Kyle Havenga

30161878

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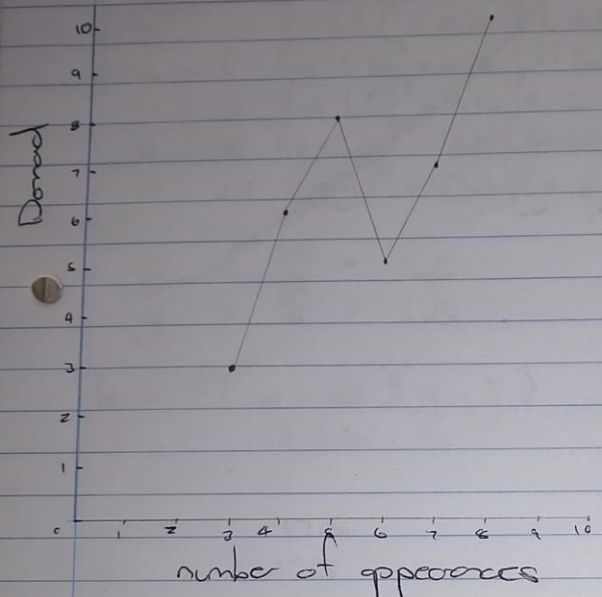
Assignment 2

Question 1

(a)

Scatter chart



(b) The graph shows that the higher the demand the higher the amount of appearances. The graph also indicates a medium strength positive correlation.

(c)

y	x	$(y-\bar{y})^2$	$(x-\bar{x})^2$	$(x-\bar{x})(y-\bar{y})$
3	3	$(3-6.5)^2 = 12.25$	$(3-5.5)^2 = 6.25$	$(3-5.5)(3-6.5) = 8,75$
6	4	$(6-6.5)^2 = 0.25$	$(4-5.5)^2 = 2.25$	$(4-5.5)(6-6.5) = 0,75$
7	7	$(7-6.5)^2 = 0,25$	$(7-5.5)^2 = 2.25$	$(7-5.5)(7-6.5) = 0,75$
5	6	$(5-6.5)^2 = 2.25$	$(6-5.5)^2 = 0.25$	$(6-5.5)(5-6.5) = -0,75$
10	8	$(10-6.5)^2 = 12.25$	$(8-5.5)^2 = 6.25$	$(8-5.5)(10-6.5) = 8,75$
8	5	$(8-6.5)^2 = 2.25$	$(5-5.5)^2 = 0.25$	$(5-5.5)(8-6.5) = -0,75$
39	33	$\Sigma(y-\bar{y})^2 = 29.5$	$\Sigma(x-\bar{x})^2 = 17.5$	$\Sigma(x-\bar{x})(y-\bar{y}) = 17,5$

$$\bar{x} = \frac{33}{6} = 5.5$$
$$\bar{y} = \frac{39}{6} = 6.5$$

$$b_1 = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\Sigma(x-\bar{x})} \qquad b_0 = \bar{y} - b\bar{x}$$
$$= 6.5 - (1)(5.5)$$
$$= 1$$

$$= \frac{17.5}{17.5}$$

$$= 1$$

$\therefore \quad x = y \quad \not\Rightarrow \quad SST = 29,5$

x	y	$\hat{y}$	$(y-\hat{y})^2$	$(\hat{y}-\bar{y})^2$
3	3	$1+1(3) = 4$	1	6.25
4	6	$1+1(4) = 5$	1	2.25
7	7	$1+1(7) = 8$	1	2.25
6	5	$1+1(6) = 7$	4	0,25
8	10	$1+1(8) = 9$	1	6.25
5	8	$1+1(5) = 6$	4	0,25

(d) if $x = 20$

$\therefore \hat{y} = 1 + 1(20)$

$= 21$

Therefor the demand that should be expected is 21.

Using the least squar regression line to estimate the demand amount is just an estimate and does not represent reality.

(e) $r^2 = \frac{SSR}{SST}$

$= \frac{17,5}{29,5}$

$= 0,593$

$r = 0,77$

59,3 % is a positive correlation but there is other variable that or impacting it.

Question 2

(a)

year	Demand	3-year moving average	Error
1	4		
2	6		
3	4		
4	5	$(4+6+4)/3 = 4,667$	$(5 - 4,667) = 0,333$
5	10	$(6+4+5)/3 = 5$	$(10 - 5) = 5$
6	8	$(4+5+10)/3 = 6,333$	$(8 - 6,333) = 1,667$
7	7	$(5+10+8)/3 = 7,667$	$(7 - 7,667) = 0,667$
8	9	$(10+8+7)/3 = 8,333$	$(9 - 8,333) = 0,67$
9	12	$(8+7+9)/3 = 8$	$(12 - 8) = 4$
10	14	$(7+9+12)/3 = 9,333$	$(14 - 9,333) = 4,667$
11	15	$(9+12+14)/3 = 11,667$	$(15 - 11,667) = 3,333$
12	—	$(12+14+15)/3 = 13,667$	
			$\Sigma(\text{error}) = 19$

$$MAD = \frac{\Sigma(\text{error})}{n}$$

$$= \frac{19}{8}$$

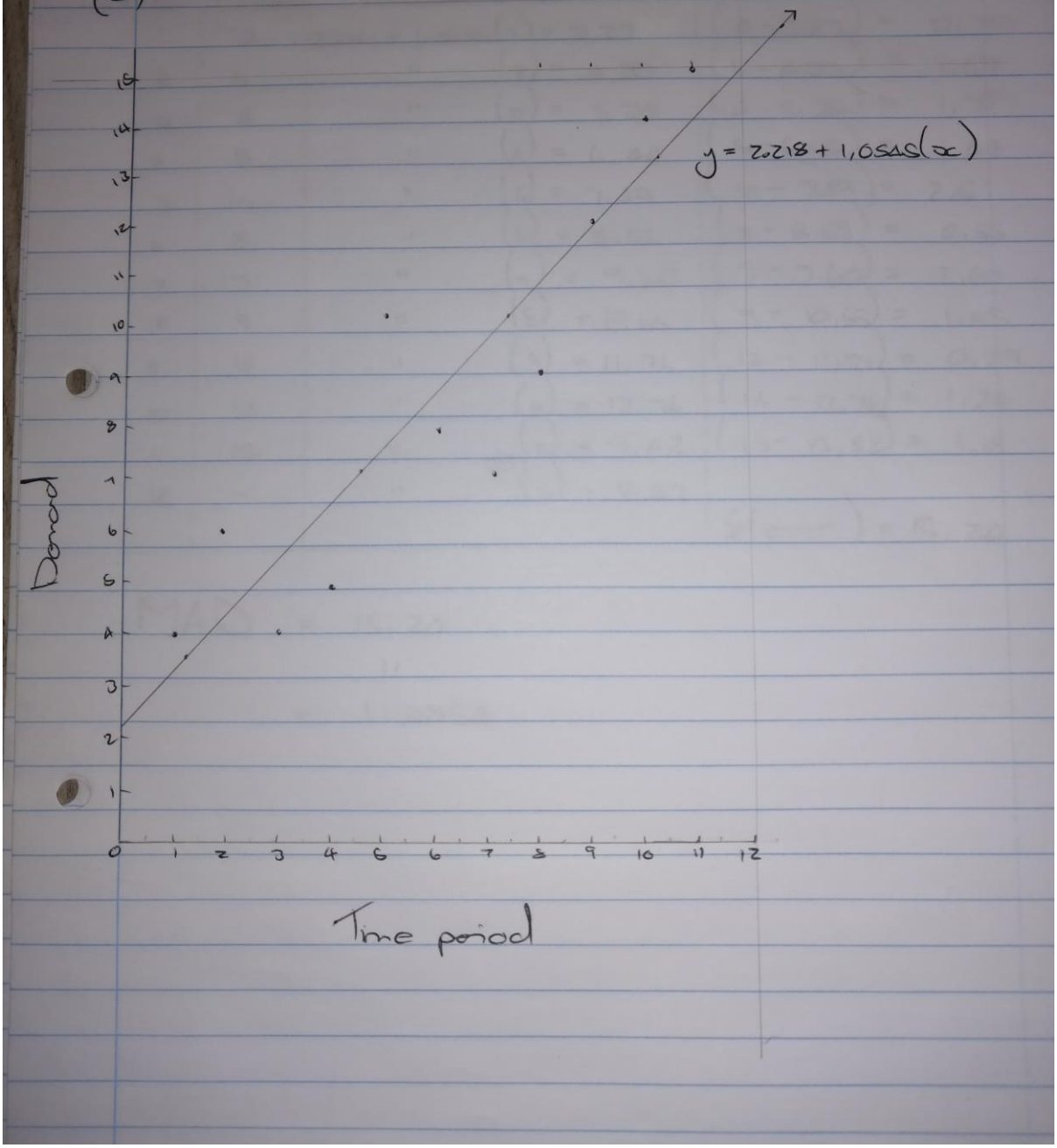
$$= 2,375$$

(b)

Year	Demand	3-year weighted moving average	Error
1	4		
2	6		
3	4		
4	5	$[(2\times4)+6+4]/4 = 4.5$	$(5-4.5)=0.5$
5	10	$[(2\times6)+4+6]/4 = 5$	$(10-5)=5$
6	8	$[(2\times10)+5+4]/4 = 7.75$	$(8-7.75)=0.75$
7	7	$[(2\times8)+10+5]/4 = 7.75$	$(7-7.75)=0.75$
8	9	$[(2\times7)+8+10]/4 = 8$	$(9-8)=1$
9	12	$[(2\times9)+7+8]/4 = 8.25$	$(12-8.25)=3.75$
10	14	$[(2\times12)+9+7]/4 = 10$	$(14-10)=4$
11	15	$[(2\times14)+12+9]/4 = 12.25$	$(15-12.25)=2.75$
12	–	$[(2\times15)+14+12]/4 = 14$	
			$\Sigma(\text{Error}) = 18.5$

$$MAD = \frac{18.5}{8} = 2.313$$

(c)


y = 2.218 + 1.054x
Demand
Time period
0 1 2 3 4 5 6 7 8 9 10 11 12
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

(c)

Year	Demand	Forecast	Error
1	4	2,2181 + 1,0545(1) = 3,27	(4 - 3,27) = 0,73
2	6	" (2) = 4,33	(6 - 4,33) = 1,67
3	4	" (3) = 5,38	(4 - 5,38) = 1,38
4	5	" (4) = 6,44	(5 - 6,44) = 1,44
5	10	" (5) = 7,49	(10 - 7,49) = 2,51
6	8	" (6) = 8,55	(8 - 8,55) = 0,55
7	7	" (7) = 9,60	(7 - 9,60) = 2,60
8	9	" (8) = 10,65	(9 - 10,65) = 1,65
9	12	" (9) = 11,71	(12 - 11,71) = 0,29
10	14	" (10) = 12,76	(14 - 12,76) = 1,24
11	15	" (11) = 13,82	(15 - 13,82) = 1,18
12	-	" (12) = 14,87	
			Σ(error) = 15,24

$$MAD = \frac{15,24}{11} = 1,3854$$

Error = Demand − Forecast

(d)

Year	Demand	Forecast	Error
1	4	5	1
2	6	$5 + 0,3(4-5) = 4,7$	1,3
3	4	$4,7 + 0,3(6-4,7) = 5,09$	1,09
4	5	$5,09 + 0,3(4-5,09) = 4,76$	0,24
5	10	$4,763 + 0,3(5-4,763) = 4,83$	5,17
6	8	$4,8241 + 0,3(10-4,8241) = 6,38$	1,62
7	7	$6,38287 + 0,3(8-6,38287) = 6,87$	0,13
8	9	$6,868709 + 0,3(7-6,868709) = 6,91$	2,09
9	12	$6,9089963 + 0,3(9-6,9089963) = 7,54$	4,46
10	14	$7,53866741 + 0,3(12-7,53866741) = 8,87$	5,13
11	15	$8,8749671874 + 0,3(14-8,8749671874) = 10,41$	4,59
12	–	$10,4124703 + 0,3(15-10,4124703) = 11,79$	–
		$\Sigma(\text{Error}) =$	26,82

$F_{t+1} = F_t + \alpha(Y_t - F_t)$ where

F_t = previous Forecast
α = Smoothing Constant
Y_t = previous period demand

$$MAD = \frac{26,82}{11} = 2,44$$

(c) When using the MAD criteria C is the the most reliable forecast error/MAD of 1,388 that predicts 14872,10 litres of Brandy