Moving averages

Grade 5 | Worked solutions

GCSE Statistics topic practice

1 A cafe is open on Thursday, Friday and Saturday each week. The table shows its takings, in hundreds of pounds, for two weeks.

Week	**Week 1**			**Week 2**		
Day	Thu	Fri	Sat	Thu	Fri	Sat
Takings (£ hundreds)	8	12	16	11	15	19

a. Work out the first two 3-point moving averages. (2)

b. Explain why a 3-point moving average is suitable for this information. (1)

(3 marks)

a)

$(8 + 12 + 16) \div 3 = 36 \div 3$

$= 12$

$(12 + 16 + 11) \div 3 = 39 \div 3$

$= 13$

b)

The cafe is open 3 days each week,

so the pattern repeats every 3 values.

a) 12 and 13 b) pattern repeats every 3 values

2 The table shows the amount of gas, in thousands of kWh, used by a school in each term of two school years.

School year	**Year 1**	**Year 1**	**Year 1**	**Year 2**	**Year 2**	**Year 2**
Term	Autumn	Spring	Summer	Autumn	Spring	Summer
Gas used (thousand kWh)	45	60	30	51	66	39

The first 3-point moving average is 45.

a. Work out the other three 3-point moving averages. (3)

b. Describe what the moving averages show about the trend in the amount of gas used. (1)

(4 marks)

a)

Add three terms in a row, then divide by 3

$(60 + 30 + 51) \div 3 = 141 \div 3$

$= 47$

$(30 + 51 + 66) \div 3 = 147 \div 3$

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$= 49$

$(51 + 66 + 39) \div 3 = 156 \div 3$

$= 52$

b)

The moving averages go up each time.

The trend is upward.

The school is using more gas over time.

a) 47, 49, 52 b) upward trend, gas use is increasing

3 The table shows the number of new members who joined a gym in each of five months. The numbers for April and May are missing.

Month	Jan	Feb	Mar	Apr	May
New members	17	21	22		

The three 3-point moving averages, in order, are 20, 22 and 23.

a. Work out the number of new members in April. (2)

b. Work out the number of new members in May. (2)

(4 marks)

a)

The second moving average uses Feb, Mar and Apr

$3 \times 22 = 66$

$66 - 21 - 22 = 23$

b)

The third moving average uses Mar, Apr and May

$3 \times 23 = 69$

$69 - 22 - 23 = 24$

a) 23 b) 24

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4 The table shows the number of umbrellas, in hundreds, sold by a shop in each quarter of two years. The time series graph shows the same information. On the graph, quarters 1 to 4 are Year 1 and quarters 5 to 8 are Year 2.

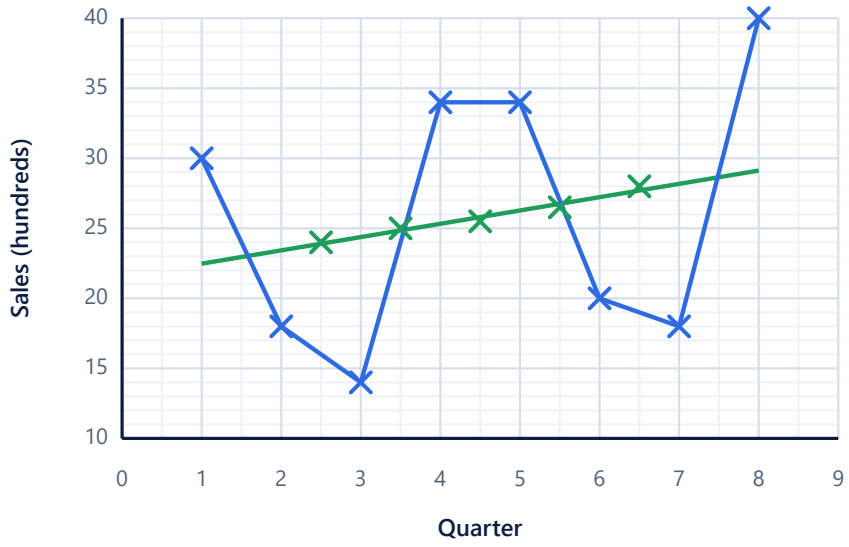
Quarter	1	2	3	4	5	6	7	8
Sales (hundreds)	30	18	14	34	34	20	18	40

The first three 4-point moving averages are 24, 25 and 25.5

a. Work out the last two 4-point moving averages. (2)

b. Plot all five moving averages on the graph. Plot each one at the middle of the four quarters it covers. (2)

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



(5 marks)

a)

$(34 + 34 + 20 + 18) \div 4 = 106 \div 4$

$= 26.5$

$(34 + 20 + 18 + 40) \div 4 = 112 \div 4$

$= 28$

b)

The first one covers quarters 1 to 4

so it is plotted halfway, at 2.5

Plot (2.5, 24), (3.5, 25), (4.5, 25.5),

(5.5, 26.5) and (6.5, 28)

c)

Draw a line of best fit through these points.

a) 26.5 and 28 b) points plotted c) trend line drawn

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5 The table shows the number of visitors, in thousands, to a castle in each quarter of two years. The number for the last quarter is missing.

Year	**Year 1**				**Year 2**			
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Visitors (thousands)	12	20	28	16	14	22	32	

The first 4-point moving average is 19 and the fourth is 21.

a. Work out the second and third 4-point moving averages. (2)

b. The fifth 4-point moving average is 22. Work out the number of visitors, in thousands, in Q4 of Year 2. (2)

c. The castle manager says, "Visitors fell from 28 thousand in Q3 to 16 thousand in Q4 of Year 1, so the castle is getting less popular." Use the moving averages to explain why the manager is wrong. (1)

(5 marks)

a)

$(20 + 28 + 16 + 14) \div 4 = 78 \div 4$

$= 19.5$

$(28 + 16 + 14 + 22) \div 4 = 80 \div 4$

$= 20$

b)

The fifth one uses the four quarters of Year 2

$4 \times 22 = 88$

$88 - 14 - 22 - 32 = 20$

c)

The moving averages are 19, 19.5, 20, 21, 22

They go up every time, so the trend is upward.

The fall in Q4 each year is seasonal variation.

a) 19.5 and 20 b) 20 thousand c) the trend is upward

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