OCR
Oxford Cambridge and RSA

AS Level Further Mathematics A
Y532/01 Statistics

Practice Paper – Set 2
Time allowed: 1 hour 15 minutes

You must have:
- Printed Answer Booklet
- Formulae AS Level Further Mathematics A

You may use:
- a scientific or graphical calculator

INSTRUCTIONS
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes provided on the Printed Answer Booklet with your name, centre number and candidate number.
- Answer **all** the questions.
- **Write your answer to each question in the space provided in the Printed Answer Booklet.** Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the barcodes.
- You are permitted to use a scientific or graphical calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.
- The acceleration due to gravity is denoted by $g\,\mathrm{m\,s^{-2}}$. Unless otherwise instructed, when a numerical value is needed, use g = 9.8.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- **You are reminded of the need for clear presentation in your answers.**
- The Printed Answer Booklet consists of **8** pages. The Question Paper consists of **4** pages.

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Turn over

Answer **all** the questions.

1 A learner driver keeps taking the driving test until she passes. The number of attempts taken, up to and including the pass, is denoted by X.

    (i) State two assumptions needed for X to be well modelled by a geometric distribution. **[2]**

   Assume now that $X \sim \text{Geo}(0.4)$.

    (ii) Find $P(X < 6)$. **[2]**

    (iii) Find $E(X)$. **[1]**

    (iv) Find $\text{Var}(X)$. **[2]**

2 The number of calls received by a customer service department in 30 minutes is denoted by W. It is known that $E(W) = 6.5$.

    (i) It is given that W has a Poisson distribution.

        (a) Write down the standard deviation of W. **[1]**

        (b) Find the probability that the total number of calls received in a randomly chosen period of 2 hours is less than 30. **[3]**

    (ii) It is given instead that W has a uniform distribution on $[1, N]$. Calculate the value of $P(W > 3)$. **[2]**

3 A pack of 40 cards consists of 10 cards in each of four colours: red, yellow, blue and green. The pack is dealt at random into four "hands", each of 10 cards. The hands are labelled North, South, East and West.

    (i) Find the probability that West has exactly 3 red cards. **[3]**

    (ii) Find the probability that West has exactly 3 red cards, given that East and West have between them a total of exactly 5 red cards. **[3]**

    (iii) South has 5 red cards and 5 blue cards. These cards are placed in a row in a random order. Find the probability that the colour of each card is different from the colour of the preceding card. **[2]**

4 A spinner has edges numbered 1, 2, 3, 4 and 5. When the spinner is spun, the number of the edge on which it lands is the score. The probability distribution of the score, N, is given in the table.

Score, N	1	2	3	4	5
Probability	0.3	0.2	0.2	x	y

It is known that $E(N) = 2.55$.

(i) Find $Var(N)$. **[7]**

(ii) Find $E(3N+2)$. **[1]**

(iii) Find $Var(3N+2)$. **[1]**

5 The speed $v\,ms^{-1}$ of a car at time t seconds after it starts to accelerate was measured at 1-second intervals. The results are shown in the following diagram.
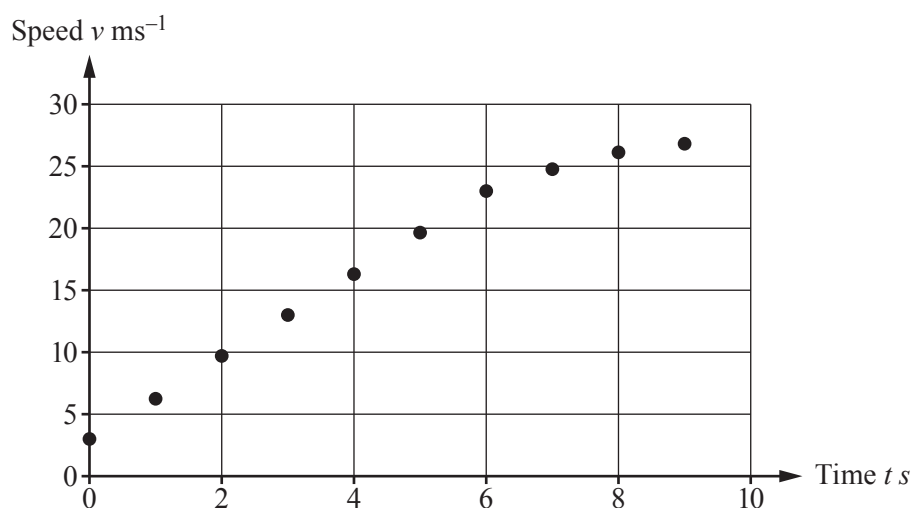
(i) State whether t or v or neither is a controlled variable. **[1]**

The value of the product moment correlation coefficient r for the data is 0.987 correct to 3 significant figures.

(ii) The speed of the car is converted to miles per hour and the time to minutes. State the value of r for the converted data. **[1]**

(iii) State the value of Spearman's rank correlation coefficient r_s for the data. **[1]**

(iv) What information does r give about the data that is not given by r_s? **[1]**

6 The discrete random variable R has the distribution $Po(\lambda)$.

Use an algebraic method to find the range of values of λ for which the single most likely value of R is 7. **[7]**

7 The numbers of students taking A levels in three subjects at a school were classified by the year in which they entered the school as follows.

	Subject	Mathematics	English	Physics
Year of Entry	Year 7	17	16	7
	Year 12	13	2	5

The Head of the school carries out a significance test at the 10% level to test whether subjects taken are independent of year of entry.

   (i) Show that in carrying out the test it is necessary to combine columns. **[2]**

   (ii) Suggest a reason why it is more sensible to combine the columns for Mathematics and Physics than the columns for Physics and English. **[1]**

   (iii) Carry out the test. **[6]**

   (iv) State which cell gives the largest contribution to the test statistic. **[1]**

   (v) Interpret your answer to part **(iv)**. **[1]**

8 In a competition, entrants have to give ranks from 1 to 7 to each of seven resorts. The correct ranks for the resorts are decided by an expert.

   (i) One competitor chooses his ranks randomly. By considering all the possible rankings, find the probability that the value of Spearman's rank correlation coefficient r_s between the competitor's ranks and the expert's ranks is at least $\frac{27}{28}$. **[7]**

   (ii) Another competitor ranks the seven resorts. A significance test is carried out to test whether there is evidence that this competitor is merely guessing the rank order of the seven resorts. The critical region is $r_s \geq \frac{27}{28}$. State the significance level of the test. **[1]**

END OF QUESTION PAPER