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Surname _____

Forename(s) _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

AS

FURTHER MATHEMATICS

Paper 2 Statistics

7366/2S

Friday 19 May 2023 Afternoon

Time allowed: 1 hour 30 minutes

At the top of the page, write your surname and forename(s), your centre number, your candidate number and add your signature.

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JUN237366 2S01

MATERIALS

- **You must have the AQA Formulae and statistical tables booklet for A-level Mathematics and A-level Further Mathematics.**
- **You should have a graphical or scientific calculator that meets the requirements of the specification.**
- **You must ensure you have the other optional Question Paper/Answer Book for which you are entered (EITHER Discrete OR Mechanics). You will have 1 hour 30 minutes to complete BOTH papers.**

INSTRUCTIONS

- **Use black ink or black ball-point pen. Pencil should only be used for drawing.**
- **Answer ALL questions.**
- **You must answer each question in the space provided. Do NOT write on blank pages.**

- If you require extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

INFORMATION

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 40.

ADVICE

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- You do not necessarily need to use all the space provided.

DO NOT TURN OVER UNTIL TOLD TO DO SO

Answer ALL questions in the spaces provided.

1 **The continuous random variable X has variance 9**

The discrete random variable Y has standard deviation 2 and is independent of X

Find Var($X + Y$)

Circle your answer. [1 mark]

5 **11** **13** **85**

2 The random variable T has a discrete uniform distribution and takes the values 1, 2, 3, 4 and 5

Find the variance of T

Circle your answer. [1 mark]

$\frac{1}{5}$ $\frac{4}{3}$ 2 $\frac{13}{6}$

3 The discrete random variable X has probability distribution

x	–4	3	8
P($X = x$)	0.2	0.7	0.1

Show that E($5X$ – 7) = 3.5
[3 marks]

[Turn over]

8

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[Turn over]

4 The proportion, p, of people in a particular town who use the local supermarket is unknown.

A random sample of 30 people in the town is taken and each person is asked if they use the local supermarket.

The manager of the supermarket claims that 35% of the people in the town use the local supermarket.

The random sample is used to conduct a hypothesis test at the 5% level of significance with the hypotheses

$H_0: p = 0.35$

$H_1: p \neq 0.35$

Show that the probability that a Type I error is made is 0.0356, correct to four decimal places. [4 marks]

[Turn over]

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[Turn over]

5 Rebekah is investigating the distances, X light years, between the Earth and visible stars in the night sky.

She determines the distance between the Earth and a star for a random sample of 100 visible stars.

The summarised results are as follows:

$\sum x = 35\ 522$ and

$\sum x^2 = 32\ 902\ 257$

5 (a) Calculate a 97% confidence interval for the population mean of X, giving your values to the nearest light year. [5 marks]

[Turn over]

5 (b) Mike claims that the population mean is 267 light years.

Rebekah says that the confidence interval supports Mike's claim.

State, with a reason, whether Rebekah is correct. [1 mark]

6 An insurance company models the number of motor claims received in 1 day using a Poisson distribution with mean 65

6 (a) Find the probability that the company receives at most 60 motor claims in 1 day.

Give your answer to three decimal places. [1 mark]

6 (b) The company receives motor claims using a telephone line which is open 24 hours a day.

Find the probability that the company receives exactly 2 motor claims in 1 hour.

Give your answer to three decimal places. [2 marks]

6 (c) The company models the number of property claims received in 1 day using a Poisson distribution with mean 23

Assume that the number of property claims received is independent of the number of motor claims received.

6 (c) (i) Find the standard deviation of the variable that represents the total number of motor claims and property claims received in 1 day.

Give your answer to three significant figures. [2 marks]

6 (c) (ii) Find the probability that the company receives a total of more than 90 motor claims and property claims in 1 day.

Give your answer to three significant figures. [2 marks]

22

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[Turn over]

7 **A theatre has morning, afternoon and evening shows.**

On one particular day, the theatre asks all of its customers to state whether they enjoyed or did not enjoy the show.

The results are summarised in the table below.

	ENJOYED	NOT ENJOYED	TOTAL
MORNING SHOW	62	25	87
AFTERNOON SHOW	91	35	126
EVENING SHOW	172	115	287
TOTAL	325	175	500

[Turn over]

The theatre claims that there is no association between the show that a customer attends and whether they enjoyed the show.

7 (a) Investigate the theatre's claim, using a 2.5% level of significance. [8 marks]

[Turn over]

[Turn over]

7 (b) **By considering observed and expected frequencies, interpret in context the association between the show that a customer attends and whether they enjoyed the show.**
[2 marks]

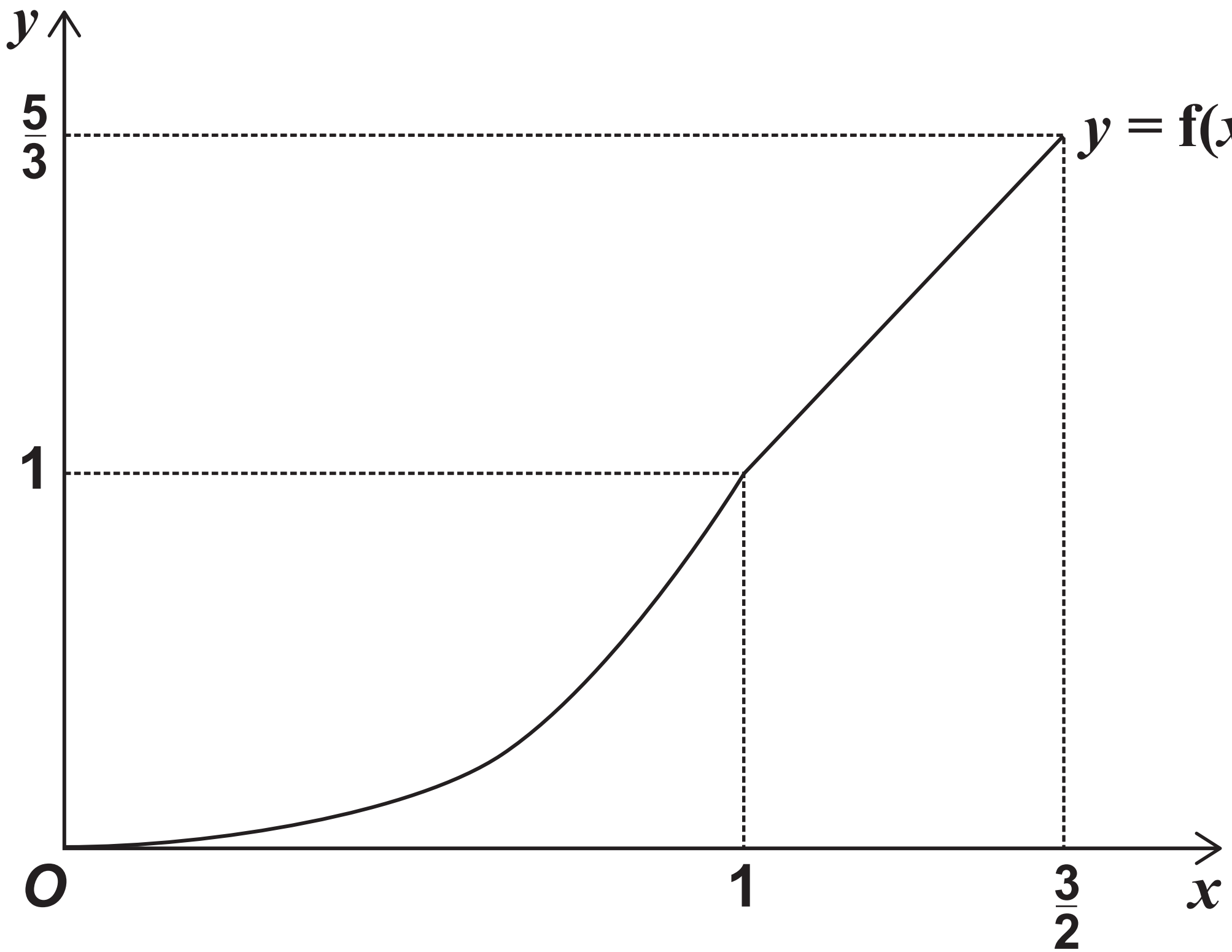
8 The continuous random variable X has probability density function $\mathrm{f}(x)$

It is given that $\mathrm{f}(x) = x^2$ for $0 \leq x \leq 1$

It is also given that $\mathrm{f}(x)$ is a linear function for $1 < x \leq \frac{3}{2}$

For all other values of x, $\mathrm{f}(x) = 0$

A sketch of the graph of $y = \mathrm{f}(x)$ is shown below.


y
5/3
1
y = f(x)
O
1
3/2
x

Show that Var(X) = 0.0864 correct to three significant figures. [8 marks]

[Turn over]

END OF QUESTIONS

Additional page, if required. Write the question numbers in the left-hand margin.

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For Examiner's Use	
Question	Mark
1	
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