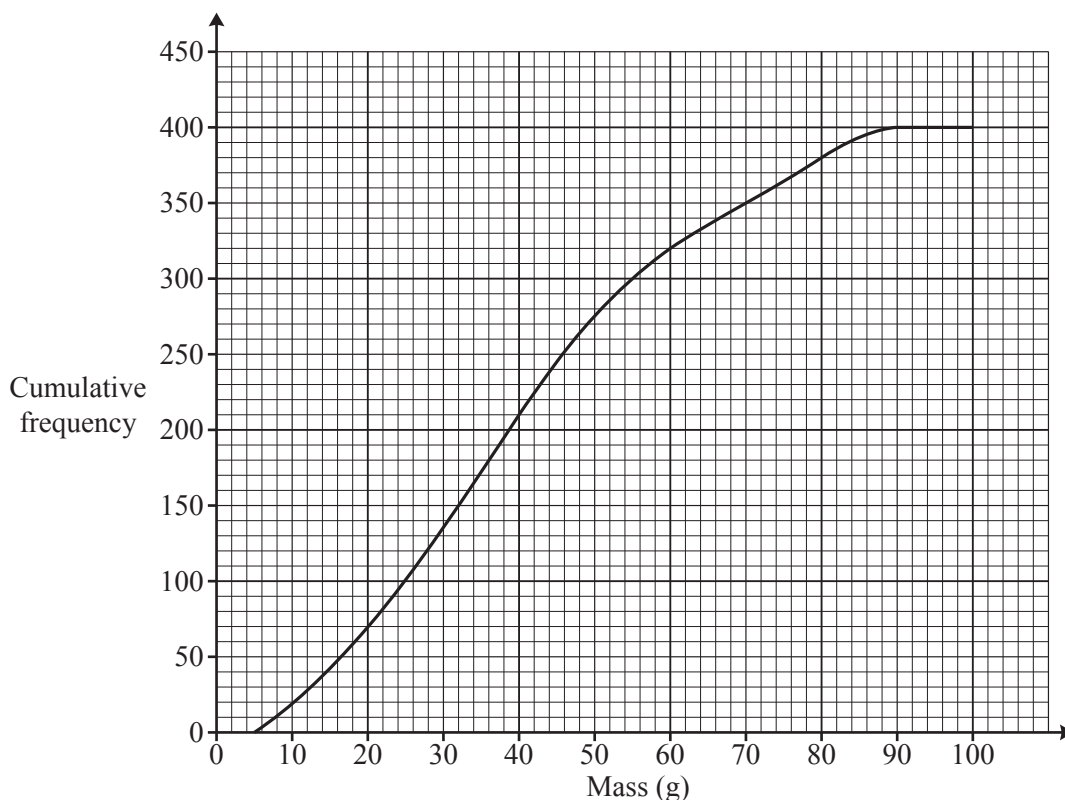
Club	Manchester United	Manchester City	Chelsea	Arsenal	Tottenham	Liverpool
$x$	5.6	7.4	6.5	4.1	3.6	6.5
$y$	80	71	71	68	62	58

$$n = 6 \quad \Sigma x = 33.7 \quad \Sigma x^2 = 200.39 \quad \Sigma y = 410 \quad \Sigma y^2 = 28314 \quad \Sigma xy = 2313.9$$

- (i) Use a suitable formula to calculate the product moment correlation coefficient,  $r$ , between  $x$  and  $y$ , showing that  $0 < r < 0.2$ . [3]
- (ii) State what this value of  $r$  shows in this context. [1]
- (iii) A fan suggests that the data should be used to draw a regression line in order to estimate the number of points that would be scored by another Premier League club, whose highest paid player's salary is £1.7 million. Give two reasons why such an estimate would be unlikely to be reliable. [2]

3

- 2 The masses, in grams, of 400 plums were recorded. The masses were then collected into class intervals of width 5 g and a cumulative frequency graph was drawn, as shown below.



- (i) Find the number of plums with masses in the interval 40 g to 45 g. [1]
  - (ii) Find the percentage of plums with masses greater than 70 g. [2]
  - (iii) Give estimates of the highest and lowest masses in the sample, explaining why their exact values cannot be read from the graph. [2]
  - (iv) On the graph paper in the answer book, draw a box-and-whisker plot to illustrate the masses of the plums in the sample. [4]
  - (v) Comment briefly on the shape of the distribution of masses. [1]
- 3 An expert tested the quality of the wines produced by a vineyard in 9 particular years. He placed them in the following order, starting with the best.
- 1980    1983    1981    1982    1984    1985    1987    1986    1988
- (i) Calculate Spearman's rank correlation coefficient,  $r_s$ , between the year of production and the quality of these wines. The years should be ranked from the earliest (1) to the latest (9). [5]
  - (ii) State what this value of  $r_s$  shows in this context. [1]

4

- 4 The table shows the load a lorry was carrying,  $x$  tonnes, and the fuel economy,  $y$  km per litre, for 8 different journeys. You should assume that neither variable is controlled.

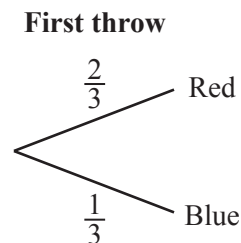
Load ( $x$ tonnes)	5.1	5.8	6.5	7.1	7.6	8.4	9.5	10.5
Fuel economy ( $y$ km per litre)	6.2	6.1	5.9	5.6	5.3	5.4	5.3	5.1

$$n = 8 \quad \Sigma x = 60.5 \quad \Sigma y = 44.9 \quad \Sigma x^2 = 481.13 \quad \Sigma y^2 = 253.17 \quad \Sigma xy = 334.65$$

- (i) Calculate the equation of the regression line of  $y$  on  $x$ . [4]
- (ii) Estimate the fuel economy for a load of 9.2 tonnes. [2]
- (iii) An analyst calculated the equation of the regression line of  $x$  on  $y$ . Without calculating this equation, state the coordinates of the point where the two regression lines intersect. [1]
- (iv) Describe briefly the method required to estimate the load when the fuel economy is 5.8 km per litre. [2]
- 5 Each year Jack enters a ballot for a concert ticket. The probability that Jack will win a ticket in any particular year is 0.27.
- (i) Find the probability that the first time Jack wins a ticket is
- (a) on his 8th attempt, [2]
- (b) after his 8th attempt. [2]
- (ii) Write down an expression for the probability that Jack wins a ticket on exactly 2 of his first 8 attempts, and evaluate this expression. [3]
- (iii) Find the probability that Jack wins his 3rd ticket on his 9th attempt and his 4th ticket on his 12th attempt. [3]
- 6 (i) The seven digits 1, 1, 2, 3, 4, 5, 6 are arranged in a random order in a line. Find the probability that they form the number 1452163. [3]
- (ii) Three of the seven digits 1, 1, 2, 3, 4, 5, 6 are chosen at random, without regard to order.
- (a) How many possible groups of three digits contain two 1s? [1]
- (b) How many possible groups of three digits contain exactly one 1? [2]
- (c) How many possible groups of three digits can be formed altogether? [2]

## 5

- 7 Froox sweets are packed into tubes of 10 sweets, chosen at random. 25% of Froox sweets are yellow.
- (i) Find the probability that in a randomly selected tube of Froox sweets there are
- (a) exactly 3 yellow sweets, [3]
- (b) at least 3 yellow sweets. [2]
- (ii) Find the probability that in a box containing 6 tubes of Froox sweets, there is at least 1 tube that contains at least 3 yellow sweets. [3]
- 8 A game is played with a fair, six-sided die which has 4 red faces and 2 blue faces. One turn consists of throwing the die repeatedly until a blue face is on top or until the die has been thrown 4 times.
- (i) In the answer book, complete the probability tree diagram for one turn.



- [2]
- (ii) Find the probability that in one particular turn the die is thrown 4 times. [2]
- (iii) Adnan and Beryl each have one turn. Find the probability that Adnan throws the die more times than Beryl. [4]
- (iv) State one change that needs to be made to the rules so that the number of throws in one turn will have a geometric distribution. [1]
- 9 The random variable  $X$  has probability distribution given by
- $$P(X = x) = a + bx \quad \text{for } x = 1, 2 \text{ and } 3,$$
- where  $a$  and  $b$  are constants.
- (i) Show that  $3a + 6b = 1$ . [2]
- (ii) Given that  $E(X) = \frac{5}{3}$ , find  $a$  and  $b$ . [4]

**END OF QUESTION PAPER**

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