Seasonal variation and predictions

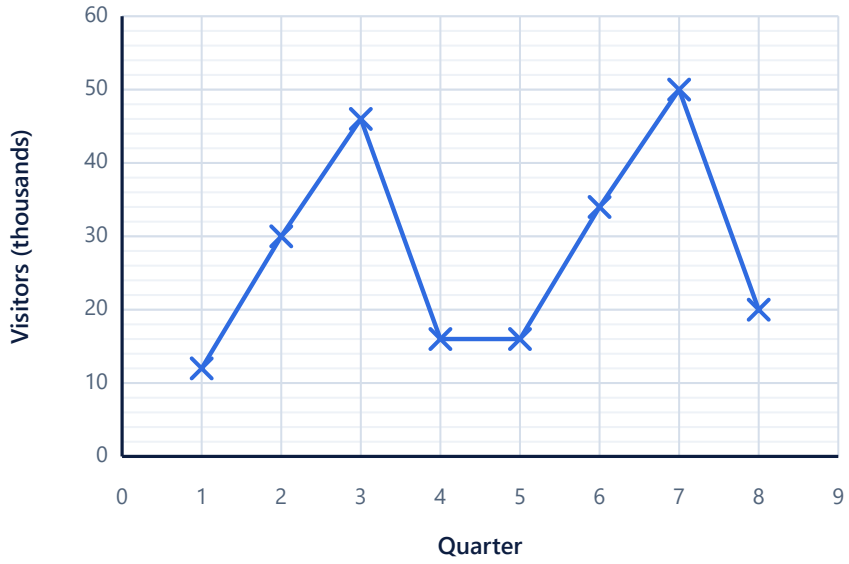
Grade 6 | Worked solutions

GCSE Statistics topic practice

1 The time series graph shows the number of visitors, in thousands, to a seaside theme park in each quarter of 2023 and 2024. Quarter 1 is January to March 2023 and quarter 5 is January to March 2024.

a. Describe the trend in the number of visitors. (1)

b. Describe the seasonal variation in the number of visitors. (2)



(3 marks)

a)

Each quarter in 2024 is higher than the same quarter in 2023.

The trend is upwards.

b)

The same pattern repeats every year.

Visitors are highest in July to September.

Visitors are lowest in January to March.

a) upward trend b) high in quarter 3, low in quarter 1

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2 The table shows the sales of a garden centre, in thousands of pounds, for each quarter of 2024. It also shows the trend value for each quarter, read from a trend line.

Quarter of 2024	1	2	3	4
Actual sales (£ thousands)	52	68	75	61
Trend value (£ thousands)	60	62	64	66

a. Work out the seasonal variation for each quarter. (2)

b. Interpret the seasonal variation for quarter 3. (1)

c. The trend value for quarter 3 of 2025 is £72 thousand. Use your seasonal variation for quarter 3 to estimate the sales in quarter 3 of 2025. (1)

(4 marks)

a)

Seasonal variation = actual value - trend value

52 - 60 = -8

68 - 62 = 6

75 - 64 = 11

61 - 66 = -5

b)

In quarter 3 the sales were £11 000 higher than the trend.

c)

Estimate = trend value + seasonal variation

72 + 11 = 83

a) -8, +6, +11, -5 b) £11 000 above trend c) £83 000

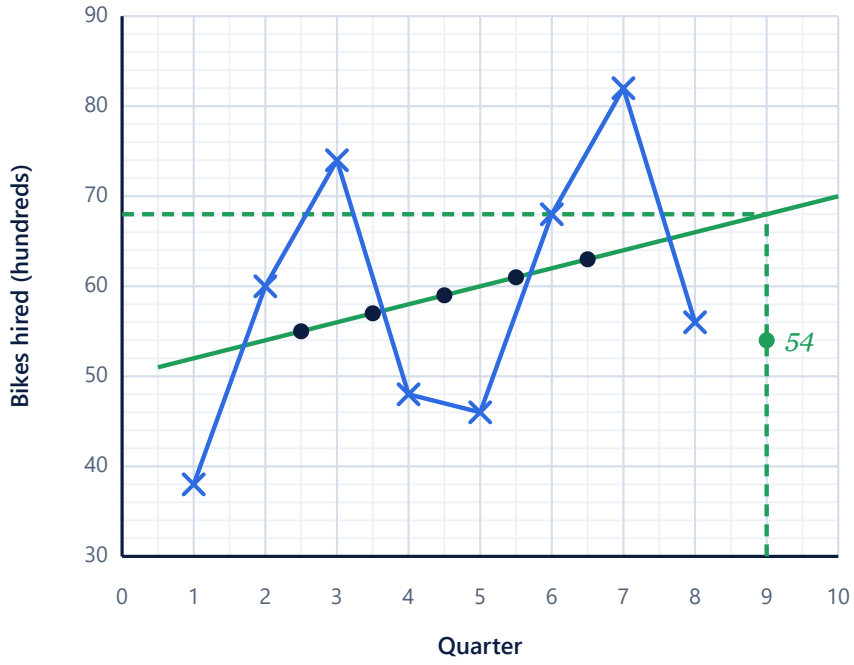
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3 A bike hire company records the number of bikes hired in each quarter of 2024 and 2025. Quarter 1 is January to March 2024. The graph shows the number of bikes hired, in hundreds, as crosses joined by lines. The 4-point moving averages are plotted as dots.

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

b. Use your trend line to find the trend value for quarter 9 (January to March 2026). (1)

c. The mean seasonal variation for the January to March quarter is −14 hundred. Predict the number of bikes hired in quarter 9. (2)



(4 marks)

a)

Draw a straight line through the dots.

Extend it as far as quarter 9.

b)

Go up from quarter 9 to the trend line.

The trend value is 68 hundred.

c)

Prediction = trend value + mean seasonal variation

$68 + (-14) = 68 - 14$

$68 - 14 = 54$

$54 \times 100 = 5400$

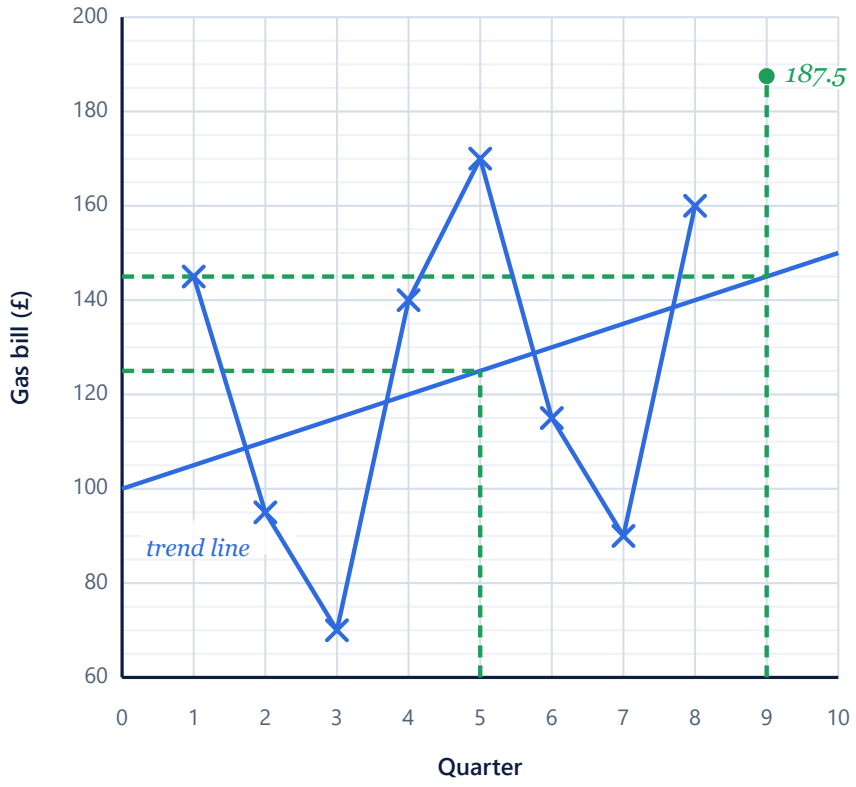
a) Line through the dots b) 68 hundred c) 5400 bikes

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4 The time series graph shows a household's gas bill, in pounds, for each quarter of 2024 and 2025. Quarter 1 is January to March 2024 and quarter 5 is January to March 2025. A trend line has been drawn on the graph.

a. The gas bill for quarter 5 was £170. Work out the seasonal variation for quarter 5. (2)

b. The seasonal variation for quarter 1 was +£40. Work out the mean seasonal variation for the January to March quarter, and use it to predict the gas bill for quarter 9 (January to March 2026). (3)



(5 marks)

a)

The trend line value at quarter 5 is 125

Seasonal variation = actual value - trend value

170 - 125 = 45

b)

The two seasonal variations are +40 and +45

Mean = (40 + 45) ÷ 2

= 42.5

The trend line value at quarter 9 is 145

Prediction = trend value + mean seasonal variation

145 + 42.5 = 187.5

a) +£45 b) mean +£42.50, prediction £187.50

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5 A courier records the number of parcels it delivers each quarter. The table shows the seasonal variations, in thousands of parcels, for quarter 4 (October to December) of three years.

Year	2022	2023	2024
Seasonal variation for quarter 4	+21	+26	+25

a. Work out the mean seasonal variation for quarter 4. (2)

b. The trend value for quarter 4 of 2024 was 180 thousand parcels. The trend line rises by 3 thousand parcels every quarter. Predict the number of parcels delivered in quarter 4 of 2025. (2)

c. Explain why a prediction for quarter 4 of 2030 made in the same way would be less reliable. (1)

(5 marks)

a)

21 + 26 + 25 = 72

72 ÷ 3 = 24

b)

Quarter 4 of 2025 is 4 quarters later

4 x 3 = 12

Trend value = 180 + 12

= 192

Prediction = trend value + mean seasonal variation

192 + 24 = 216

c)

2030 is a long way beyond the data.

The trend may not carry on the same way.

a) +24 thousand b) 216 thousand parcels c) too far ahead

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