

PART 1

$$p = 30\% = 0.3$$

$$q = 1 - 0.3 = 0.7$$

$$n = 6$$

$$(a) P(X=5) = \frac{n!}{(n-x)!x!} p^x q^{(n-x)}$$

$$= \frac{6!}{1! \times 5!} 0.3^5 0.7^1$$

$$= 0.010206$$

$$(b) P(X \geq 3) = P(X=3) + P(X=4) + P(X=5) + P(X=6)$$

$$\text{or} \\ 1 - (P(X=0) + P(X=1) + P(X=2))$$

$$P(X=0) = {}^6C_0 \times 0.3^0 \times 0.7^6 = 0.117649$$

$$P(X=1) = {}^6C_1 \times 0.3^1 \times 0.7^5 = 0.302526$$

$$P(X=2) = {}^6C_2 \times 0.3^2 \times 0.7^4 = 0.324135$$

$$P(X \geq 3) = 1 - (0.117649 + 0.302526 + 0.324135)$$

$$= 0.25569$$

$$\begin{aligned} \text{(c)} P(X \leq 2) &= P(X=0) + P(X=1) + P(X=2) \\ &= 0.117649 + 0.302526 + 0.324135 \\ &= 0.74431 \end{aligned}$$

$$\begin{aligned} \text{(d)} P(X \geq 1) &= 1 - P(X=0) \\ &= 1 - 0.117649 \\ &= 0.882351 \end{aligned}$$

(e) By advising them on different options/purchases they want to make.

$$\mu = \frac{7}{15} = 0.46667$$

$$P(X=10) = \frac{e^{-\mu} \mu^x}{x!} = \frac{e^{-0.46667} \cdot 0.46667^{10}}{10!}$$

$$\text{(a)} \mu = 7$$

$$\begin{aligned} P(X=10) &= \frac{e^{-\mu} \mu^x}{x!} = \frac{e^{-7} \cdot 7^{10}}{10!} \\ &= 0.071 \end{aligned}$$

$$\begin{aligned} \text{(b)} P(X \leq 10) &= \frac{e^{-7} \cdot 7^0}{0!} + \frac{e^{-7} \cdot 7^1}{1!} + \frac{e^{-7} \cdot 7^2}{2!} + \frac{e^{-7} \cdot 7^3}{3!} + \frac{e^{-7} \cdot 7^4}{4!} \\ &\quad + \frac{e^{-7} \cdot 7^5}{5!} + \frac{e^{-7} \cdot 7^6}{6!} + \frac{e^{-7} \cdot 7^7}{7!} + \frac{e^{-7} \cdot 7^8}{8!} + \frac{e^{-7} \cdot 7^9}{9!} \\ &\quad + \frac{e^{-7} \cdot 7^{10}}{10!} \\ &= 0.9015 \end{aligned}$$

c) Yes. The service is prompt. The rate of service is 10 customers per minute.

$$\mu = 4648$$

$$\sigma = 400$$

$$(a) P(X < 4000) = \frac{X - \mu}{\sigma} = \frac{4000 - 4648}{400} = -1.62$$

$$P(Z < -1.62) = 0.0526$$

$$(b) P(4200 < X < 4800)$$

$$= P\left(\frac{4200 - 4648}{400} < Z < \frac{4800 - 4648}{400}\right)$$

$$= P(-1.12 < Z < 0.38)$$

$$= 0.648 - 0.1314$$

$$= 0.5166$$

$$(c) P(X > 5100) = \frac{5100 - 4648}{400} = 1.13$$

$$P(Z > 1.13) = 0.1292$$

$$(d) -1.28 = \frac{X - 4648}{400}$$

$$X = 4136$$

$$= \$4136$$