Mean seasonal variation

Grade 8 | Worked solutions

GCSE Statistics topic practice

1 A shop sells ice cream. The table shows the actual sales and the trend line values, in thousands of pounds, for the third quarter (July to September) of each of three years.

Year	Actual sales (£1000s)	Trend value (£1000s)
1	86	60
2	91	64
3	93	68

Calculate the mean seasonal variation for the third quarter of the year. (3 marks)

seasonal variation = actual value - trend value

86 - 60 = 26

91 - 64 = 27

93 - 68 = 25

Find the mean of the three

26 + 27 + 25 = 78

78 ÷ 3 = 26

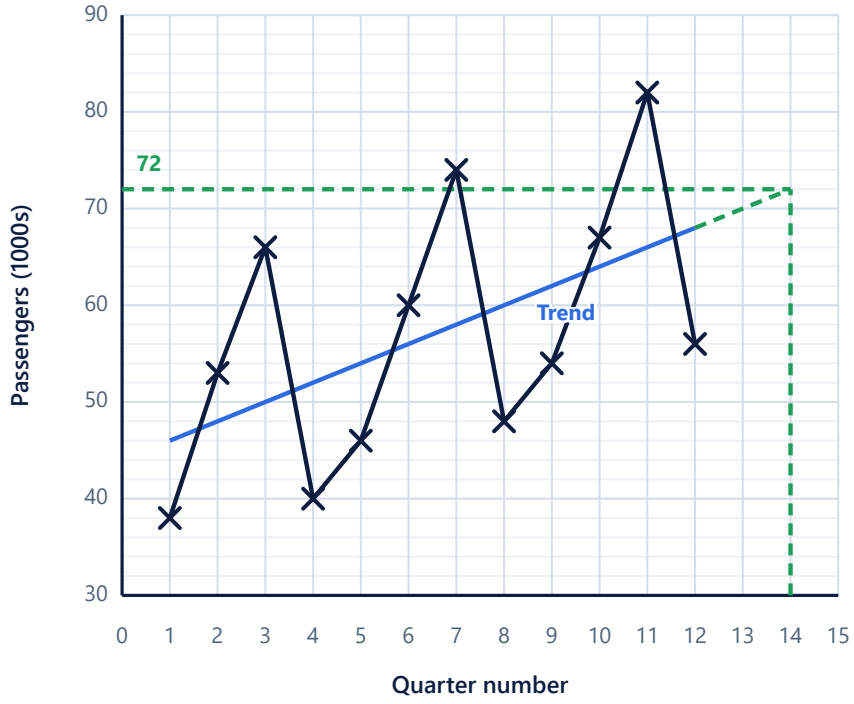
26 (£26 thousand)

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2 The time series graph shows the number of passengers, in thousands, using a ferry in each quarter of three years. Quarter 1 on the graph is January to March of Year 1. A trend line, labelled Trend, has been drawn.

a. Quarter 14 is the second quarter of Year 4. Extend the trend line and use it to find the trend value for quarter 14. (2)

b. The mean seasonal variation for the second quarter of the year is 4 thousand passengers. Predict the number of passengers in the second quarter of Year 4. (2)



(4 marks)

a)

Extend the trend line to quarter 14

Read up from 14 to the line, then across

Trend value = 72 thousand

b) prediction = trend value + mean seasonal variation

prediction = 72 + 4

prediction = 76

76 thousand passengers

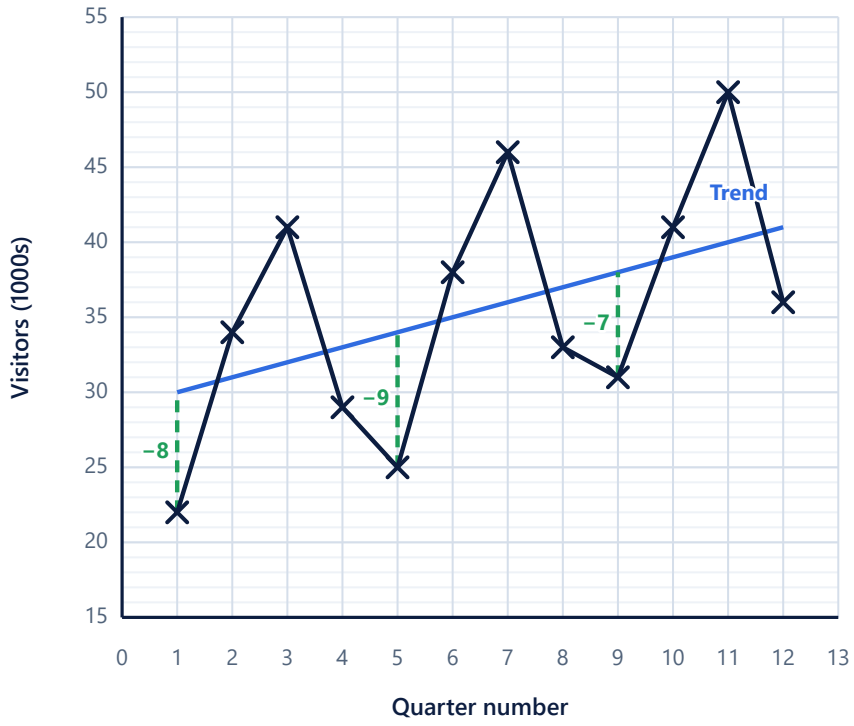
a) 72 thousand b) 76 thousand

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3 The time series graph shows the number of visitors, in thousands, to a museum in each quarter of three years. Quarter 1 on the graph is January to March of Year 1, so quarters 1, 5 and 9 are the first quarters of the three years. A trend line, labelled Trend, has been drawn.

a. Use the graph to calculate the mean seasonal variation for the first quarter of the year. (3)

b. Interpret your answer to part (a) in context. (1)



(4 marks)

a) Read the actual and trend values from the graph

Quarter 1 actual 22, trend 30

Quarter 5 actual 25, trend 34

Quarter 9 actual 31, trend 38

seasonal variation = actual value − trend value

$22 - 30 = -8$

$25 - 34 = -9$

$31 - 38 = -7$

Find the mean of the three

$(-8) + (-9) + (-7) = -24$

$-24 \div 3 = -8$

Mean seasonal variation = −8 thousand

b)

In the first quarter of a year the museum has about 8 thousand fewer visitors than the trend

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a) -8 thousand b) 8 thousand below the trend

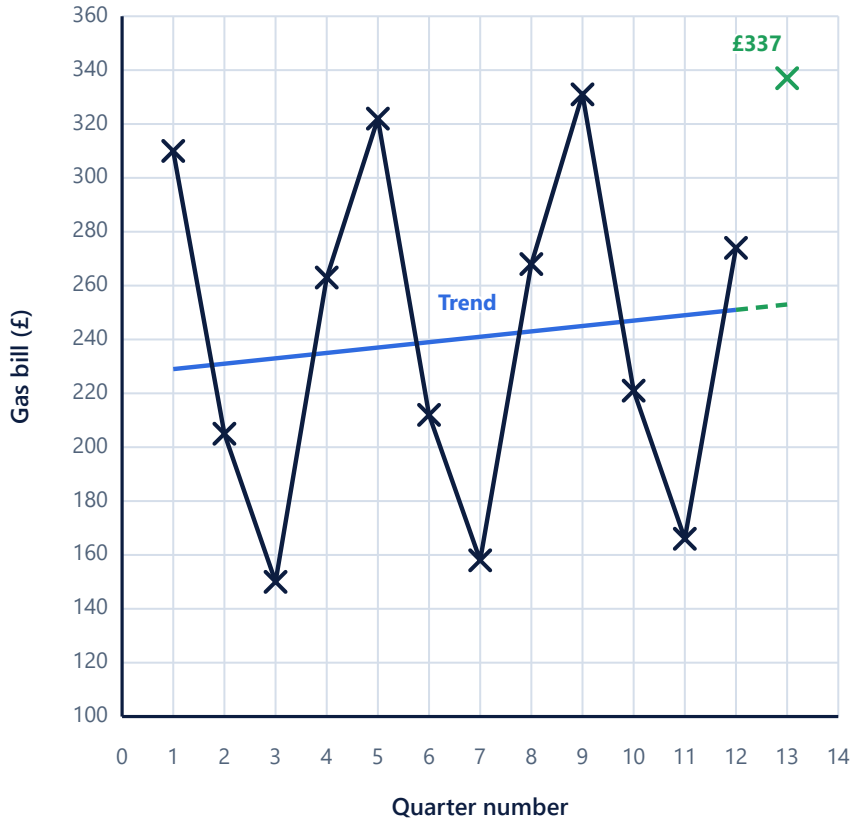
4 The time series graph shows the quarterly gas bills, in pounds, for a house over three years. Quarter 1 on the graph is January to March of Year 1. A trend line, labelled Trend, has been drawn.

The table shows the actual bill and the trend line value for the first quarter of each year.

Quarter number	Actual bill (£)	Trend value (£)
1 (Year 1)	310	229
5 (Year 2)	322	237
9 (Year 3)	331	245

a. Calculate the mean seasonal variation for the first quarter of the year. (3)

b. The trend line goes up by £2 each quarter. Predict the gas bill for the first quarter of Year 4. (2)



(5 marks)

a) seasonal variation = actual value - trend value

310 - 229 = 81

322 - 237 = 85

331 - 245 = 86

Find the mean of the three

81 + 85 + 86 = 252

252 ÷ 3 = 84

Mean seasonal variation = £84

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b) First quarter of Year 4 is quarter 13

4 quarters after quarter 9, so the trend goes up 4 x £2

trend value = 245 + 4 x 2

trend value = 253

prediction = trend value + mean seasonal variation

prediction = 253 + 84

prediction = £337

a) £84 b) £337

5 A theatre records its ticket sales, in thousands of pounds, for each of the three terms (spring, summer and autumn) of three years. The time series graph shows the sales. Period 1 on the graph is spring of Year 1. A trend line, labelled Trend, has been drawn.

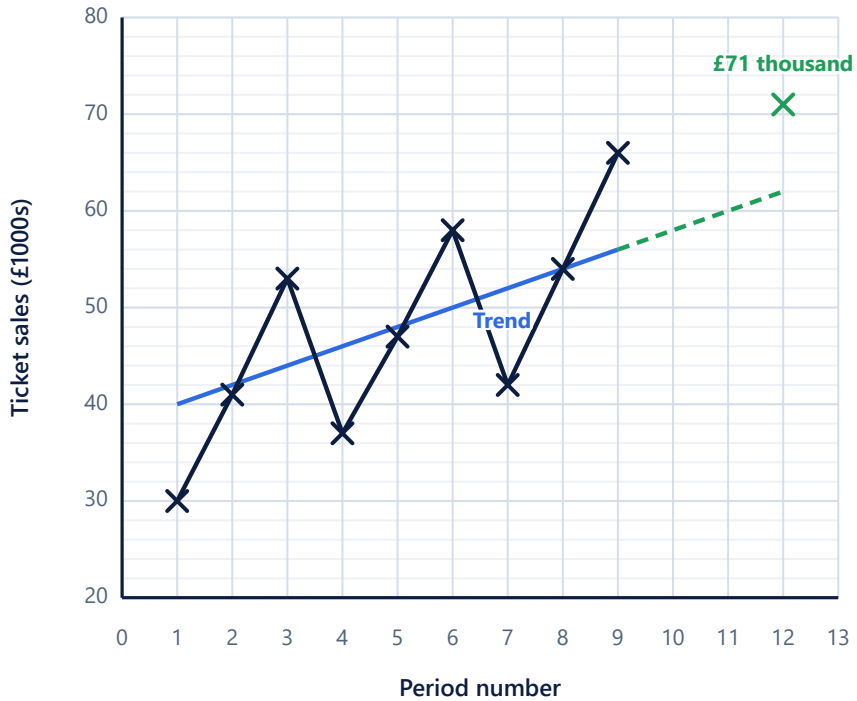
The table shows the actual sales and the trend line values for the autumn term of each year.

Period number	Actual sales (£1000s)	Trend value (£1000s)
3 (Year 1)	53	44
6 (Year 2)	58	50
9 (Year 3)	66	56

a. Calculate the mean seasonal variation for the autumn term. (2)

b. Predict the ticket sales for the autumn term of Year 4. (2)

c. Give one reason why your prediction may not be reliable. (1)



(5 marks)

a) seasonal variation = actual value − trend value

53 − 44 = 9

58 − 50 = 8

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$66 - 56 = 10$

Find the mean of the three

$9 + 8 + 10 = 27$

$27 \div 3 = 9$

Mean seasonal variation = 9 (£9 thousand)

b) Autumn of Year 4 is period 12

The trend goes up 6 every 3 periods, so 2 each period

trend value $= 56 + 3 \times 2$

trend value $= 62$

prediction = trend value + mean seasonal variation

prediction $= 62 + 9$

prediction $= 71$

£71 thousand

c)

Period 12 is outside the range of the data

The trend may not continue in the same way

a) 9 (£9 thousand) b) £71 thousand c) trend may not continue

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