

Assignment 2

Ref:

Date:

1. (a) Riped = 90% , Unripped = 10% , $n = 18$, $r = 18$

$${}^n C_r p^r (1-p)^{n-r}$$

$${}^{18} C_{18} 0.9^{18} (1-0.9)^{18-18}$$

$$= 0.15$$

(b) Maintenance 1 day = 0.2 per van , total = 20

$$\begin{aligned} \text{i) } u_x &= np \\ &= 20(0.2) \\ &= 4 \end{aligned}$$

$$\begin{aligned} \text{ii) } \sigma^2_x &= np(1-p) \\ &= 20(0.2)(1-0.2) \\ &= 3.2 \end{aligned}$$

(c) Hit = 0.95 , Not hit = 0.05 , miss first in any 15th

$$P(x) = (1-p)^{x-1} (p)$$

$$P(x=15) = (1-0.05)^{15-1} (0.05)$$

$$= 0.0024$$

$$2. (a) \quad p(x=50) = \frac{580}{4434}$$

$$= 0.13$$

$$(b) \quad p(x < 50) = \frac{300 + 150 + 60}{4434}$$

$$= 0.115$$

$$(c) \quad p(40 \leq x \leq 69) = \frac{300 + 580 + 678}{4434}$$

$$= 0.35$$

$$(d) \quad p(x \geq 70) = \frac{1288 + 1378}{4434}$$

$$= 0.6$$

3. Plain water = $\frac{3}{5}$, No plain water = $\frac{2}{5}$, $n=10$, $p=0.6$, $q=0.4$
= 0.6 = 0.4

$$(a) P(x=6) = {}^{10}C_6 (0.6)^6 (1-0.6)^{10-6}$$

$$= 0.2508$$

$$(b) P(x < 9) = 1 - P(x=10)$$

$$= 1 - {}^{10}C_{10} (0.6)^{10} (0.4)^{10-10}$$

$$= 1 - 0.00605$$

$$= 0.994$$

$$(c) P(x=4) = (1-p)^{x-1} (p)$$

$$= (1-0.6)^{4-1} (0.6)$$

$$= 0.0384$$

4. (a) $\mu = 25$, $\sigma = 6$

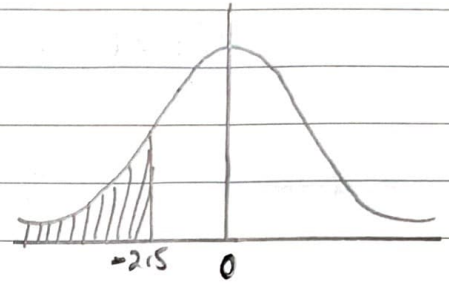
i) $P(X < 10) = P(Z < (10 - 25)/6)$

$$= P(Z < -2.5)$$

$$= 1 - P(Z < 2.5)$$

$$= 1 - 0.99379$$

$$= 0.00621$$



$$\Rightarrow \text{Percentage} = 0.00621 \times 100\% = 0.621\%$$

ii) $P(16 < X < 31) = P((16 - 25)/6 < Z < (31 - 25)/6)$

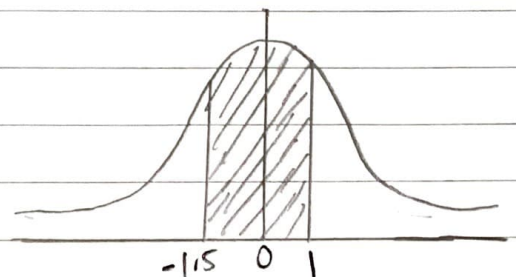
$$= P(-1.5 < Z < 1)$$

$$= P(Z < 1) - [1 - P(Z < -1.5)]$$

$$= 0.84134 - [1 - 0.93319]$$

$$= 0.77453$$

$$\Rightarrow \text{Percentage} = 0.77453 \times 100\% = 77.45\%$$



$$\text{iii) } P(X > k) = 0.33$$

$$P(Z > (k-25)/6) = 0.33$$

$$1 - P(Z > (k-25)/6) = 0.33$$

$$P(Z > (k-25)/6) = 0.67$$

$$\frac{k-25}{6} = 0.67$$

$$\frac{k-25}{6} = 0.44$$

$$k = 27.64$$

(b) i)

$$f(x) = \begin{cases} 1/5, & 14 < x < 20 \\ 0, & \text{otherwise} \end{cases}$$

$$\text{ii) } P(X > 15) = 5 \times 1/5$$

$$= 1.0$$

5. (a) X is a binomial random variable

$$\begin{aligned} b) P(X=4) &= {}^{12}C_4 (0.6)^4 (0.4)^{12-4} \\ &= 0.042 \end{aligned}$$

$$\begin{aligned} c) P(4 \leq X \leq 7) &= 0.042 + [{}^{12}C_5 (0.6)^5 (0.4)^{12-5}] + [{}^{12}C_6 (0.6)^6 (0.4)^{12-6}] \\ &\quad + [{}^{12}C_7 (0.6)^7 (0.4)^{12-7}] \\ &= 0.55 \end{aligned}$$

$$\begin{aligned} d) P(X=2) &= {}^{12}C_2 (0.4)^2 (0.6)^{12-2} \\ &= 0.064 \end{aligned}$$

(b) a) X = accounts with error.

$$\begin{aligned} b) P(X=6) &= (1-0.03)^{6-1} (0.03) \\ &= 0.026 \end{aligned}$$

$$\begin{aligned} c) P(X \leq 5) &= P(X=1) + P(X=2) + P(X=3) + P(X=4) + P(X=5) \\ &= [(1-0.03)^{1-1} (0.03)] + [(1-0.03)^{2-1} (0.03)] + [(1-0.03)^{3-1} (0.03)] \\ &\quad + [(1-0.03)^{4-1} (0.03)] + [(1-0.03)^{5-1} (0.03)] \\ &= 0.1131 \end{aligned}$$

$$6. \mu = 20, \sigma = 2$$

$$(a) P(X > 24) = P\left(Z > \frac{24-20}{2}\right)$$

$$= P(Z > 2)$$

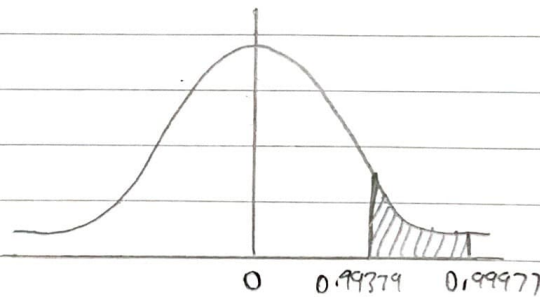
$$= 0.97725$$

$$(b) P(25 \leq X \leq 27) = P\left(\frac{25-20}{2} \leq Z \leq \frac{27-20}{2}\right)$$

$$= P(2.5 \leq Z \leq 3.5)$$

$$0.99379$$

$$0.99977$$



$$P(25 \leq X \leq 27) = 0.99977 - 0.99379$$

$$= 0.00598$$