Student Name MARKING KEY

Eastern Goldfields College
Mathematics Applications U3&4 2017
Test 4 – Calculator Free Section

Working Time: 20 minutes | **Total Marks: 21 marks**

Question 1 [3 marks: ½, ½, ½, ½, ½, ½]
Which of the following situations involve time series data? *(Circle your answer)*

a) Comparing the average price of petrol each day by recording the average price and the day of the week for three consecutive weeks.

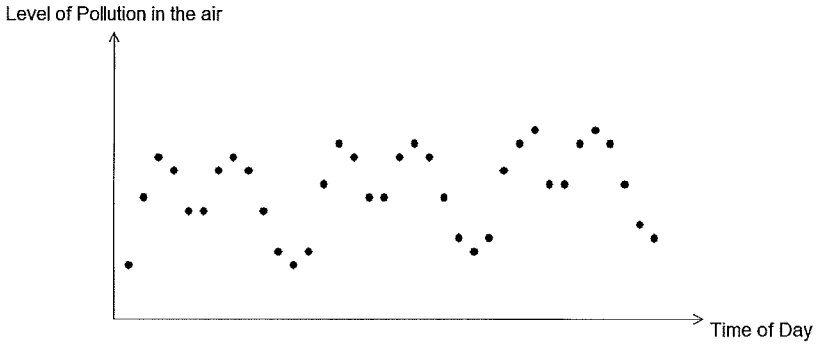
(Yes) | No ½

b) Recording data on the size of the ocean's tides at 6 hour intervals by recording the level of the tide and the time of day for 5 consecutive days.

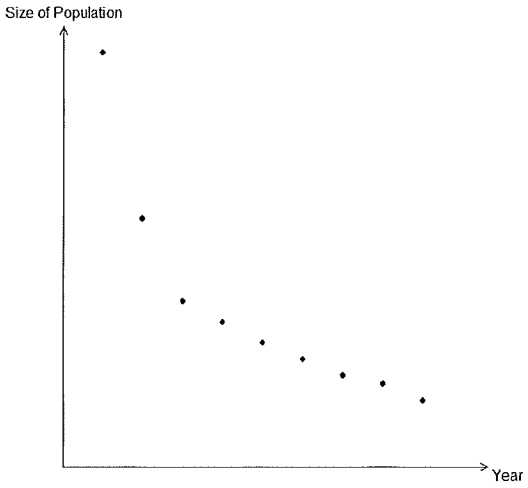
(Yes) | No ½

c) Comparing the fastest running time for each student in the class by recording their fastest time each day for 3 consecutive days.

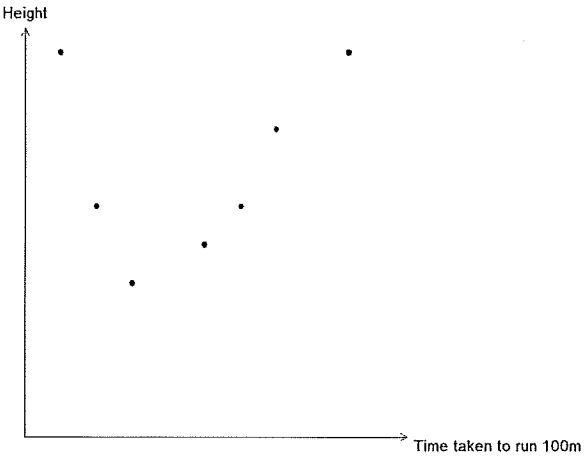
Yes | (No) ½

d) 

(Yes) | No ½

e) 

(Yes) | No ½

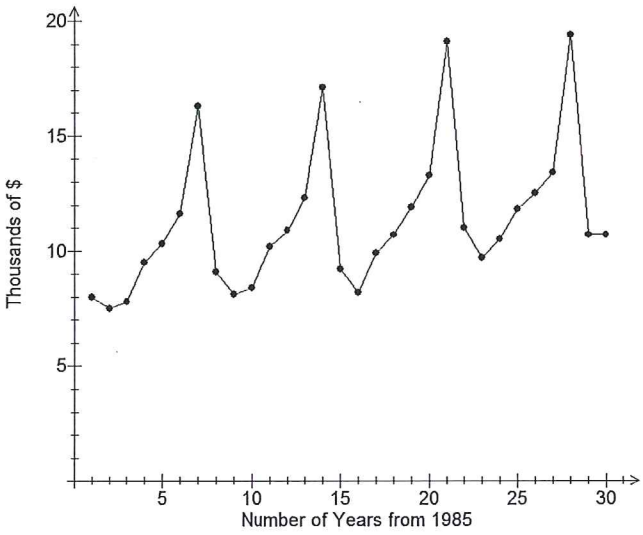
f) 

Yes | (No) ½

Question 2 [6 marks: 3, 3]

Describe the trend for or each of the scenario's described in the graph and table below.

a) A company's sales figures.



✓ Increasing/Positive overall trend

✓ Seasonal

✓ Other eg. { 7 data points/season
7 years ∃ season

b) Attendance in a weekly course.

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Attendance (100s of people)	10.9	11.5	11.3	11.4	6.2	12.2	11.4	11.1	12	5.9	12.4	13.1	11.3	12.9	6.3

✓ seasonal fluctuation

✓ increasing/positive trend.

✓ other - { peaks 1, 6, 11
troughs 5, 10, 15
etc

Question 3 [4 marks: 2, 2]

a) Joe Blog wants to buy shares, there are several shares which today cost the same price. Suggest a way in which he might be able to decide which share to buy.

same { ✓ record history over time

✓ to find pattern for prediction.

Determine share cost ∃ Company. each month for past 10 years.

Look overall trend in the share price + purchase the Company whose future trend is increasing the most.

b) How can collecting prices of properties be analysed as time series data?

Determine average sold prices ∃ month/year in area you want to buy/invest.

Determine underlying pattern to purchase in trough + sell in peaks.

Question 4 [8 marks: 1, 1, 4, 2]

The following data has been provided by the Australian Bureau of statistics and shows the total number of employed persons in Australia in the 1000s. The data was collected monthly and is shown in the table right.

	Month-Year	Total number of employed persons in Australia 000's
1	Jan-2013	11301.0
2	Feb-2013	11420.1
3	Mar-2013	11431.5
4	Apr-2013	11475.4
5	May-2013	11485.4
6	Jun-2013	11485.8
7	Jul-2013	11473.8
8	Aug-2013	11355.6
9	Sep-2013	11533.0
10	Oct-2013	11476.5
11	Nov-2013	11439.8
12	Dec-2013	11531.2
13	Jan-2014	11316.8
14	Feb-2014	11457.5
15	Mar-2014	11528.4
16	Apr-2014	11548.0
17	May-2014	11547.6
18	Jun-2014	11548.6
19	Jul-2014	11535.6
20	Aug-2014	11566.6
21	Sep-2014	11535.8
22	Oct-2014	11542.4
23	Nov-2014	11572.7
24	Dec-2014	11703.6
25	Jan-2015	11454.5 ✓
26	Feb-2015	11710.2 ✓
27	Mar-2015	11684.6 ✓
28	Apr-2015	11694.3 ✓
29	May-2015	11764.2 ✓
30	Jun-2015	11735.1 ✓
31	Jul-2015	11743.8 ✓
32	Aug-2015	11686.3 ✓
33	Sep-2015	11756.9 ✓
34	Oct-2015	11849.5 ✓
35	Nov-2015	11919.1 ✓
36	Dec-2015	12007.5

a) What is a way in which this data may have been collected?

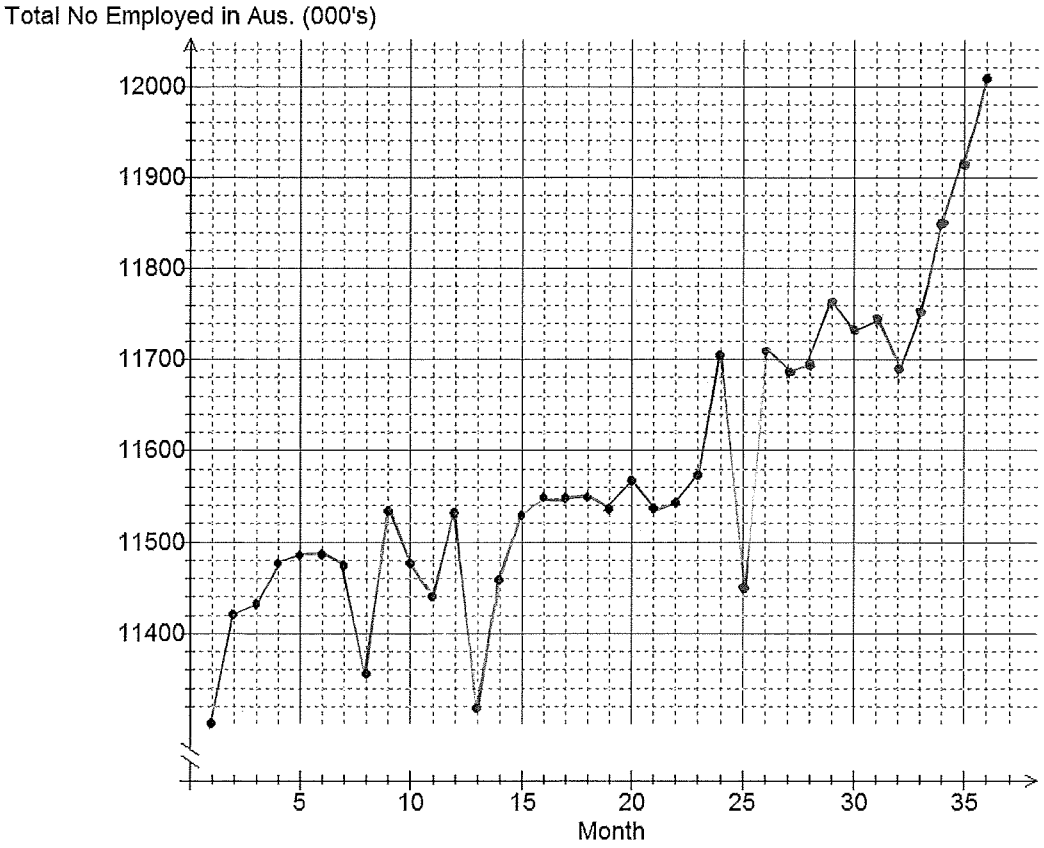
✓ Any valid answer
ex. - Census
- Survey.
- ATO.

b) List a reason why collecting this data might be useful?

✓ Any valid answer
- Employment Rates.
- Economic Growth
- Pensions. etc

The first 24 data points have been graphed below.

c) Graph the missing data points for employment in Australia over the past three years.



✓ line graph

✓✓ 9-11 plotted correct

✓✓ 7-10 "

✓ 6 "

d) Describe the trend.

✓ irregular

✓ increasing / positive overall trend.

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Mathematics Applications U3&4 2017
Test 4 – Calculator Assumed Section

Working Time: 40 minutes | **Total Marks: 34 marks**

Question 1 [6 marks: 5, 1]
A company's quarterly earnings ($000's) for the past 3 years are listed in the table below.

a) Use the information in the partially completed table below to calculate the values of A, B, C, D and E.

Year/Quarter	Company Earnings ($ 000's)	4 Point Centred Moving Average	Average for the Year	Company Earnings as a percentage of Yearly average
2012 – 1	38			
2012 – 2	45			
2012 – 3	20	A 44.75 ✓	B 44.5 ✓	
2012 – 4	78	44.25		
2013 – 1	34	43.75		C 79.0697% ✓
2013 – 2	43			100%
2013 – 3	18		43	41.86%
2013 – 4	D 76 ✓ (75.9982)	41.625		176.74%
2014 – 1		E 40.75 ✓		
2014 – 2	40	40.375		
2014 – 3		40.125	40.25	
2014 – 4		39.75		
2015 – 1	30	39.625		
2015 – 2	38	39.125		
2015 – 3	16		38.5	
2015 – 4				

b) Why does it make sense to consider a 4 point moving averages for this data?

4 data points per season ✓

Question 2 [6 marks: 1, 2, 3]

The following table shows the seasonal indices for the weekly sales figures for a particular company.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Seasonal Index	98%	80%	79%		102%	141%	70%

a) Calculate the seasonal index for Thursday.

$700 - (98 + 80 + 79 + 102 + 141 + 70) = 130$

$= 700 - 570$

b) The actual sales figure for Friday is \$25 300. Calculate the deseasonalised sale figure for Friday.

$D = \frac{25300}{1.02} = 24803.92 \simeq 24803$

The least squares regression line for predicting the deseasonalised sale figure for this week of sales is given by deseasonalised sales figure=20.2+0.89×day number, where day 1 is Monday, day 2 is Tuesday etc and sales are in thousands of dollars.

c) Calculate the actual sales figure for Sunday.

$A = (20.2 + 0.89 \times 7) \times 0.7$

$= 18.501 \times 1000$

$= \$18\,501$

Question 3 [22 marks – 2, 3, 2, 2, 4, 2, 2, 3, 2]

A street market has recently opened. It is open 3 days a week. Attendance is recorded and tracked for the first three weeks of the market opening.

Week/Day	Attendance (000's)	Weekly Mean	Attendance Percentage of Mean
Week 1 / 1	12	$8.\dot{3}$	144%
Week 1 / 2	8		96%
Week 1 / 3	5		60%
Week 2 / 1	9	$7.\dot{6}$	117.39%
Week 2 / 2	8		104.35%
Week 2 / 3	6		78.26%
Week 3 / 1	9	$8.\dot{3}$	108%
Week 3 / 2	9		108%
Week 3 / 3	7		84%

a) The seasonal index for Day 2's is 102.78%. Explain what this figure means. (2 marks)

The attendance for day 2 was 2.78% above the average.

b) Calculate the seasonal index for Day 1 and for Day 3. (3 marks)

Day 1 $= \frac{144 + 117.39 + 108}{3}$

$= 123.13\%$

Day 3 $= \frac{60 + 78.26 + 84}{3}$

$= 74.09\%$

c) Complete the following table of the deseasonalised data for attendance at the street market. Rounding your answer to 2 decimal places. (2 marks)

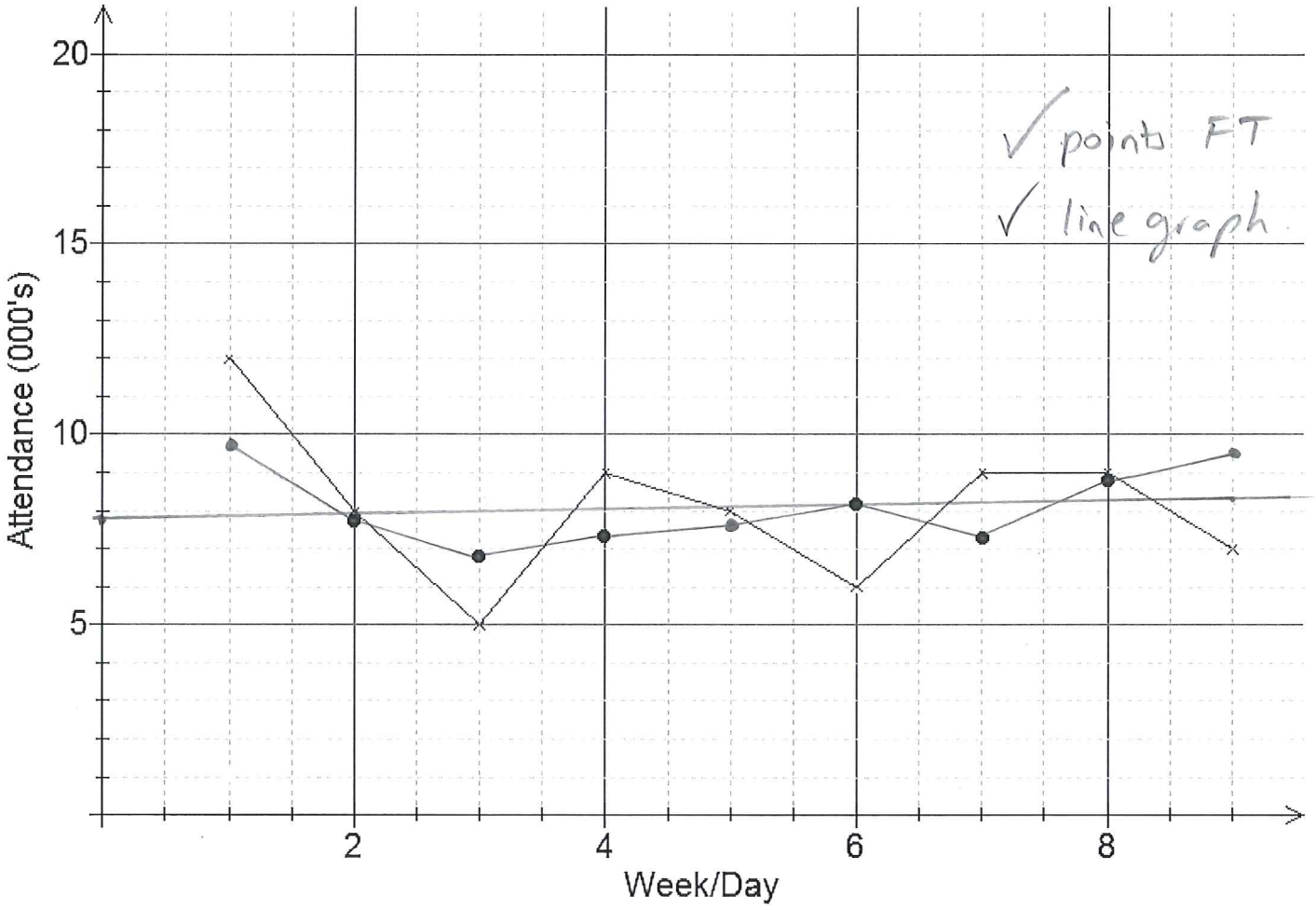
	Week/Day	Deasonalised Attendance (000's)
1	1/1	9.75 FT(b)
2	1/2	7.78
3	1/3	6.75
4	2/1	7.31
5	2/2	7.78
6	2/3	8.10
7	3/1	7.31
8	3/2	8.76
9	3/3	9.45 FT(b)

✓✓ all 3 correct

✓ 2 correct

x 1/0.

d) Complete the following graph for the deseasonalised data. (2 marks)



✓ points FT

✓ line graph

e) State the rule for the least squares regression line for the deseasonalised data and add this line to the scatterplot of the deseasonalised attendance. (4 marks)

✓y-int ✓grad.

Attendence = 0.0608 × Weekday + 7.8058
or y or x.

FT (c)

f) Compare the deseasonalised data to that of the actual data and comment on the effect of deasonalising the data. (2 marks)

does. ✓ smooth data.
or
removes fluctuation.

why ✓ to show an overall trend
or
show key features.

g) Calculate the deseasonalised attendance figure for each day in the fourth week. (2 marks)

Day		
1	$y = 0.0608(10) + 7.8058$	$= 8.4138$
2	$y = 0.0608(11) + 7.8058$	$= 8.4746$
3	$y = 0.0608(12) + 7.8058$	$= 8.5354$

FT (e)

h) Using deseasonalised attendance prediction, estimate the actual attendance for the fourth week. (3 marks)

D × SI = A

Day			
1	8.4138×1.2313	$=$	10.3587
2	8.4746×1.0278	$=$	8.7102
3	8.5354×0.7409	$=$	6.3239

$+ = 25.3928$

$\simeq 25\,392$ ✓

Pay 25000 − 25500.

i) Explain how reliable your prediction is for the estimated actual attendance for the fourth week. (2 marks)

✓ Not reliable

✓ Extrapolation.

END OF TEST