

Stats 1 - (5) Estimation

① a) $\bar{x} = 181.8 / 36 = 5.052$

$\sigma = 75 \text{ ml} = 0.0752$

$n = 36$

Z value for 98% CI = 2.3263 (look up 0.99)

$$\begin{aligned} \rightarrow \mu &= \bar{x} \pm z \times \frac{\sigma}{\sqrt{n}} \\ &= 5.05 \pm 2.3263 \times \frac{0.075}{\sqrt{36}} \\ &= 5.05 \pm 0.02907 \\ &= (5.02, 5.08) \end{aligned}$$

b) **MEAN** 52 is below lower bound of confidence interval, so **AGREE** with the claim

% 8/36 contained less than SL = 22%, so **DISAGREE** with this claim

c) Yes, because we do not know if the distribution of volumes in the population was normally distributed.

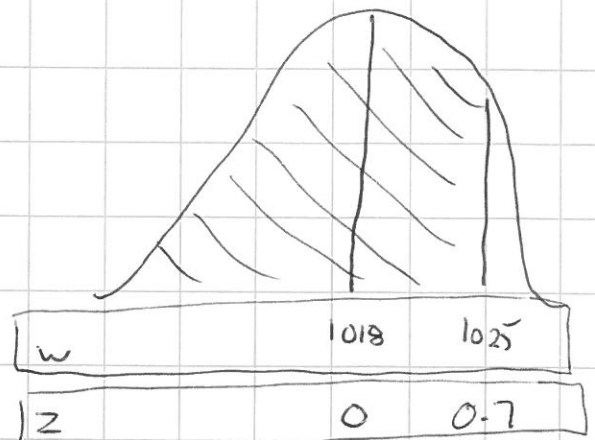
② a) i) $w \sim N(1018, 18^2)$

$P(w < 1025)$

$= P\left(Z < \frac{1025 - 1018}{18}\right)$

$= P(Z < 0.7)$

$= 0.75804$



$$ii) P(1015 < w < 1030)$$

$$= P\left(\frac{1015 - 1018}{10} < Z < \frac{1030 - 1018}{10}\right)$$

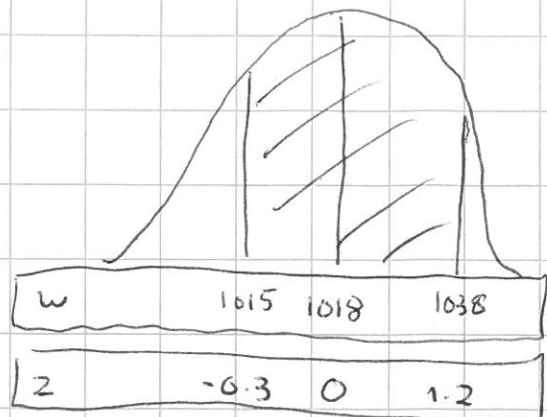
$$= P(-0.3 < Z < 1.2)$$

$$= P(Z < 1.2) - P(Z < -0.3)$$

$$= 0.88493 - [1 - P(Z < 0.3)]$$

$$= 0.88493 - [1 - 0.61791]$$

$$= 0.50284$$



b) SAMPLE!!!! $n = 24$

$$\bar{w} \sim N\left(\frac{1018}{24}, \frac{10^2}{24}\right)$$

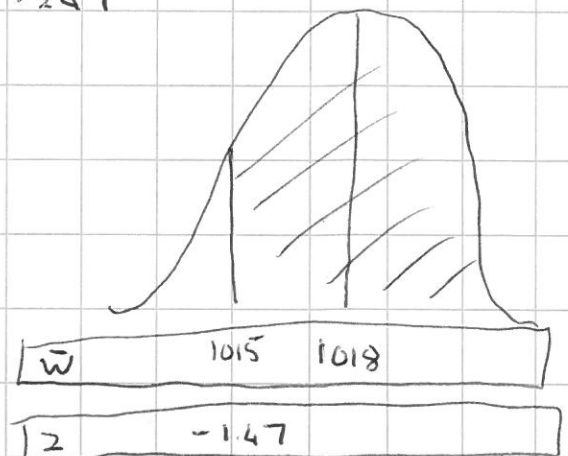
$$P(\bar{w} > 1015)$$

$$= P\left(Z > \frac{1015 - 1018}{10/\sqrt{24}}\right)$$

$$= P(Z > -1.47)$$

$$= P(Z < 1.47)$$

$$= 0.92922$$



$$(3) a) i) \bar{x} = \frac{\sum x}{n} = \frac{2290}{50} = 45.8$$

$$s^2 = \frac{\sum (x - \bar{x})^2}{n-1} = \frac{28225.5}{49} = 576.03...$$

$$s = \sqrt{576.03} = 24.00$$

ii) If we take off 2 standard deviations from mean we get: $45.8 - 2 \times 24 = -2.2$

cannot have negative salary, so unlikely to be normally distributed.

b) i) Sample size > 30 , so Central Limit Theorem implies sample means are normally distributed.

$$\text{ii) } \bar{x} = 45.8$$

$$s = 24$$

$$n = 50$$

$$Z \text{ value for } 99\% = 2.5758 \quad (\text{look up } 0.995)$$

$$\begin{aligned} \rightarrow \mathcal{X} &= \bar{x} \pm Z \times \frac{s}{\sqrt{n}} \\ &= 45.8 \pm 2.5758 \times \frac{24}{\sqrt{50}} \\ &= 45.8 \pm 8.74255 \\ &= (37.06, 54.54) \end{aligned}$$

c) Ave EXCEEDS £55,000 £55k is above upper bound of confidence interval, therefore REJECT claim

125% 6/50 exceed £60k = 12%,
 \therefore reject this claim as well.