

Assignment - 2

① 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

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \mu)^2}{n}}$$

$$= \frac{(4-6.85)^2 + (4-6.85)^2 + (5-6.85)^2 + (5-6.85)^2 + (6-6.85)^2 + (6-6.85)^2 + (7-6.85)^2 + (7-6.85)^2 + (7-6.85)^2 + (7-6.85)^2 + (8-6.85)^2 + (8-6.85)^2 + (8-6.85)^2 + (8-6.85)^2 + (9-6.85)^2 + (9-6.85)^2 + (10-6.85)^2}{20}$$

$$= 8.12 + 8.12 + 3.4 + 3.4 + 0.7 + 0.7 + 0.7 + 0.7 + 0.02 + 0.02 + 0.02 + 0.02 + 1.32 + 1.32 + 1.32 + 1.32 + 4.62 + 4.62 + 9.92$$

$$= \sqrt{2.519} = \boxed{1.58}$$

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

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

$$= \cancel{75} \quad \boxed{104}$$

Mode:

$$= \boxed{75}$$

Std. deviation

$$s = \boxed{38.77}$$

$$\textcircled{3} \quad n = 6$$

$$x = 2$$

$$p = 0.3$$

$$\frac{n!}{x!(n-x)!} p^x (1-p)^{n-x}$$

$$= \frac{6!}{2!(6-2)!} (0.3)^2 (1-0.3)^4$$

$$= \frac{3 \times 5 \times 4 \times 3 \times 2 \times 1}{2 \times 1} \frac{(0.3)^2 (0.7)^4}{4 \times 3 \times 2 \times 1}$$

$$= 15 \times 0.09 \times 0.24$$

$$= 0.324$$

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

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

⑥

$$p = 0.75$$

$$q = 0.25$$

$$x = 5$$

$$n = 8$$

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

0.015

$$p = 0.45$$

$$q = 0.55$$

$$x = 5$$

$$n = 12$$

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

$$p = 0.75$$

$$q = 0.25$$

$$x = 4$$

$$n = 8$$

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

$$p = 0.45$$

$$q = 0.55$$

$$x = 4$$

$$n = 12$$

$$\begin{aligned} & \frac{n!}{x!(n-x)!} p^x q^{n-x} \\ &= \frac{12!}{4!(8)!} (0.45)^4 (0.55)^8 \\ &= \frac{12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{4 \times 3 \times 2 \times 1 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1} (0.45)^4 (0.55)^8 \\ &= 0.16 \end{aligned}$$

0.074

$$p = 0.75$$

$$q = 0.25$$

$$x = 6$$

$$n = 8$$

$$\frac{n!}{x!(n-x)!} p^x q^{n-x}$$

$$\frac{8!}{6!(2)!} (0.75)^6 (0.25)^2$$

$$= \frac{48 \times 7}{2} (0.75)^6 (0.25)^2$$

$$= 0.311$$

→ 0.311

$$p = 0.45$$

$$q = 0.55$$

$$x = 6$$

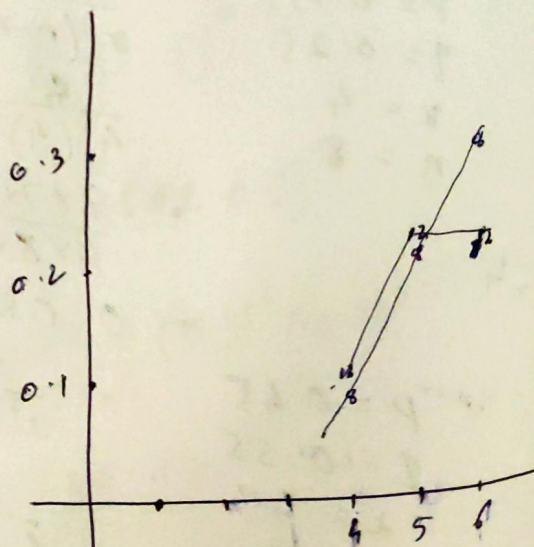
$$n = 12$$

$$\frac{n!}{x!(n-x)!} p^x q^{n-x}$$

$$\frac{12!}{6!(6)!} (0.45)^6 (0.55)^6$$

$$\frac{12 \times 11 \times 10 \times 9 \times 8 \times 7}{6 \times 5 \times 4 \times 3 \times 2 \times 1} (0.45)^6 (0.55)^6$$

$$= 0.212$$



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

72 customers / hour

$$672/60 = 6/5 = 1.2$$

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

$$4 \text{ min} = 1.2 \times 4 = 4.8$$

$$\mu = 4.8$$

(a) 5 customers

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

$$= \boxed{0.515}$$

(b) not more than 3 customers

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

(c) more than 3 customers

$$\begin{aligned} & 1 - [P(0) + P(1) + P(2) + P(3)] \\ &= 1 - 0.857 \\ &= \boxed{0.143} \end{aligned}$$

⑧

$$77 \text{ words} = 1 \text{ min}$$

$$6 \text{ errors} = 60 \text{ min}$$

$$4620 \text{ words} = 60 \text{ min}$$

$$4620 \cdot 6$$

$$2$$

$$= 1530$$

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

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

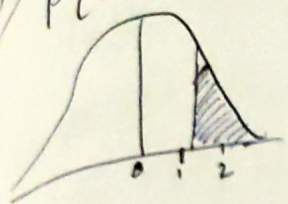
$$x = 2$$
$$p(2) = \frac{e^{-5.909} \cdot 5.909^2}{2!} =$$

$$= \frac{(2.72)^{-5.909} \times (5.909)^2}{2}$$

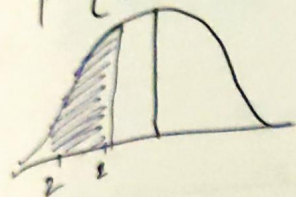
$$= \frac{0.0027 \times 34.91}{2} = \frac{0.094}{2}$$

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

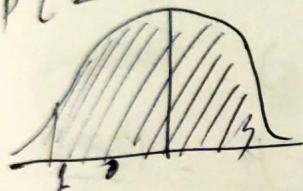
$$\begin{aligned}
 P(Z > 1.26) &= 0.8962 \\
 &= 1 - 0.8962 \\
 &= 0.1038 \\
 &= \boxed{10.38\%}
 \end{aligned}$$



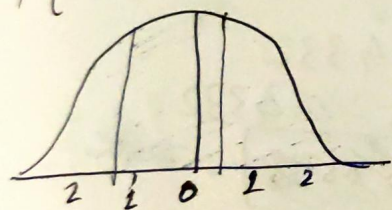
$$\begin{aligned}
 P(Z < -0.86) &= 0.1949 \\
 &= \boxed{19.49\%}
 \end{aligned}$$



$$\begin{aligned}
 P(Z > -1.37) &= \cancel{1} 0.8534 \\
 &= \boxed{85.34\%}
 \end{aligned}$$



$$\begin{aligned}
 P(-1.25 < Z < 0.37) &= 0.3944 + 0.1443 \\
 &= 0.5387 \\
 &= \boxed{53.87\%}
 \end{aligned}$$



$$\begin{aligned}
 P(Z > -1.25) &= 1 - 0.10565 \\
 &= 0.89435 \\
 &= \boxed{89.43\%}
 \end{aligned}$$

$$\begin{aligned}
 P(Z < 0.37) &= \cancel{0.35569} \\
 &= 0.64431 \\
 &= \boxed{64.43\%}
 \end{aligned}$$

$$\begin{aligned}
 &89.43 - 35.57 \\
 &= \boxed{53.87\%}
 \end{aligned}$$

⑤

~~2.57~~

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

$$= \boxed{2.57}$$

⑥

$$P(-2 < Z < 2) = 0.99$$

$$= \boxed{3.9}$$

⑪

$$\mu = 10$$

$$\sigma^2 = 4$$

$$\sigma = 2$$

Normal distribution

$$P(Z > 13)$$

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

$$= 1.5$$

$$= 0.4332$$

$$= 0.5 - 0.4332$$

$$= \boxed{0.0668}$$

$$= 0.0668$$

$$P(9 < X < 11)$$

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

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

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

$$P(Z < 0.5)$$

$$0.6915$$

$$= 0.6915 - 0.3085$$

$$= \boxed{0.383}$$