

Statistics I - Linearising - Solutions

Section 1

1. $V = 69.92 - 7.31C$

a) If there is no cloud cover the daily mean

visibility will be 69.62 km

As the cloud cover increases by 1 Octa, the visibility decreases by 7.31 km

b) i) $C=4 \Rightarrow V = 69.62 - 7.31(4) = 40.38 \text{ km}$

ii) $C=6 \Rightarrow V = 69.62 - 7.31(6) = 25.76 \text{ km}$

c) Carse Data Set has data from May - October. The relationship may be different in December and so b) i) is the most dubious

d) $C=9 \Rightarrow V = 69.62 - 7.31(9) = 3.83$

ii) Octas are in the range $0 \leq C \leq 8$, it is therefore impossible to have $C=9$, as so V value is meaningless.

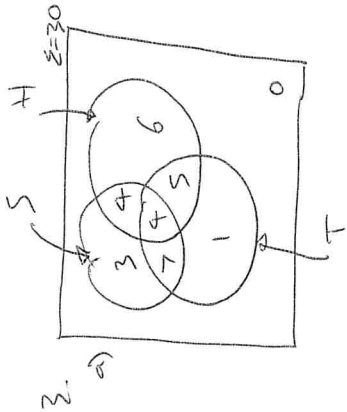
2.

	A	A'	
B	0.25	0.25	0.5
B'	0.35	0.15	0.5
	0.6	0.4	1

a) $P(A \cap B) = 0.85 \Rightarrow P(A' \cap B') = 1 - 0.85 = 0.15$

b) $P(B|A) = \frac{0.25}{0.6} = 0.416$

c) $P(A'|B') = \frac{0.15}{0.5} = 0.3$



$18 + 19 + 17 = 54$

$54 - 30 = 24 \Rightarrow$ total overlaps = 24

$8 + 9 + 11 = 28$

$28 - 24 = 4 \Rightarrow$ overlap of overlaps = 4

b) $\frac{10}{18} = \frac{5}{9}$

c) $\frac{12}{29} = \frac{6+5+1}{30-1}$

4. $X = 10$, dogs preferring this product

a) $X \sim \text{Bin}(40, 0.8)$

$H_0: p = 0.8$

$H_1: p < 0.8$

$5\% \left. \begin{array}{l} H_1 \\ H_0 \end{array} \right\} c$

$P(X=c) = 0.05$

$P(X \leq 27) = 0.0432$

$P(X \leq 28) = 0.0875$

c between 27 and 28

ie critical region is $X \leq 27$

b) $x=31 \Rightarrow$ Accept H_0 , i.e. insufficient evidence to

suggest that the company is overestimating the popularity of its product

So) Correlation does not imply causation. There is no evidence to support her claim

b) Data is in 2 separate sections

In each section the data does not show much correlation

Section 2

$$1. f = ab^t$$

$$\log_{10} f = \log_{10} a + \log_{10} b^t$$

$$\Rightarrow \log_{10} f = \log_{10} a + t \log_{10} b$$

$$Y = C + X M$$

$$a) m = \frac{5-2}{5-0} = 0.6 \Rightarrow \log_{10} b = 0.6 \Rightarrow b = 10^{0.6} = 3.98$$

$$(0, 2) \Rightarrow C = 2 \Rightarrow \log_{10} a = 2 \Rightarrow a = 10^2 = 100$$

$$b) f = 100 (3.98)^t$$

$$i) t = 0 \Rightarrow f = 100$$

$$ii) f = 300 \Rightarrow 100 (3.98)^t = 300$$

$$\Rightarrow 3.98^t = 3$$

$$\Rightarrow t = \log_{3.98} 3$$

$$\Rightarrow t = 0.725 \text{ hours}$$

$$\Rightarrow t = 48 \text{ mins}$$

8

2.

a) Independent = x axis = Daily Total Sunshine

b) Clear from graph relationship is non-linear

$$c) W = aS^b$$

$$\Rightarrow \log_{10} W = \log_{10} a + b \log_{10} S$$

$$Y = C + m X$$

$$\text{i.e. } x \text{ axis} = \log_{10} S$$

$$y \text{ axis} = \log_{10} W$$

$$d) y = 1.35 - 1.1x$$

$$\Rightarrow \log_{10} W = 1.35 - 1.1 \log_{10} S$$

$$\Rightarrow W = 10^{1.35 - 1.1 \log_{10} S}$$

$$\Rightarrow W = \frac{10^{1.35}}{10^{1.1 \log_{10} S}}$$

$$\Rightarrow W = \frac{22.39}{\log_{10} S^{1.1}}$$

$$\Rightarrow W = \frac{22.39}{S^{1.1}}$$

$$\Rightarrow W = 22.39 S^{-1.1}$$

$$e) S = 6 \Rightarrow W = 22.39 (6)^{-1.1} = 3.12$$

f) Use a much bigger sample than 10 values.

Total = 20

12