1)

a)

The mean of type 1 is 370.8
median of type 1 is 371.

The mean of type 2 is 371.
median of type 2 is 371.

The mean of type 3 is 371.
median of type 3 is 371.

By, looking at data all looks the almost the same.

1)

b) The variance of type1 is 207.60 & SD is 14.41

The variance of type 2 is 141.43 & SD is 11.89

The variance of type 3 is 111.14 & SD is 10.54

There is difference of 100 between type 1 & 3 and of 4 with SD of type 1 & 3.

1)

c)

Type 1: $Q_1 = 358$, $Q_2 = 371$,

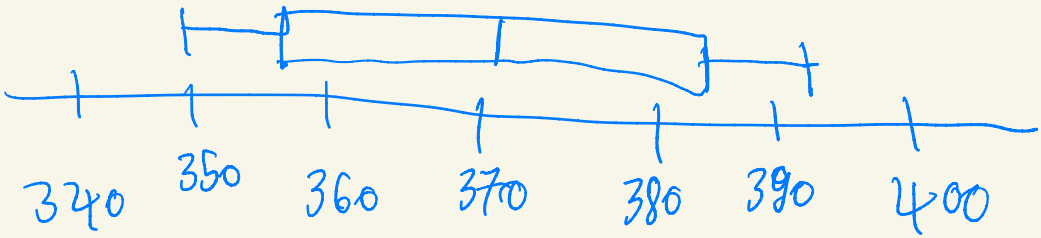
$Q_3 = 384$, $\min = 350$

$\max = 392$, $IQR = 26$

$Q_1 - 1.5\ IQR = 319$

$Q_3 + 1.5\ IQR = 423$

$[319, 423]$



type 2: $Q_1 = 363$, $Q_2 = 371$, $Q_3 = 380$

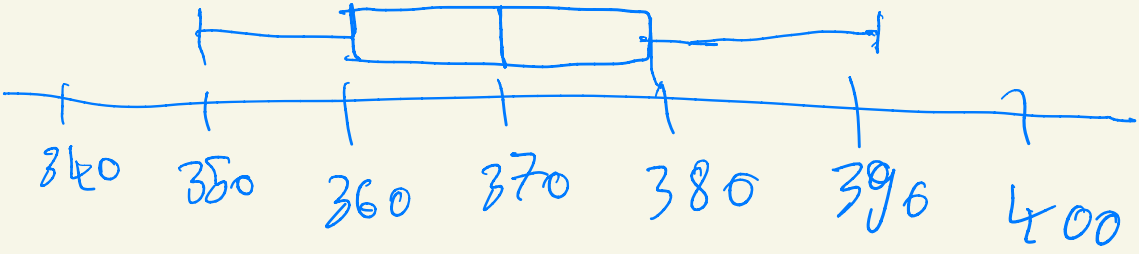
Min $= 350$, Max $= 392$,

$IQR = 17$

$Q_1 - 1.5IQR = 337.5$

$Q_3 + 1.5IQR = 405.5$

$[337.5, 405.5]$



type 3: $Q_1 = 364$, $Q_2 = 371$

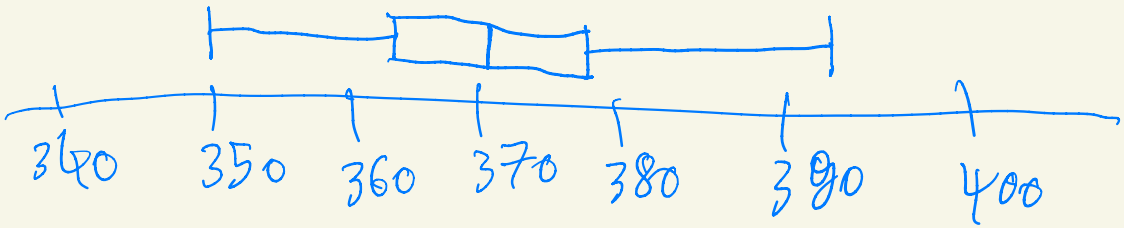
$Q_3 = 379$, $\min = 350$

$\max = 392$, $IQR = 15$

$Q_1 - 1.5\,IQR = 341.5$

$Q_3 + 1.5\,IQR = 401.5$

$[341.5, 401.5]$



2)

a)

$$P(I \cup C) = P(I) + P(C) - P(I \cap C)$$

$$= 60 + 80 - 50$$

$$= 90\%$$

b)

$$\text{Internet} = P(I) - P(I \cap T)$$

$$= 60 - 50$$

$$= 10\%$$

Cable = P(C) − P(I ∩ C)

= 80 − 50

= 30%

So the total of exactly one service will be ~~Internet~~ + Cable = 40%.

3)

a)

$$P(A_1 \cap A_2) = P(A_1) + P(A_2) - P(A_1 \cup A_2)$$

$$= 0.55 + 0.65 - 0.80$$

$$\boxed{= 0.40}$$

b)

$$P(A_2 | A_3) = P(A_2 \cap A_3) / P(A_3)$$

$$= 0.40 / 0.70$$

$$\boxed{= 0.57}$$

The events are not independent because $P(A_2 | A_3) \neq P(A_2)$.

c)

$$P(A_2 \cup A_3 | A_1) = \frac{P(A_1 \cup A_2 \cup A_3) - P(A_1)}{1 - P(A_1)}$$

$$= \frac{0.88 - 0.55}{1 - 0.55}$$

$$\boxed{= 0.73}$$

CS 418 Assignment 1

4)

a)

The Purchase of tall CUP.

$$P(T) = P(T_R) + P(T_D)$$

$$P(T) = 0.20 + 0.10$$

$$\boxed{P(T) = 0.30 \simeq 30\%.}$$

The Purchase of DeCaf Coffee

$$P(D) = P(D_T) + P(D_{CR}) + P(D_V)$$

$$P(D) = 0.10 + 0.20 + 0.10$$

$$\boxed{P(D) = 0.40 \simeq 40\%}$$

b) the purchase of decaf tall.

$$P(D/T) = \frac{P(D \cap T)}{P(T)}$$

$$P(D/T) = \frac{0.10}{0.30}$$

$$\boxed{P(D/T) = 0.33 \simeq 33\%}$$

c)

$$P(T/D) = \frac{P(T \cap D)}{P(D)}$$

$$P(T/D) = \frac{0.10}{0.40}$$

$$\boxed{P(T/D) = 0.25 \simeq 25\%}$$

5)

a) $P(x \leq 50)$

$= P(45) + P(46) + P(47) + P(48) + P(49) + P(50)$

$= 0.05 + 0.10 + 0.12 + 0.14 + 0.25 + 0.17$

$= 0.83 \simeq 83\%$

b) $P(x > 50) = 1 - P(x \leq 50)$

$= 1 - 0.83$

$= 0.17 \simeq 17\%$

c)

$$P(x \leq 49) = P(x \leq 50) - P(50)$$

$$= 0.83 - 0.17$$

$$= 0.66 \simeq 66\%.$$

d)

$$P(x \leq 47) = P(x \leq 49) - P(49) - P(48)$$

$$= 0.66 - 0.25 - 0.14$$

$$= 0.27 \simeq 27\%.$$

6)

$x < 105$

$$\rightarrow \frac{x < 104}{5} < \frac{105 - 104}{5}$$

$$\frac{x < 104}{5} < \frac{1}{5}$$

$$z < 0.2$$

z is standard normal distribution

Here, $P(x < 105) = P(z < 0.2)$

$= (0.2)$

$= 0.5793$

$$P(X \leq 105) = P(X < 105) + P(X = 105)$$

$$= 0.5793 + 0$$

$$\boxed{= 0.5793}$$

b)

$$= P(\mu - 6 \leq X \leq \mu + 6)$$

$$= \mu - 6 \leq X \leq \mu + 6$$

$$\frac{(\mu - 6) - \mu}{6} \leq \frac{X - \mu}{6} \leq \frac{(\mu + 6) - \mu}{6}$$

$$-1 \leq \frac{X - \mu}{6} \leq 1$$

$$P(\mu-\sigma \le x \le \mu+\sigma) = P(-1 \le Z \le 1)$$

$$= \phi(1) - \phi(-1)$$

$$= 0.8413 - 0.1587$$

$$= 0.6826$$

$$= 1 - 0.6826$$

$$\boxed{= 0.3174}$$

c)

$$\phi(Z\ 0.0005)$$

$$= 0.9995$$

$$Z\ 0.0005 = -3.3$$

$$\frac{x_{0.0005} - 104}{5} = z_{0.0005}$$

$$x_{0.0005} - 104 = 3.3 \times 5$$

$$x_{0.0005} - 104 = 16.5$$

$$\boxed{x_{0.0005} = 120.5}$$

$$\frac{x_{0.9995} - 104}{5} = -3.3$$

$$x_{0.9995} = 104 - 16.5$$

$$\boxed{x_{0.9995} = 87.5}$$

7)

Type 1 error: this error is called false positive error of rejecting a null hypothesis. when it's true to conclude that, plant does not compliance when it's higher than 150.

Type 2 error: this error is false negative error of rejecting a null hypothesis. It is true to conclude that, plant compliance when in fact it's not.

→Error 2 is more serious because it effect the ecosystem more then 1. It also based on the person who is thinking that either type 1 or type 2 error will be considered more serious.

8) $n = 50$

$\bar{x} = 3.05$ mm

$\mu_0 = 3.20$ mm

$H_0 = \mu = 3.20$ mm

$H_a = \mu \neq 3.20$ mm

$\sigma = 0.34$ mm

$$z = \frac{x - \mu_0}{\sigma/\sqrt{n}}$$

$$z = \frac{3.05 - 3.20}{0.34/\sqrt{50}}$$

$$z = -3.13$$

$$z_{\alpha/2} = -\frac{3.13}{2}$$

$$= -1.96$$

Hence, the null hypothesis is rejected.

8)

9)

$H_0: \mu_1 - \mu_2 \leq 1$

$H_a: \mu_1 - \mu_2 > 1$

$$Z = \frac{(64.9 - 63.1) - 1}{\sqrt{(0.09)^2 + (0.11)^2}}$$

$$Z = \frac{0.8}{0.142} = 5.63$$

$$\boxed{Z_{0.001} = 3.09}$$

$Z_{cal}(5.63) > Z_\alpha(3.09)$ reject null hypothesis.

b)

let μ_1 be the Population mean for those age 60+.

let μ_2 be the Population mean for those age 20-39.

$H_0: \mu_1 - \mu_2 = 1$

VS

$H_a: \mu_1 - \mu_2 < 1$