|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Name: | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | Date: *\_\_\_\_\_\_\_\_* | |
| **Yr 12 Mathematics Applications Test 4 RESOURCE ASSUMED** | | | | | |
| **Time:** | *47 minutes* | | **Marks:** | *46* | |
| **Reading:** | *2 minutes* | | **Equipment Allowed:** | *½ page notes (A4 one side),*  *CAS calculator* | |
| **Working:** | *45**minutes* | |  |  | |

***Answers should be rounded appropriately****. All working should be shown in the space provided. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks.*



**Question 1**

Part of the graph of the original estimates of the short-term departures from Australia from June 2011 to May 2015 is reproduced below.

(a) Name three items missing from the graph (3)

(b) Select and describe two pieces of evidence on this graph that suggests the data are seasonal and in your description, identify the length of each season. (3)

(c) What evidence on this graph suggests that there is an overall positive trend in short-term departures. (1)

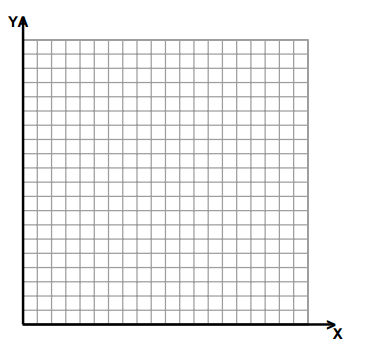
**Question 2**

The table and graph below show the average price per kilogram of pineapples, on a quarterly basis, over the time period Summer 2007 to Winter 2010.

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Season** | **Time (t)** | **Price $/kg** |
| 2007 | Summer | 1 | 2.5 |
| Autumn | 2 | 2.9 |
| Winter | 3 | 4 |
| Spring | 4 | 3.5 |
| 2008 | Summer | 5 | 2.8 |
| Autumn | 6 | 3.2 |
| Winter | 7 | 4.2 |
| Spring | 8 | 3.7 |
| 2009 | Summer | 9 | 3 |
| Autumn | 10 | 3.4 |
| Winter | 11 | 4.4 |
| Spring | 12 | 3.7 |
| 2010 | Summer | 13 | 3 |
| Autumn | 14 | 3.6 |
| Winter | 15 | 4.5 |

(a) Plot the data average price per kilogram of pineapples, on a quarterly basis, over the time period Summer 2007 to Winter 2010.on the graph below (3)

Cost per kg

Time (t)

(b) Determine the equation for the least squares regression line. Write the equation below **and** then draw it on the graph. (2)

( c) i) Use the line to predict the price of pineapples in winter 2011 (to the nearest cent).

ii) Is the prediction reliable? Explain. (3)

**Question 3**

The table show the percentage of total retail sales that were made in a department store over an 11 year period.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sales (%) | 12.3 | 12 | 11.7 | 11.5 | 11 | 10.5 | 10.6 | 10.7 | 10.4 | 10 | 9.4 |
| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |

(a) Construct a time series plot on your CAS calculator. Comment on the data. (2)

(b) Write down the equation of the trend line. (1)

(c) Interpret the slope of the trend line. (1)

(d) Use the trend line equation to forecast the percentage of retail sales which will be made by the department store in year 15. (1)

**Question 4**

The data shows the number of female students in a Year 12 Statistics class over a period 1960 to 2010, shown in five-year period.

Complete the table for values A,B,C,D,E,F (6)

|  |  |  |  |
| --- | --- | --- | --- |
| Year (t) | Number of female  students, y | Three point moving average | Three moving average with centering |
| 1 | 2 |  |  |
| 2 | 1 | 2 |  |
| 3 | **A** | 3 | 3.56 |
| 4 | 5 | 5.7 | **E** |
| 5 | 9 | **C** | 7.1 |
| 6 | 10 | 7.7 | 7.46 |
| 7 | 4 | **D** | 6.9 |
| 8 | 6 | 6.3 | 7.3 |
| 9 | 9 | 9 | **F** |
| 10 | 12 | 12 |  |
| 11 | **B** |  |  |

**Question 5**

Table 1 gives the data for number of blanket sales in each of the four seasons for the years 2010 to 2012 for a Rug Company.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year/Season | Summer | Autumn | Winter | Spring | Average |
| 2010 | 446 | 1085 | 1241 | 920 | 923 |
| 2011 | 541 | 1180 | 1356 | 1033 | 1028 |
| 2012 | 659 | 1234 | 1450 | 1299 |  |
| Seasonal Index (SI) | 0.52 | 1.15 |  | 1.03 |  |

(a) What is the average number of sales per season for the year 2012? (1)

(b) What is the seasonal index for Winter? (1)

(c) What does the seasonal index of 0.52 indicate about the sales of blankets during summer? (1)

The deseasonalised data of sales for the four seasons are shown in Table 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year/Season | Summer | Autumn | Winter | Spring |
| 2010 |  | 943 | 955 | 893 |
| 2011 | 1040 |  | 1043 | 1005 |
| 2012 | 1267 | 1151 | 1115 | 1261 |

(d) Complete the table for Summer and Autumn. (1)

The graph below shows the deseasonalised data for blanket sales.

(e) Use the data in Table 2 and work out the equation of the trend line. (1)

(f) Draw the trend line on the graph. (1)

(g) Use the trend line equation to calculate the value of N for Winter 2013. (1)

(h) Using the value in (g), estimate the number of blankets sales in Winter 2013. (1)

**Question 6 (12)**

The data shows the takings for a swimming pool company over 4 years in millions, by seasons

1. Calculate the seasonal index for each season
2. Calculate and give the deseasonalised takings for each season
3. Determine the regression line for the deseasonalised data.
4. Use the regression equation and the seasonal index to predict the takings for spring in the 4th year.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year (t) | Season | Sales in millions | Year Average | Sales as from 4 mth mean | Seasonal index | Deseasonalised Sales |
| 1 | Summer | 1.84 |  | 1.5827 | 1.5503 | 1.1868 |
| Autumn | 0.52 |  | 0.4473 | 0.4988 | 1.0425 |
| Winter | 0.85 |  | 0.7312 | 0.7143 | 1.1899 |
| Spring | 1.44 |  |  |  |  |
| 2 | Summer | 1.88 |  | 1.5473 |  | 1.2127 |
| Autumn | 0.63 | 1.215 | 0.5185 |  | 1.2630 |
| Winter | 0.83 |  | 0.6831 |  | 1.1619 |
| Spring | 1.52 |  |  |  |  |
| 3 | Summer | 1.92 |  | 1.5208 |  | 1.2385 |
| Autumn | 0.67 | 1.2625 | 0.5307 |  | 1.3432 |
| Winter | 0.92 |  | 0.7287 |  | 1.2879 |
| Spring | 1.54 |  |  |  |  |