



S15-test Time Series and Moving Averages: Test Pack

EDEXCEL 1ST0 · Calculator allowed · about 25 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Statisticians use special words to describe patterns in data collected over time.
- (a) State the name given to the smooth, general direction of change shown by a moving average, once the ups and downs within each year have been smoothed out. (1)
- (b) State the name given to the regular rise and fall in a time series that repeats in the same way each year, such as ice cream sales rising every summer. (1)

(Total for Question 1 is 2 marks)

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- 2** Write down whether this statement is True or False.
A 4-point moving average value is plotted at the same time point as the last of the 4 values used to calculate it.

(Total for Question 2 is 1 mark)

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- 3** The total of four consecutive quarterly sales figures is 150. Work out the 4-point moving average for this data.

(Total for Question 3 is 1 mark)

- 4 A garden centre's quarterly compost sales are shown again.

Quarter	Y1 Q1	Y1 Q2	Y1 Q3	Y1 Q4	Y2 Q1	Y2 Q2
Bags of compost sold	54	88	112	46	58	94

- (a) Which of these calculations gives the second 4-point moving average for this data? (1)

- ☐ A) $(54 + 88 + 112 + 46) / 4$
☐ B) $(88 + 112 + 46 + 58) / 4$
☐ C) $(112 + 46 + 58 + 94) / 4$
☐ D) $(54 + 88 + 112 + 46 + 58) / 5$

- (b) Hence write down the value of this moving average. (1)

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(Total for Question 4 is 2 marks)

- 5 A garden centre's first two 4-point moving averages for compost sales are 60 and 63. State whether the trend is increasing or decreasing, and give a reason.

(Total for Question 5 is 2 marks)

- 6 A bakery has 10 quarters of sales data. Work out how many 4-point moving averages can be calculated from this data.

(Total for Question 6 is 2 marks)

- 7** A shop's quarterly sales are recorded for 2 complete years, giving 8 quarters of data in total.
- (a)** Calculate how many 4-point moving averages can be found from these 8 quarters of data. Show how you worked this out. **(2)**

- (b)** Explain why no moving average value can be plotted at Quarter 1 or at Quarter 8. **(1)**

(Total for Question 7 is 3 marks)

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- 8** A toy shop's quarterly sales of umbrellas are 15, 45, 20, 10, 18, 50. Calculate the first three 4-point moving averages for this data.

(Total for Question 8 is 3 marks)

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- 9** A cafe's trend value is 65 in one quarter, and is expected to increase by 4 each quarter. The seasonal variation for the following quarter is known to be -6. Predict the trend value for the following quarter, then use it to forecast the actual sales for that quarter.

(Total for Question 9 is 3 marks)

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- 10** A shop's five successive 4-point moving averages are, in order: 80, 78, 82, 85, 90. State whether the trend is increasing, decreasing or roughly constant, giving a reason using values from the list. A student then claims that these moving averages prove every individual quarter sold more than the quarter before it. Explain why this claim is not necessarily correct.

(Total for Question 10 is 3 marks)

Mark scheme · S15-test Time Series and Moving Averages: Test Pack

Question 1

- (a) **B1** Trend cao
- (a) **Answer: Trend**
- (b) **B1** Seasonal variation cao
- (b) **Answer: Seasonal variation**

Question 2

- **B1** False cao
- **Answer: False**

Question 3

- **B1** 37.5 cao
- **Answer: 37.5**

Question 4

- (a) **B1** B cao
- (a) **Answer: B) $(88 + 112 + 46 + 58) / 4$**
- (b) **B1** 76 cao
- (b) **Answer: 76**

Question 5

- **M1** compares 60 and 63, oe
- **A1** Increasing, since 63 is greater than 60
- **Answer: Increasing, since 63 is greater than 60**

Question 6

- **M1** $10 - 4 + 1$, oe
- **A1** 7 cao
- **Answer: 7**

Question 7

- (a) **M1** correct method, e.g. $8 - 4 + 1$, or lists the valid groups (quarters 1-4, 2-5, 3-6, 4-7, 5-8)
- (a) **A1** 5 cao
- (a) **Answer: 5**
- (b) **B1** each moving average is plotted at the midpoint in time of the 4 values used; quarter 1 and quarter 8 are always at the very start or end of a group of 4, never at the middle, so no moving average is centred there, oe
- (b) **Answer: Quarter 1 and Quarter 8 can never be the midpoint of a group of 4 consecutive quarters, so no moving average is plotted there.**

Question 8

- **M1** correct method shown, e.g. $(15 + 45 + 20 + 10) / 4$
- **A1** 22.5 and 23.25 cao
- **A1** 24.5 cao
- **Answer: 22.5, 23.25, 24.5**

Question 9

- **M1** $65 + 4$, oe
- **A1** 69 cao
- **A1** 63 cao ft $(69 + (-6))$
- **Answer: Trend = 69; forecast sales = 63**

Question 10

- **B1** Increasing
- **B1** valid reason comparing the first (80) and last (90) values, or noting the general rise, or
- **B1** explains that moving averages smooth out/remove seasonal variation, so they cannot show whether every individual quarter's raw sales rose, or
- **Answer: Increasing (90 is greater than 80, and the values generally rise); the claim is not necessarily correct because a moving average removes seasonal variation and cannot show whether every individual quarter's raw sales rose.**