

QQQ – Further Statistics 2 – Chapter 3 – Continuous Distributions (Version 2)

Total Marks: 24

(24 = Platinum, 22 = Gold, 19 = Silver, 16 = Bronze)

1. A continuous random variable X has cumulative distribution function $F(x)$ given by

$$F(x) = \begin{cases} 0 & x < -1 \\ \frac{1}{5}(x+1)^2 & -1 \leq x \leq 0 \\ 1 - \frac{1}{20}(4-x)^2 & 0 < x \leq 4 \\ 1 & x > 4 \end{cases}$$

- (a) Find the probability density function, $f(x)$ (2)
- (b) (i) Sketch $f(x)$ (2)
- (ii) Hence describe the skewness of the distribution. (1)
- (c) Find, to 3 significant figures, the value of c such that

$$P(1 < X < c) = P(c < X < 2)$$

(3)

(Total 8 marks)

2. A continuous random variable X is uniformly distributed over the interval $[b, 4b]$ where b is a constant.

(a) Write down $E(X)$. **(1)**

(b) Use integration to show that $\text{Var}(X) = \frac{3b^2}{4}$. **(3)**

(c) Find $\text{Var}(3 - 2X)$. **(2)**

Given that $b = 1$ find

(d) the cumulative distribution function of X , $F(x)$, for all values of x , **(2)**

(e) the median of X . **(1)**

(Total 9 marks)

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3. A rectangle is to have an area of 40 cm^2

The length of the rectangle, L cm, follows a continuous uniform distribution over the interval $[4, 10]$

Find the expected value of the perimeter of the rectangle.

Use algebraic integration, rather than your calculator, to evaluate any definite integrals. **(7)**

(Total 7 marks)

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