

Name:
Marks:
/48

Calculator Free

1. [2, 2, 1, 2 = 7 marks]

(22 marks)

A continuous random variable X has the probability function f :

$$f(x) = \begin{cases} 0 & , x < 0 \\ h(10 - x) & , 0 \leq x \leq 10 \\ 0 & , x > 0 \end{cases}$$

a) Determine the constant h .

b) State the cumulative function $F(x)$ for the PDF $f(x)$.

Hence or otherwise, determine:

c) $P(X = 3)$

d) $P(X \geq 1)$

6. [2, 2, 1, 1 = 6 marks]

- a) A continuous random variable X has a mean of 12 and a standard deviation of 4.

Determine the expected value and standard deviation in each part below if X is transformed to the random variable Y by each of the following:

(i) $Y = 5X$

(ii) $Y = 5 - 2X$

- b) If $X \sim N(28, 7^2)$ determine the:
- (i) 31th percentile

(ii) 0.73 quantile

- b) Determine exactly $P(X < \frac{7}{4})$

- a) Show that the value of $A = \frac{1}{2}$.

$$f(x) = \begin{cases} A \sin(x) & , 0 \leq x \leq \pi \\ 0 & , \text{elsewhere} \end{cases}$$

In a certain PDF the distribution is defined by:

3. [2, 3 = 5 marks]

End of Part A



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Calculator Section

(26 marks)

4. [2, 2 = 4 marks]

Pierre spends X hours gaming during the day.

The probability distribution of X is given by:

$$f(x) = \begin{cases} 2(1-x) & , 0 \leq x \leq 1 \\ 0 & , elsewhere \end{cases}$$

a) Evaluate $E(X)$, the expected value of X , to the nearest minute.

b) Determine the variance of X .

5. [1, 1, 1, 2, 2, 2, 2 = 11 marks]

Main Roads Western Australia recently installed new radar devices in the Northbridge Tunnel on the Graham Farmer Freeway. During the first week of monitoring the average speed was determined to be 82 km/h with a standard deviation of 5.1 km/h.

- a) If vehicle speeds can be considered normally distributed, determine the probability that a randomly chosen vehicle was travelling:
- (i) less than 80 km/h
 - (ii) at 90 km/h
 - (iii) between 85 km/h and 90 km/h
 - (iv) faster than 90 km/h given the vehicle was travelling in excess of 85 km/h.
- b) The fastest 4% of vehicles were issued with speeding fines. Above what speed would you calculate a driver to be fined?
- c) Determine the probability that in a randomly chosen group of 12 cars
- (i) Exactly three drivers were fined
 - (ii) At least one driver was fined