AQA S1 Jan 12

(1) (a) $\Sigma x = 27$

Median is 14^{th} value

So Median $= 10$

LQ is 7^{th} UQ is 21^{st}

IQR $= 11 - 9 = 2$

(b) "≤ 6" and "≥ 12"

change to grouped data

(2) (a) Probably correct (ie no correlation)

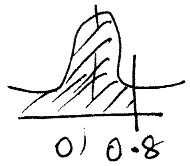
(b) Definitely incorrect (as >1)

(c) Probably incorrect (negative correlation unlikely, as higher weight for bigger waist likely positive correlation)

(3) (a)(i) $\mu = 32 \quad \sigma = 10$

$$z = \frac{40-32}{10} = 0.8$$

$\Phi(0.8) = 0.78814$ (from table) $= \underline{0.788}$

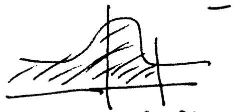


0 0.8

(ii) $$z = \frac{25-32}{10} = -0.7$$

$\Phi(0.7) = 0.75804$
$= \underline{0.758}$

-0.7



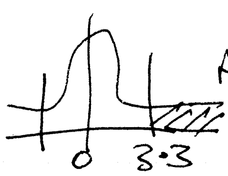
0.7

(iii) $\Rightarrow P(X<40) - P(X<25)$

$= 0.78814 - (1 - 0.75804)$

$= 0.54618 = 0.546$

(b) $P(x>65) \Rightarrow z = \frac{65-32}{10} = 3.3$



0 3.3

As $P(z<3.3) = 0.99952$

So $\Rightarrow 1 - 0.99952$

$= 0.00048$

(c) Has a cut off at 0 litres.

unusual spread due to holiday traffic.

(4) (a)(i) $X \sim B(40, 0.15)$

$P(X=6) = {}^{40}C_6 \times 0.15^6 \times 0.85^{34}$

$= 0.1741... \approx 0.174$

(ii) $P(X \leq 5) = 0.4325$ from table

(iii) ...3 4 5 | 6 7 8 9 | 10 11 12 ...

$P(X \leq 9) - P(X \leq 5) = 0.9328 - 0.4325$

$= 0.5003 = 0.500$

(b) Mean $= np = 40 \times 0.15$

$= 4.8$

S.D. $= \sqrt{npq} = \sqrt{40 \times 0.15 \times 0.85}$

$= \sqrt{4.08}$

$= 2.02$

(c) Mean $= \frac{77}{10} = \underline{7.7}$

S.D. $=$

$$= \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$$

sample "sum of difference between value and mean squared"

$$= \sqrt{\frac{16.1}{9}} = \sqrt{17.89}$$

$= 4.23$

As mean and SD are so different from model it is shown to be unsuitable.

(5) (a) Calorific value is a result of the moisture level set in the experiment.

(b) $$b = \frac{\frac{\Sigma xy}{n} - \bar{x}\bar{y}}{\frac{\Sigma x^2}{n} - \bar{x}^2}$$ ($\bar{x} = 3.5$, $\bar{y} = 2.68$

$$= \frac{66.15 - (3.5 \times 2.68)}{1575 - 35^2}$$

$= -0.079$

$a = 5.445$

$y = -0.079x + 5.445$

$-$gradient $\qquad$ y intercept

5 (c) "a" calorific value when moisture level $= 0$

"b" as moisture level increases calorific value decreases

(d) $x = 27$ so $y =$ 3.312

(e) when $x = 35$ regression line gives $y = -0.079 \times 35 + 5.45$

$= 2.68$

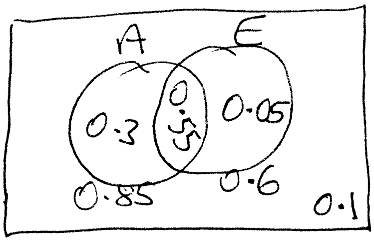
$2.5 - 2.68 = -0.18$

(f) Good estimate/~~reliable~~ as max and min residuals close to zero.

(g) (i) well outside range of data available (ii) $x = 80$

$y = -0.875$ ie a negative calorific value.

6



$0.3 + 0.55 + 0.05 = 0.9$

(i) $1 - 0.9 = \underline{0.1}$

(ii) 0.9

(iii) $0.3 + 0.05 = 0.35$

(b) (i) $0.55 \times 0.3 = 0.165$

(ii) AEX, AXC, XEC, AEC

$0.55 \times 0.4 = 0.22$

$0.85 \times (1 - 0.6) \times 0.75 = 0.255$

$0.6 \times (1 - 0.85) \times 0.75 = 0.0675$

$0.55 \times 0.3 = 0.165$

Total $= 0.7075 = 0.708$

7 (a) (i) $s^2 = \dfrac{\Sigma(x - \bar{x})^2}{n-1} = \dfrac{28225.5}{49}$

$= 576.03$ $s = \sqrt{576.03} = 24$

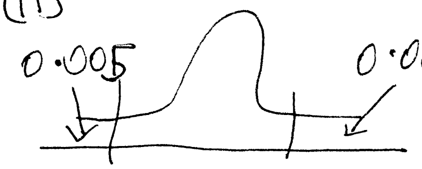
$\bar{x} = \dfrac{2290}{50} = 45.8$

(ii) Two SD = 48 (000)

28,225.50 − 48,000 is negative so cut off at £0

(b) (i) Sample size > 30. Use Central Limit Theorem

(ii)



Sample mean = 45.8

$\Rightarrow 45.8 \pm 2.5758 \times \dfrac{24}{\sqrt{50}}$

$= 37.057$ to 54.543

$= \underline{37.1 \text{ to } 54.5}$ thousand pounds

(c) Sample mean ≃ £45,800 versus claim of £55,000. Thus claim is likely to be false.

$z = \dfrac{60 - 45.8}{24} = 0.5967$

$\Phi(0.59) = 0.72240$ $\Phi(0.60) = 0.72575$

$\dfrac{0.00135}{5} = 0.00027$

$\Rightarrow 0.72267 < 75\%$

∴ more than 25% exceed £60K