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) \[ \binom{6}{4} p^4(1-p)^2 = 0.261 \]
\[ \Rightarrow p = 0.529 \text{ or } 0.787 \] (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]