

Self-assessment answers: 18 Probability distributions

1. (a) $\sum P(X=x) = 1$

$$\Rightarrow 3p + \frac{7}{10} = 1$$

$$\Rightarrow p = \frac{1}{10}$$

(b) $P(X \geq 4) = \frac{7}{10}$

(c) $E(X) = \sum xP(X=x) = \left(\frac{1}{10} + \frac{3}{5} + \frac{4}{10} + \frac{12}{10} + \frac{14}{5} \right) = \frac{51}{10}$ [8 marks]

2. Let volume of coffee (ml) dispensed be V . Then $V \sim N(150, 25)$.

(a) $P(V < 142) = 0.0548$ (3SF) (from GDC)

(b) $P(V > a) = 0.2 \Rightarrow a = 154.2$ [5 marks]

3. (a) Probability of not rolling a six = $1 - 0.12 = 0.88$ Let X be the random variable 'number of sixes in 7 throws'

$$\therefore P(X=0) = 0.88^7 \approx 0.409$$
 [1 mark]

(b) $E(X) = 0.840$ (3SF) [3 marks]

(c) $\text{Var}(X) = 0.739$ (3SF) [3 marks]

(d) $P(X > 4) = P(X=5) + P(X=6) + P(X=7) \approx 4.23 \times 10^{-4}$ [2 marks]

4. (a) $\binom{6}{4} p^4 (1-p)^2 = 0.261$

$$\Rightarrow p = 0.529 \text{ or } 0.787 \text{ (GDC)}$$

(b) $P(X \leq 2 | p = 0.787) = 0.0213$

(c) $E(X) = np = 4.72$, $\text{Var}(X) = np(1-p) = 1.01$ [8 marks]