1 i) $X \sim B(8, 0.1)$ $P(X=1) = {}^8C_1 \times 0.1^1 \times 0.9^7$

$$= 0.3826$$

1 ii) $X \sim B(30, 0.1)$ $E(X) = 30 \times 0.1 = 3$

Approximate with $X \sim \text{Poisson}(3)$

A) $P(X=6) = \dfrac{e^{-3} \times 3^6}{6!} = 0.0504$

B) $P(X \geqslant 8) = 1 - P(X \leqslant 7)$

$$= 1 - 0.9881$$

$$= 0.0119$$

1 iii) n is large and p is small   B1 B1

Allow appropriate numerical ranges

1 iv) $X \sim B(120, 0.1)$ $E(X) = 120 \times 0.1 = 12$ (np)

$\text{Var}(X) = 120 \times 0.1 \times 0.9 = 10.8$

(npq)

Approximate with

$$X \sim N(\overset{\mu}{12}, \overset{\sigma^2}{\sqrt{10.8}^2})$$
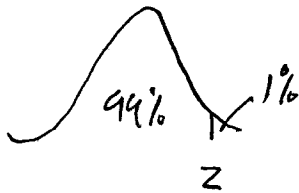
1 v)   Find $P(X > 15.5)$ $z = \dfrac{x - \mu}{\sigma}$

$$z = \dfrac{15.5 - 12}{\sqrt{10.8}} = 1.065$$

②

1v)
cont)

$$P(Z > 1.065) = 1 - P(Z < 1.065)$$

$$= 1 - 0.8566$$

$$= 0.1434$$

1vi)

$$z = \Phi^{-1} 0.99$$

$$z = 2.326$$

$$z = \frac{x - \mu}{\sigma}$$

$$x = z\sigma + \mu$$

$$x = 2.326 \times \sqrt{10.8} + 12$$

$$x = 19.64$$

So carry 20 breakfasts