**Self-assessment answers: 18 Probability distributions**

**1.** (a) ∑ P(*X* = *x*) = 1

⇒ 3*p* +  = 1

⇒ *p* = 

(b) P(*X* ≥ 4) = 

(c) E(*X*) = ∑ *x*P(*X* = *x*) = *[8 marks]*

**2.** Let volume of coffee (ml) dispensed be *V*. Then *V* ~ N(150, 25).

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

(b) P(*V* > *a*) = 0.2 ⇒ *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’

∴ P(*X* = 0) = 0.887 ≈ 0.409 *[1 mark]*

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

(c) Var(*X*) = 0.739 (3SF) *[3 marks]*

(d) P(*X* > 4) = P(*X* = 5) + P(*X* = 6) + P(*X* = 7) ≈ 4.23 × 10−4 *[2 marks]*

**4.** (a) *p*4(1 – *p*)2 = 0.261

⇒ *p* = 0.529 or 0.787 (GDC)

(b) P(*X* ≤ 2|*p* = 0.787) = 0.0213

(c) E(*X*) = *np* = 4.72, Var(*X*) = *np*(1 – *p*) = 1.01*[8 marks]*