Assignment 2

Ham Jing Yi A19EC0048
Khor Yong Xin A19EC0061

1a). $p = 0.90$ = pineapples shipped out are ripe and ready to eat.

$n = 18$, $q = 1.0 - 0.9 = 0.1$

$P(X=18) = {}^{18}C_{18}(0.90)^{18}(0.10)^{0}$

$= 0.15$

b). $n = 20$

$p = 0.2$ = maintenance

Y = number of vans require maintenance on a given day.

i) mean for $Y = np$

$= (20)(0.2)$

$= 4$

ii) Variance for $Y = npq$

$= np(1-p)$

$= 20(0.2)(1-0.2)$

$= 3.2$

c). $X = 15$, $p = 1 - 0.95 = 0.05$ (miss the target)

$p(15) = (1-0.05)^{15-1}(0.05)$

$= 0.95^{14}(0.05)$

$= 0.0244$

2a) P(in the age of 50's) = P(age of 50–59)

$= \dfrac{580}{60+150+300+580+678+1288+1378}$

$= \dfrac{580}{4434}$

$= 0.1308$

b). P(less than 50 years old) $= \dfrac{60+150+300}{4434}$

$= \dfrac{510}{4434}$

$= 0.1150$

c). P(40–69, inclusive) $= \dfrac{300+580+678}{4434}$

$= \dfrac{1558}{4434}$

$= 0.3514$

d). P(at least 70 years old) $= P(\geq 70$ years old$)$

$= \dfrac{1288+1378}{4434}$

$= \dfrac{2666}{4434}$

$= 0.6013$

3) $p = \frac{3}{5}$ (ask for plain water with their meal)

$n = 10$, $q = 1 - \frac{3}{5} = \frac{2}{5}$

X = number of customers that asks for plain water.

a) $P(X=6) = {}^{10}C_6 \left(\frac{3}{5}\right)^6 \left(\frac{2}{5}\right)^4$

$= 0.2508$

b) $P(X<9) = P(X=0) + P(X=1) + \ldots\ldots + P(X=8)$

$= 1 - P(X=9) - P(X=10)$

$= 1 - \left({}^{10}C_9 \left(\frac{3}{5}\right)^9 \left(\frac{2}{5}\right)^1 + {}^{10}C_{10} \left(\frac{3}{5}\right)^{10} \left(\frac{2}{5}\right)^0\right)$

$= 1 - 0.0463574$

$= 0.9536$

c). $X = 4$

$P(4) = (1 - \frac{3}{5})^{4-1} (\frac{3}{5})$

$= \left(\frac{2}{5}\right)^3 \left(\frac{3}{5}\right)$

$= 0.0384$

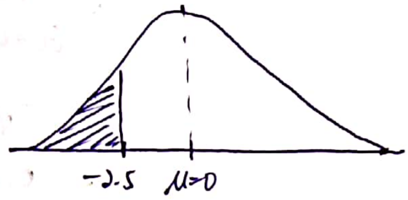
4). $X \sim N(25, 6)$

ai). $P(X<10) = P(Z < \frac{X-\mu}{\sigma})$

$= P(Z < \frac{10-25}{6})$

$= P(Z < -2.5)$

$= 0.0062$



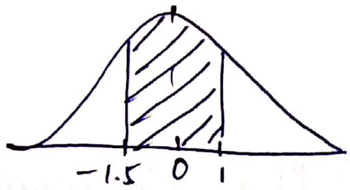
ii) $P(16 < X < 31) = P\left(\frac{16-25}{6} < Z < \frac{31-25}{6}\right)$

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

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

$= 0.8413 - 0.0668$

$= 0.7745$



iii) $P(z = ?) = 0.33$

$a - 0.5 = 0.33$

$a = 0.83$

$Z = \frac{X-\mu}{\sigma}$

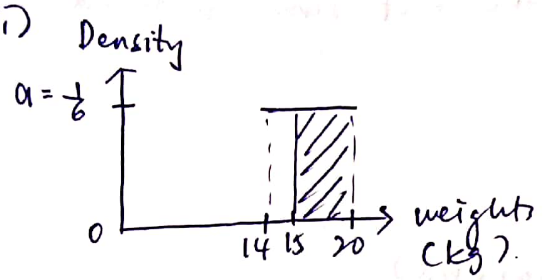
$0.95 = \frac{x-25}{6}$

$x = 30.7$

4 b) i) $f(x) = \begin{cases} \frac{1}{6} & , 14 \le x \le 20 \\ 0 & , \text{otherwise.} \end{cases}$

General: $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$

ii)



$(20-14)(a) = 1$

$a = \frac{1}{6}$ (Density)

P(package weights at least 15 pounds)

$= (20-15)(\frac{1}{6})$

$= \frac{5}{6}$

5) $p = 0.60$ (laptops)

$q = 0.40$ (desktop)

$n = 12$

X = number of laptops purchased among these 12 customers.

a) a). X is a binomial random variable.

b). $P(X=4) = {}^{12}C_4 (0.60)^4 (0.40)^8$

$= 0.042$

c). $P(4 \le X \le 7) = P(X=4) + P(X=5) + P(X=6) + P(X=7)$

$= {}^{12}C_4(0.60)^4(0.40)^8 + {}^{12}C_5(0.60)^5(0.40)^7 + {}^{12}C_6(0.60)^6(0.40)^6$

$+ {}^{12}C_7 (0.60)^7 (0.40)^5$

$= 0.54655$

$= 0.5466$

d). X = number of desktops purchased among these 12 customers. X is a geometric random variable.

$p = 0.40$ (desktop)

$q = 0.60$ (laptops)

$n = 12$

$P(X=2) = {}^{12}C_2 (0.40)^2 (0.60)^{10}$

$= 0.06385$

$= 0.0639$

5 b) $p = 0.03$

a) It is geometric distribution.

X = number of accounts until the first error is found.

b). $P(5) = (1-0.03)^{5-1}(0.03)$

$= 0.97^4(0.03)$

$= 0.0266$

c). $P(X<=5) = P(1)+P(2)+P(3)+P(4)+P(5)$

$= (1-0.03)^{1-1}(0.03) + (1-0.03)^{2-1}(0.03) + (1-0.03)^{3-1}(0.03) + (1-0.03)^{4-1}(0.03) + (1-0.03)^{5-1}(0.03)$

$= 0.1413$

6) $X \sim N(20, 2)$

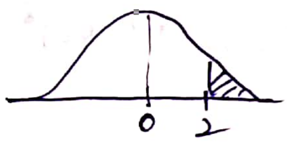
a) $P(X \geqslant 24) = P(Z \geqslant \frac{24-20}{2})$

$= P(Z \geqslant 2)$

$= 1 - P(Z<2)$

$= 1 - 0.9772$

$= 0.0228$



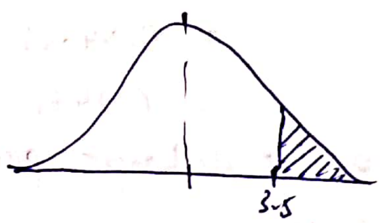
b). $P(X \geqslant 27) = P(Z \geqslant \frac{27-20}{2})$

$= P(Z \geqslant 3.5)$

$= 1 - P(Z<3.5)$

$= 1 - 0.99977$

$= 0.00023$



Scanned with CamScanner