Pearson Edexcel AS Further Mathematics 8FM0

FurStats 2 – 2 Continuous Distributions

Time allowed: 45 **minutes**

School: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	8	
2	12	
3	6	
4	9	
5	14	
6	9	
Total:	58	

How I can achieve better:

-
-
-

Last updated: February 3, 2026

1. The continuous random variable X has probability density function

$$\mathrm{f}(x) = \begin{cases} \frac{1}{8} & 1 \leq x \leq 9 \\ 0 & \text{otherwise} \end{cases}$$

(a) Write down the name given to this distribution. [1]

The continuous random variable $Y = 5 - 2X$.

(b) Find $\mathrm{P}(Y > 0)$. [2]

(c) Find $\mathrm{E}(Y)$. [2]

(d) Find $\mathrm{P}(Y < 0 \mid X < 7.5)$. [3]

Total: 8

(Q1 continued . . .)

2. Charlie and Diane are trying to model the continuous random variable X.

Charlie suggests modelling the cumulative distribution function of X with $\mathrm{F}_C(x)$ where

$$\mathrm{F}_C(x) = \begin{cases} 0 & x < 2 \\ \frac{1}{6}\left(9x - x^2 - 14\right) & 2 \leqslant x \leqslant 5 \\ 1 & x > 5 \end{cases}$$

(a) Explain what is wrong with Charlie's model. [2]

Diane suggests modelling the probability density function of X with $\mathrm{f}_D(x)$ where

$$\mathrm{f}_D(x) = \begin{cases} k\left(x^2 - 2x + \frac{2}{3}\right) & 2 \leqslant x \leqslant 5 \\ 0 & \text{otherwise} \end{cases}$$

where k is a constant.

(b) Find the value of k for Diane's model. [3]

(c) Sketch $\mathrm{f}_D(x)$ for Diane's model. [2]

(d) Use algebraic integration on Diane's model to find $\mathrm{E}(X)$. [3]

Diane is going to calculate the median of X.

(e) With reference to the shape of your sketch in part (c), state, giving a reason, whether or not she should expect the median of X to be smaller, equal to or greater than $\mathrm{E}(X)$. [2]

Total: 12

(Q2 continued . . .)

3. A piece of string AB is 7 m long. A point P on the string is chosen at random. The random variable X, representing the length AP, has a continuous uniform distribution over the interval $[0, 7]$. [6]

   A rectangle is formed with length AP and width BP.

   Find the expected area of the rectangle.

(Q3 continued . . .)

4. Lloyd regularly takes a break from work to go to the local cafe. The amount of time Lloyd waits to be served, in minutes, is modelled by the continuous random variable T, having probability density function

$$\mathrm{f}(t) = \begin{cases} \dfrac{t}{120} & 4 \leqslant t \leqslant 16 \\ 0 & \text{otherwise} \end{cases}$$

(a) Show that the cumulative distribution function is given by [2]

$$\mathrm{F}(t) = \begin{cases} 0 & t < 4 \\ \dfrac{t^2}{240} - c & 4 \leqslant t \leqslant 16 \\ 1 & t > 16 \end{cases}$$

where the value of c is to be found.

(b) Find the exact probability that the amount of time Lloyd waits to be served is between 5 and 10 minutes. [2]

(c) Find the median of T. [2]

(d) Find the value of k such that [3]

$$\mathrm{P}(T < k) = \frac{2}{3}\mathrm{P}(T > k)$$

giving your answer to 3 significant figures.

Total: 9

(Q4 continued . . .)

5. The continuous random variable X has cumulative distribution function

$$\mathrm{F}(x) = \begin{cases} 0 & x < 4 \\ px - k\sqrt{x} & 4 \leqslant x \leqslant 9 \\ 1 & x > 4 \end{cases}$$

where p and k are constants.

(a) Find the value of p and the value of k. [4]

Given that $\mathrm{E}(X) = \frac{119}{18}$.

(b) show that $\mathrm{Var}(X) = 2.05$ to 3 significant figures. [6]

(c) Write down the mode of X. [1]

(d) Find the exact value of the constant a such that $\mathrm{P}(X \leqslant a) = \frac{7}{27}$. [3]

Total: 14

(Q5 continued . . .)

6. The continuous random variable X has cumulative distribution function

$$\mathrm{F}(x) = \begin{cases} 0 & x < 3 \\ c - 4.5x^n & 3 \leq x \leq 9 \\ 1 & x > 9 \end{cases}$$

where c is a positive constant and n is an integer.

(a) Showing all stages of your working, find the value of c and the value of n. [7]

(b) Find the lower quartile of X. [2]

Total: 9

(Q6 continued . . .)