**Question 13** (13 marks)
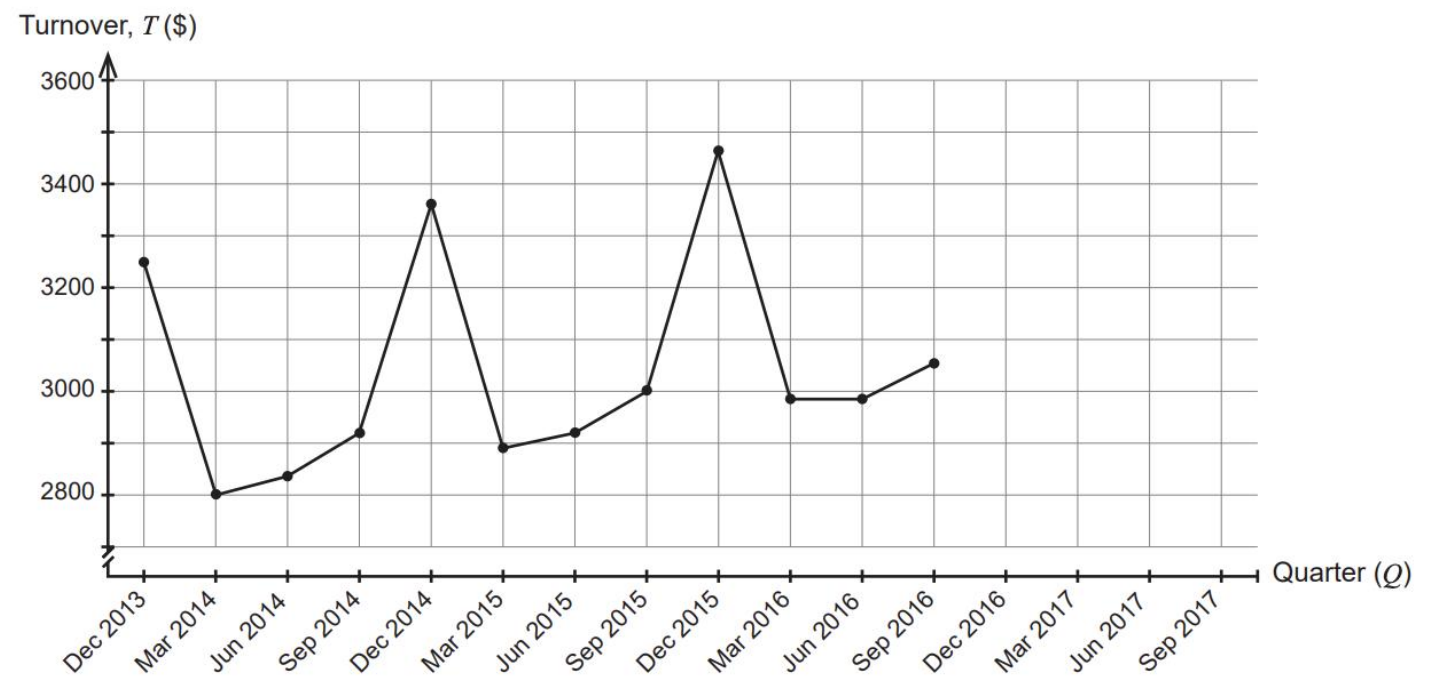
The graph below shows the quarterly retail turnover per capita ($) in Australia, i.e. the average amount spent per person at retail outlets during each quarter.

**Quarterly retail turnover per capita, Australia, 2013–2017**



The data for the next four quarters are shown in the following table.

| Quarter | December 2016 | March 2017 | June 2017 | September 2017 |
|---|---|---|---|---|
| Quarterly retail turnover per capita ($) | 3521.40 | 2980.10 | 3045.00 | 3075.30 |

(a)   Complete the time series plot by including this additional information. (2 marks)

(b)   The equation of the least-squares line for the above data is $T = 9.6143Q + 2986.50$, where $Q = 1$ for December 2013, $Q = 2$ for March 2014, etc.

   (i)   Fit this line to the graph.                                    (2 marks)

   (ii)   Describe the trend and seasonality of this data.               (2 marks)

(c)     The 4-point centred moving average for March 2017 is $3152.78 (correct to two decimal places). Determine the **actual** retail turnover per capita for September 2016.     (2 marks)

(d)     The seasonal indices (correct to two decimal places) are shown in the table below.

| Quarter | Seasonal index |
|---|---|
| December | 110.76% |
| March | 95.00% |
| June | |
| September | 98.20% |

(i)     Complete the table by determining the seasonal index for June.     (1 mark)

(ii)    Use the seasonal index to determine the deseasonalised retail turnover per capita for December 2016.     (2 marks)

(iii)     The deseasonalised retail turnover per capita for March 2016 is $3142.42. Determine the **actual** retail turnover per capita for this quarter.     (2 marks)