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1. A manufacturer produces sweets of length L mm where L has a continuous uniform distribution with range $[15, 30]$.

- (a) Find the probability that a randomly selected sweet has a length greater than 24 mm. **(2)**

These sweets are randomly packed in bags of 20 sweets.

- (b) Find the probability that a randomly selected bag will contain at least 8 sweets with length greater than 24 mm. **(3)**

- (c) Find the probability that 2 randomly selected bags will both contain at least 8 sweets with length greater than 24 mm. **(2)**



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4. The number of houses sold by an estate agent follows a Poisson distribution, with a mean of 2 per week.

(a) Find the probability that in the next 4 weeks the estate agent sells,

- (i) exactly 3 houses,
- (ii) more than 5 houses.

(5)

The estate agent monitors sales in periods of 4 weeks.

(b) Find the probability that in the next twelve of these 4 week periods there are exactly nine periods in which more than 5 houses are sold.

(3)

The estate agent will receive a bonus if he sells more than 25 houses in the next 10 weeks.

(c) Use a suitable approximation to estimate the probability that the estate agent receives a bonus.

(6)



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7. The continuous random variable X has probability density function $f(x)$ given by

$$f(x) = \begin{cases} \frac{x^2}{45} & 0 \leq x \leq 3 \\ \frac{1}{5} & 3 < x < 4 \\ \frac{1}{3} - \frac{x}{30} & 4 \leq x \leq 10 \\ 0 & \text{otherwise} \end{cases} .$$

- (a) Sketch $f(x)$ for $0 \leq x \leq 10$ **(4)**
- (b) Find the cumulative distribution function $F(x)$ for all values of x . **(8)**
- (c) Find $P(X \leq 8)$. **(2)**



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8. In a large restaurant an average of 3 out of every 5 customers ask for water with their meal.

A random sample of 10 customers is selected.

- (a) Find the probability that
 - (i) exactly 6 ask for water with their meal,
 - (ii) less than 9 ask for water with their meal.

(5)

A second random sample of 50 customers is selected.

- (b) Find the smallest value of n such that

$$P(X < n) \geq 0.9$$

where the random variable X represents the number of these customers who ask for water.

(3)



