

## Assignment -2

D) mean = 
$$\frac{6+7+5+7+7+8+7+6+9+7+4+10+6+8+8+9+5+6+4+8}{20}$$

= 
$$\boxed{6.85}$$

median  

$$4\ 4\ 5\ 5\ 6\ 6\ 6\ 6.7\ 7\ 7\ 7\ 7\ 8\ 8\ 8\ 8\ 9\ 9\ 10$$

= 
$$\boxed{7}$$

mode = 
$$\boxed{7}$$

standard deviation

$$\sigma = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}}$$

$$\begin{aligned} &= (4-6.85)^2 + (4-6.85) + (5-6.85) + (5-6.85)^2 + (6-6.85)^2 + (6-6.85)^2 \\ &\quad + (6-6.85)^2 + (6-6.85)^2 + (7-6.85)^2 + (7-6.85)^2 + (7-6.85)^2 \\ &\quad + (7-6.85)^2 + (8-6.85)^2 + (8-6.85)^2 + (8-6.85)^2 + (8-6.85)^2 \\ &\quad + (9-6.85)^2 + (9-6.85)^2 + (10-6.85)^2 \end{aligned}$$

$\overline{20}$

$$\begin{aligned} &= 8.42 + 8.42 + 3.4 + 3.4 + 0.7 + 0.7 + 0.7 + 0.7 + \\ &\quad 0.02 + 0.02 + 0.02 + 0.02 + 1.32 + 1.32 + 1.32 + 1.32 \\ &\quad + 4.62 + 4.62 + 9.92 \\ &= \sqrt{2.519} = \boxed{1.58} \end{aligned}$$

$$\textcircled{2} \quad \underline{\text{Mean}} = \boxed{107.51}$$

Median =

28 40 68 70 75 75 75 75 80 86 89 90 90 100 100 100  
 104 104 109 120 120 120 122 123 123 130 140 145  
 174 194 217

$$= \boxed{\cancel{104}} \quad \boxed{104}$$

Mode:

$$= \boxed{75}$$

Std. deviation

$$\sigma = \boxed{38.77}$$

$$\begin{aligned}\textcircled{3} \quad n &= 6 \\ x &= 2 \\ p &= 0.3\end{aligned}$$

$$\begin{aligned}& \frac{n!}{x!(n-x)!} p^x (1-p)^{n-x} \\&= \frac{6!}{2!(6-2)!} (0.3)^2 (0.7)^4 \\&= \frac{36 \times 5 \times 4 \times 3 \times 2 \times 1}{2 \times 1 \times 4 \times 3 \times 2 \times 1} (0.3)^2 (0.7)^4 \\&= 15 \times 0.09 \times 0.24 \\&= 0.324\end{aligned}$$

$$\begin{aligned}\text{mean} &= n \times p \\ &= 6 \times 0.3 \\ &= \boxed{1.8}\end{aligned}$$

$$\begin{aligned}\text{std. deviation} &= \sqrt{n \times p \times (1-p)} \\ &= \sqrt{6 \times 0.3 \times 0.7} \\ &= \sqrt{1.26} = \boxed{1.12}\end{aligned}$$

$$\begin{aligned} p &= 0.75 \\ q &= 0.25 \\ x &= 5 \\ n &= 8 \end{aligned}$$

$$\begin{aligned} &\frac{n!}{x!(n-x)!} p^x q^{n-x} \\ &= \frac{8!}{5!(3)!} (0.75)^5 (0.25)^3 \\ &= \frac{48 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{5 \times 4 \times 3 \times 2 \times 1 \times 3 \times 2 \times 1} (0.75)^5 (0.25)^3 \\ &= 0.207 \end{aligned}$$

0.015

$$\begin{aligned} p &= 0.45 \\ q &= 0.55 \\ x &= 5 \\ n &= 12 \end{aligned}$$

$$\begin{aligned} &\frac{n!}{x!(n-x)!} p^x q^{n-x} \\ &= \frac{12!}{5!(7)!} (0.45)^5 (0.55)^7 \\ &= \frac{12 \times 11 \times 10 \times 9 \times 8 \times 7}{8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1} (0.45)^5 (0.55)^7 \\ &= 0.222 \end{aligned}$$

$$\begin{aligned} p &= 0.75 \\ q &= 0.25 \\ x &= 4 \\ n &= 8 \end{aligned}$$

$$\begin{aligned} &\frac{n!}{x!(n-x)!} p^x q^{n-x} \\ &= \frac{8!}{4!(4)!} (0.75)^4 (0.25)^4 \\ &= \frac{28 \times 7 \times 6 \times 5}{4 \times 3 \times 2 \times 1} (0.75)^4 (0.25)^4 \\ &= 0.086 \end{aligned}$$

$$\begin{aligned} p &= 0.45 \\ q &= 0.55 \\ x &= 4 \\ n &= 12 \end{aligned}$$

$$\begin{aligned} &\frac{n!}{x!(n-x)!} p^x q^{n-x} \\ &= \frac{12!}{4!(8)!} (0.45)^4 (0.55)^8 \\ &= \frac{12 \times 11 \times 10 \times 9}{4 \times 3 \times 2 \times 1} (0.45)^4 (0.55)^8 \\ &= 0.16 \end{aligned}$$

0.074

$$p = 0.75$$

$$q = 0.25$$

$$n = 6$$

$$n = 8$$

$$\begin{aligned} & \frac{n!}{x!(n-x)!} p^x q^{n-x} \\ & \frac{8!}{6!(2)!} (0.75)^6 (0.25)^2 \\ & = \frac{48 \times 7}{2} (0.75)^6 (0.25)^2 \\ & = 0.311 \end{aligned}$$

a. 0.044

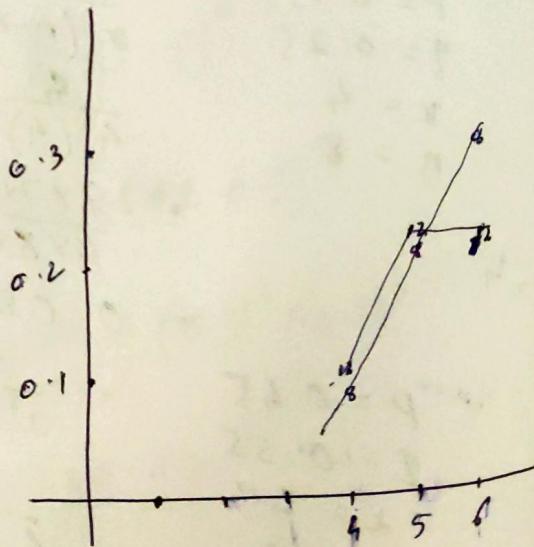
$$p = 0.45$$

$$q = 0.55$$

$$n = 6$$

$$n = 12$$

$$\begin{aligned} & \frac{n!}{x!(n-x)!} p^x q^{n-x} \\ & \frac{12!}{6!(6)!} p (0.45)^6 (0.55)^6 \\ & \frac{12 \times 11 \times 10 \times 9 \times 8 \times 7}{6 \times 5 \times 4 \times 3 \times 2 \times 1} (0.45)^6 (0.55)^6 \\ & = 0.212 \end{aligned}$$



$$1 \text{ hour} = 60 \text{ min}$$

72 customers/hour

$$6.72/60 = 6/5 = 1.2$$

$$1 \text{ min} = 1.2$$

$$\begin{aligned} 4 \text{ min} &= 1.2 \times 4 \\ &= 4.8 \end{aligned} \quad \mu = 4.8$$

② 5 customers

$$\frac{e^{-\mu} \mu^x}{x!} = \frac{e^{-4.8} (4.8)^5}{5!} = \frac{61.83}{5 \times 4 \times 3 \times 2 \times 1} = \frac{61.83}{120}$$

$$= \boxed{0.515}$$

(i) not more than 3 customers

$$\begin{aligned} P(0) + P(1) + P(2) + P(3) \\ = \frac{e^{-4.8} (4.8)^0}{0!} + \frac{e^{-4.8} (4.8)^1}{1!} + \frac{e^{-4.8} (4.8)^2}{2!} + \frac{e^{-4.8} (4.8)^3}{3!} \\ = \frac{0.024 \times 1}{1} + \frac{0.024 \times 4.8}{1} + \frac{0.024 \times 23.04}{2} + \frac{0.024 \times 110.59}{6} \\ = 0.024 + 0.1152 + 0.276 + 0.442 \\ = \boxed{0.857} \end{aligned}$$

(ii) more than 3 customers

$$1 - [P(0) + P(1) + P(2) + P(3)]$$

$$1 - 0.857$$

$$= \boxed{0.143}$$

(8)

$$\begin{aligned}
 77 \text{ words} &= 1 \text{ min} & 4620 &\quad 6 \\
 6 \text{ errors} &= 60 \text{ min} & &\quad 2 \\
 4620 \text{ words} &= 60 \text{ min} & = 1530
 \end{aligned}$$

$$455 \text{ words} = \frac{455}{77}$$

$$\mu = 5.909 \text{ min}$$

$$\begin{aligned}
 p(2) &= \frac{e^{-5.909}}{2!} \frac{5.909^2}{2} = \\
 &= (2.72)^{-5.909} \times (5.909)^2
 \end{aligned}$$

$$\begin{aligned}
 &= \frac{0.0027 \times 34.91}{2} = \frac{0.094}{2}
 \end{aligned}$$

$$p(2) = \boxed{\underline{0.047}}$$

$$\textcircled{1} \quad P(z > 1.26) = 0.8962$$

$$= 1 - 0.8962$$

$$= 0.1038$$

$$= 10.38\%$$

$$P(z < -0.86) = 0.1949$$

$$= 19.49\%$$

$$P(z > -1.37) = \cancel{0.8533}$$

$$= 85.33\%$$

$$P(-1.25 < z < 0.37) = 0.3944 + 0.1443$$

$$= 0.5387$$

$$= 53.87\%$$

$$P(z > 1.26) = 0.10565$$

$$= 0.89435$$

$$= 89.43\%$$

$$P(z < 0.37) = \cancel{0.35569}$$

$$= 0.64431$$

$$= 64.43\%$$

$$= 89.43 - 85.56$$

$$= 53.87\%$$

(b)

~~Sketch~~

$$P(Z > 2) = 0.05$$

$$= \boxed{2.57}$$

(c)

$$P(-z < Z < z) = 0.99$$

$$= \boxed{3.9}$$

(ii)

$$\mu = 10$$

Normal distribution

$$\sigma^2 = 4$$

$$\sigma = 2$$

$$P(Z > 13)$$

$$= \frac{Z - \mu}{\sigma} = \frac{13 - 10}{2} = \frac{3}{2}$$

$$= 1.5$$

$$= 0.4332$$

$$= 0.5 - 0.4332$$

$$= \boxed{0.0668} = \boxed{0.0668}$$

$$= 0.0668$$

$$P(9 < Z < 11)$$

$$\frac{X - \mu}{\sigma} < X < \frac{X - \mu}{\sigma}$$

$$\frac{9 - 10}{2} < X < \frac{11 - 10}{2}$$

$$P(-0.5 < X < 0.5)$$

$$P(Z < 0.5) = 0.6915$$

$$= 1 - 0.6915 = 0.3085$$

$$= \boxed{0.383}$$