Stats A2 Maths 2021

1(a) They could be biased.

$X \sim B(36, 0.08)$

(b) (i) $P(X = 4) = 0.167873305$

(ii) $P(X \geq 7) = 1 - P(X \leq 6)$

$= 0.022233836 46$

(c) $0.08 \times 0.4 = \frac{4}{125}$

(d) $Y \sim B(50, 4/125)$

$P(Y \leq 2) = 0.785081535 8$

2. $n = 16$

(a) There is a weak negative correlation.

(b) Because of the negative correlation Marc's suggestion is consistent.

(c) $r = -0.544582662$

(d) $H_0: \rho = 0$

$H_1: \rho < 0$

5% level of significance

for $n = 16$ 5% need a result as big as -0.4259 to be significant. As more extreme than this then can reject H_0 in favour of H_1, there is a negative correlation.

(5) $y = x - 1010$

(a) Hectopascal or hPa

$y = x - 1010$

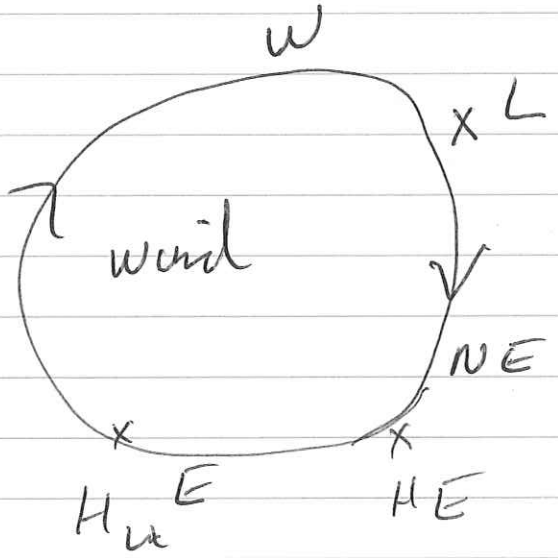
coded — Daily mean pressure

(b) $\frac{\Sigma y}{n} = \frac{214}{30} = \frac{107}{15} = \bar{y}$

$\bar{x} = \frac{107}{15} + 1010 = \frac{15257}{15} = 1017.1\dot{3}$

(c) $SD_y = \sqrt{\frac{\Sigma y^2}{n} - (\bar{y})^2} = 12.09058403$

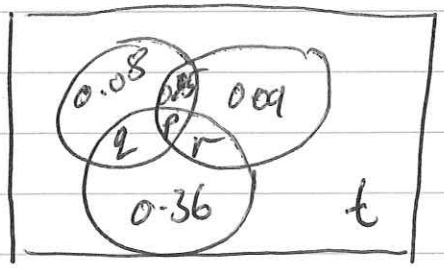
(d)



Pressure above mean, so high pressure and clockwise

For Leuchars comes from W, Heathrow the NE and Hurn the East.

(4) (a) $0.08 + 0.09 + 0.36 = 0.53$



(b) $0.25 = 0.08 + q + 0.05 \Rightarrow q = 0.12$

(i) $p = 0$

(ii) $q = 0.12$

(i) $P(S/E) = 5/12 = \dfrac{P(S \cap E)}{P(E)}$

$5/12 = \dfrac{r}{r + 0.05 + 0.09} \Rightarrow 5/12\,r + 7/120 = r$

$7/12\,r = 7/120 \Rightarrow r = 1/10$

(ii) $1 - 0.08 - 0.12 - 0.36 - 0.1 - 0.09 - 0.05$

$= 1/5$

$t = 0.2$

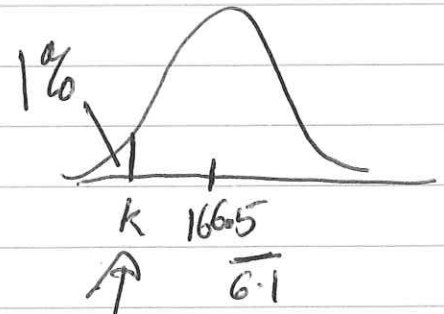
(iii) $P(S \cap E') \times P(G) =$

$= 0.48 \times 0.25 = 3/25 = 0.12$

$P((S \cap E') \cap G) = 0.12$ so independent

5

(a)

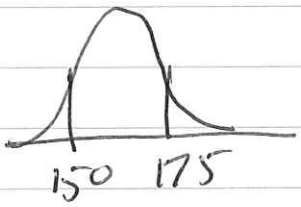


-2.326347931 standard deviations

$166.5 - 2.326347931 \times 6.1$

$= 152.3092776$

(b)



Using classic 0.9148409455

(c) $P(X > 160) / (150 < X < 175)$

btwn 160 & 175 $= 0.7749488272$

$\frac{0.7749488272}{0.9148409455} = 0.8470858579$

5(d) $H_0 \quad \mu = 166.5 \qquad \bar{X} \sim N\left(166.5, \frac{7.4^2}{50}\right)$

$H_1 \quad \mu < 166.5$

1 tail test 5%

$$P\left(\bar{X} < 164.6\right) \Big/ \bar{X} \sim N\left(166.5, \frac{7.4^2}{50}\right)$$

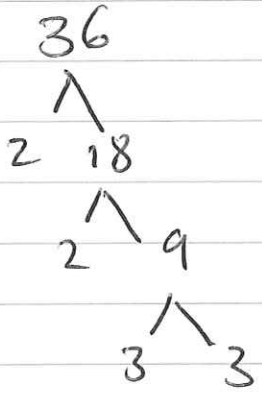
$= 0.0347201416 9$

As this is less than 5%, then the result is significant, there is sufficient evidence to reject the null hypothesis in favour of the alternative, the mean height of females in this country is less than 166.5.

6. (a) $\log_{36} a + \log_{36} b + \log_{36} c = 1$

$\log_{36} abc = 1$

$abc = 36$



$a = 2$

$b = 3$

$c = 6$

(b) $P(X_1 = X_2)$

$(\log_{36} 2)^2 + (\log_3 6\ 3)^2 + (\log_{36} 6)^2$

$= 0.381401436$