

Time Series

Q1

The table gives information about the numbers, in thousands, of overseas visitors to the United Kingdom from North America.

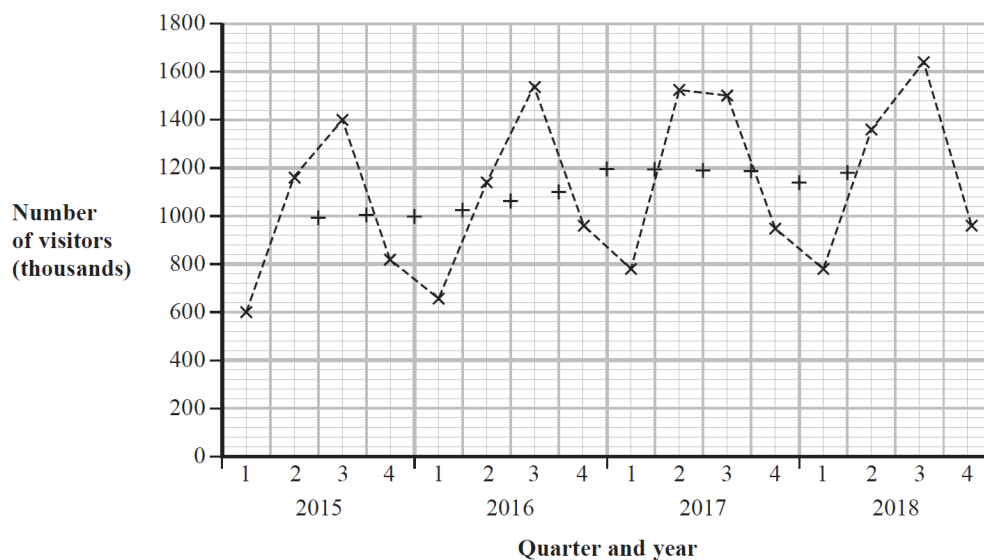
Year	Quarter	Number of visitors (thousands)	4-point moving average (thousands)
2015	1	606	
	2	1164	
	3	1397	993.75
	4	808	1005
2016	1	651	998.25
	2	1137	1034.75
	3	1543	1070.75
	4	952	1102.25
2017	1	777	1198.25
	2	1521	1188.25
	3	1503	1186.5
	4	945	1186
2018	1	775	1146.5
	2	1363	1179.25
	3	1634	1181.75
	4	955	

The time series graph has been plotted on the grid below for the data in the table.

Twelve of the 4-point moving averages for the data in the table have also been plotted on the grid so that the final 4-point moving average is missing from the grid.

(b) Plot this 4-point moving average on the grid.

(1)



(c) Draw a trend line for the time series graph.

(1)

Table 1 below shows the estimated quarterly expenditure on cycling equipment in Northern Ireland between 2014 and 2016

Q2

Table 1

		Expenditure (nearest £ thousand)			
		Q1	Q2	Q3	Q4
Year	2014	127	188	240	160
	2015	145	199	254	147
	2016	145	202	254	163

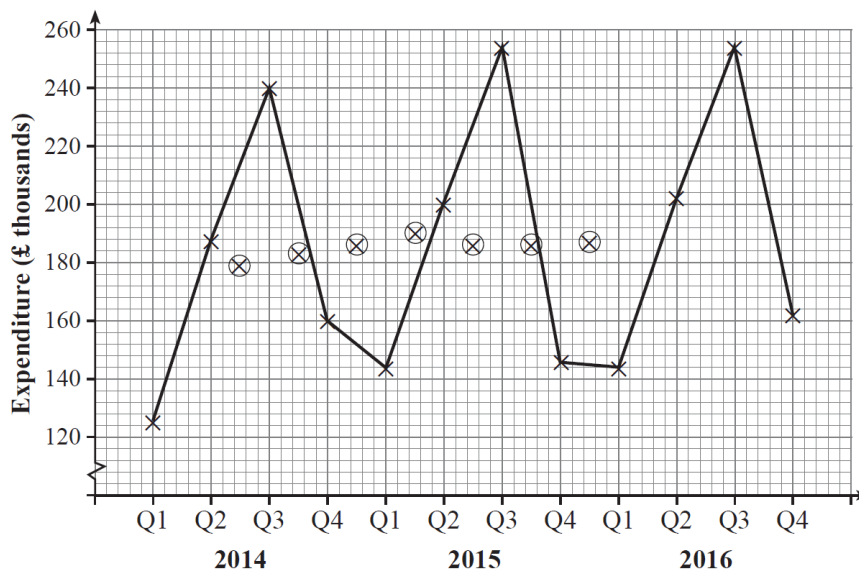
(b) The first seven 4-point moving averages have been calculated, to the nearest thousand, as follows:

179 183 186 190 186 186 187

- (i) Explain briefly why a 4-point moving average has been used.
- (ii) Calculate the last two 4-point moving averages.

Answer _____ and _____ [2]

The time series graph below shows the data in **Table 1**.
In addition, the first seven moving averages have been plotted.



- (c) Plot the remaining two moving averages, calculated in part (b)(ii), on the graph and draw a trend line. [2]
- (d) Use your trend line to estimate the expenditure, to the nearest £ thousand, for Quarter 1 of 2017

Laura works in the Human Resources department of a large company.

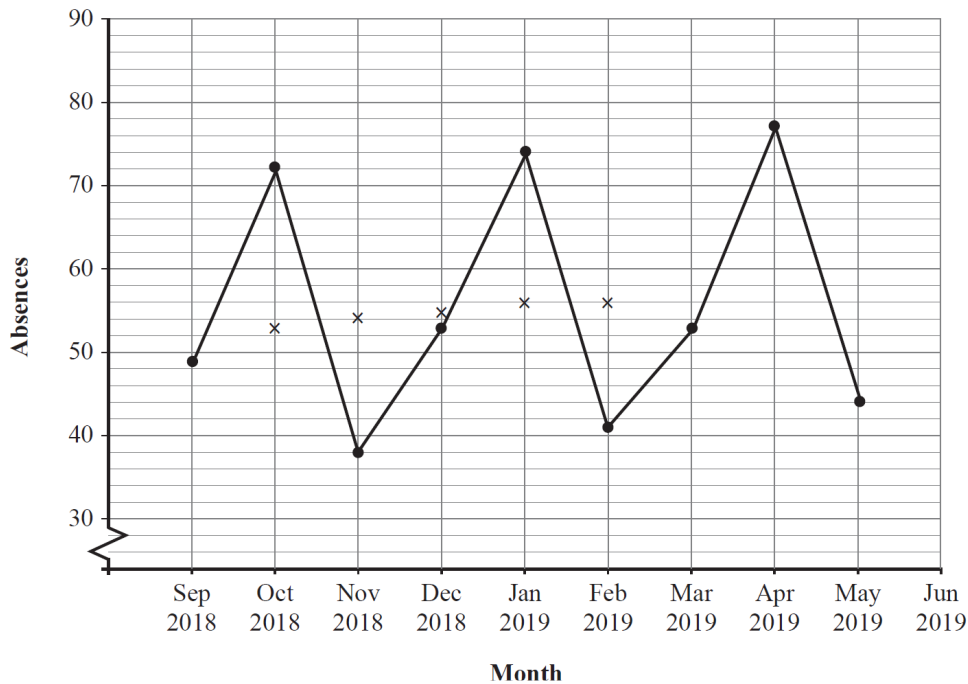
She recorded the number of absences every month between September 2018 and May 2019

Her results are shown in the table below.

Q3

Month	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019
Absences	49	72	38	53	74	41	53	77	44

Laura's results are shown in the graph below.



To illustrate the trend in the data, Laura calculated 3-point moving averages.

(a) Explain why Laura calculated moving averages using 3 points.

Laura plotted the first five moving averages on the graph.

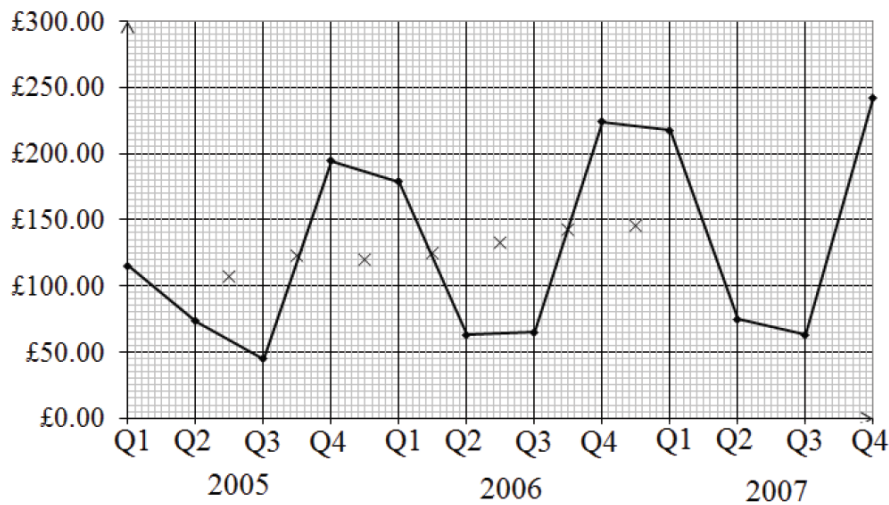
(b) Show that the next two moving averages are 57 and 58

(e) Use your trend line to predict the number of absences for June 2019

The time series graph and table below show Mrs Bailey's quarterly gas bills for 2005–2007.

The first seven four-point moving averages are also shown on the graph.

Q4



Adapted from <https://www.gov.uk/government/statistical-data-sets/monthly-domestic-energy-price-stastics>

Date	Q1 2005	Q2 2005	Q3 2005	Q4 2005	Q1 2006	Q 2 2006
Bill	£115.16	£73.22	£44.84	£194.18	£178.72	£62.73

Date	Q3 2006	Q4 2006	Q1 2007	Q2 2007	Q3 2007	Q4 2007
Bill	£65.12	£224.00	£217.67	£74.56	£62.94	£242.02

(a) (i) Calculate the next two four-point moving averages.

(ii) Plot these moving averages on the graph. [2]

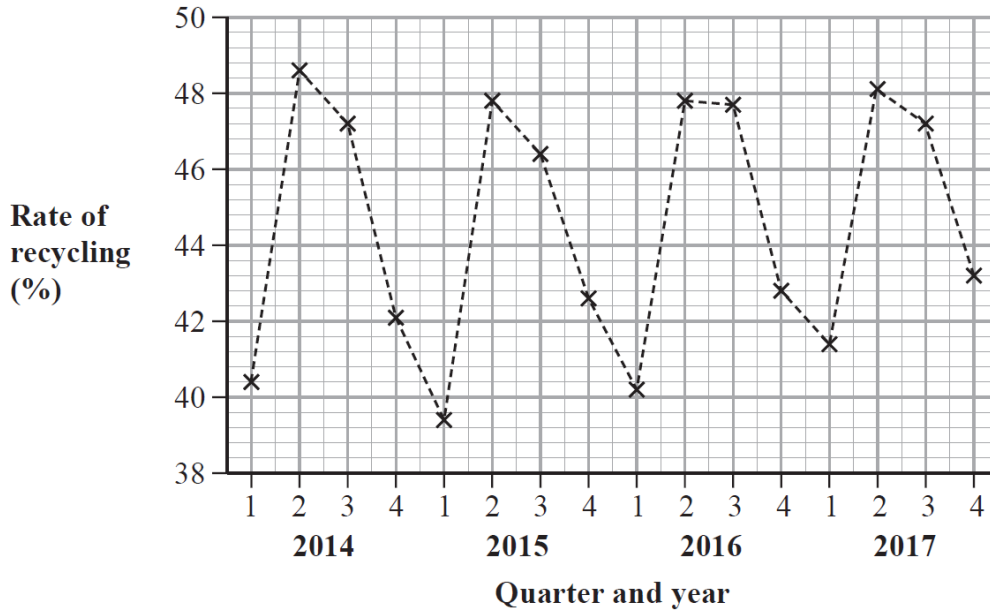
(b) Draw the trend line. [1]

(c) Describe the general trend in Mrs Bailey's gas bill over the three-year period.

Q5

The percentage of household waste that is recycled is called the rate of recycling.

The time series graph shows information about the rate of recycling for households in the UK for each quarter from 2014 to 2017



(Source: Department for Environment, Food and Rural Affairs)

(a) For which quarter each year from 2014 to 2017 was the rate of recycling between 42% and 44%?

- 1 2 3 4

(1)

Andrea uses n -point moving averages for the information shown in the time series graph in order to help determine the trend.

(c) Write down an appropriate value of n .
Give a reason for your answer.

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(2)

Andrea uses the time series graph to predict the rate of recycling in the UK for 2018 Quarter 3

(d) Discuss the reliability of Andrea's prediction.