Quantitative skills
Averages

3 Point Moving Average and Other Data where Averages can be Relevant

Method

To calculate a simple average of data, add up all the numerical information provided to find the **total** figure and **divide** it by the **number of items** you have added up. For example, let's assume that the revenue of a person selling ice creams in a seven-day period are as follows:

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Revenue (£)	70	60	80	45	100	125	175

If all of the revenue figures are added up, this gives a **total** of £655. To find the average revenue in this seven-day period, the **total** is **divided** by the **number of items**, which is 7 days in this case.

Therefore, the average revenue per day is £655 / 7 days = £93.57.

Remember, to calculate an average:	Add up each figure to get the total
	Number of figures

In the specification, you are asked to calculate a 3-point moving average. Consider the data below for a hair and beauty salon.

| Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Revenue (£)	3 000	3 500	4 000	3 500	3 600	4 000	4 000	4 500

In order to calculate the 3 point moving average, the first 3 figures are added up and divided by 3 (i.e. Jan, Feb, Mar). This gives the average revenue for the 3 months Jan – Mar. Then, move one number across so that the 3-point average is calculated for Feb, Mar, Apr. Continue this pattern of calculations until you get to the end, and you will get a table as below:

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Revenue (£)	3 000	3 500	4 000	3 500	3 600	4 000	4 000	4 500
3-point moving average		3 500	3 667	3 700	3 700	3 867	4 167	

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Notice that Jan and Aug do not have figures because they are not midpoints of the 3 months being calculated. What can be seen from the 3-point moving average is that revenue has increased (and remained the same for midpoints Apr and May).
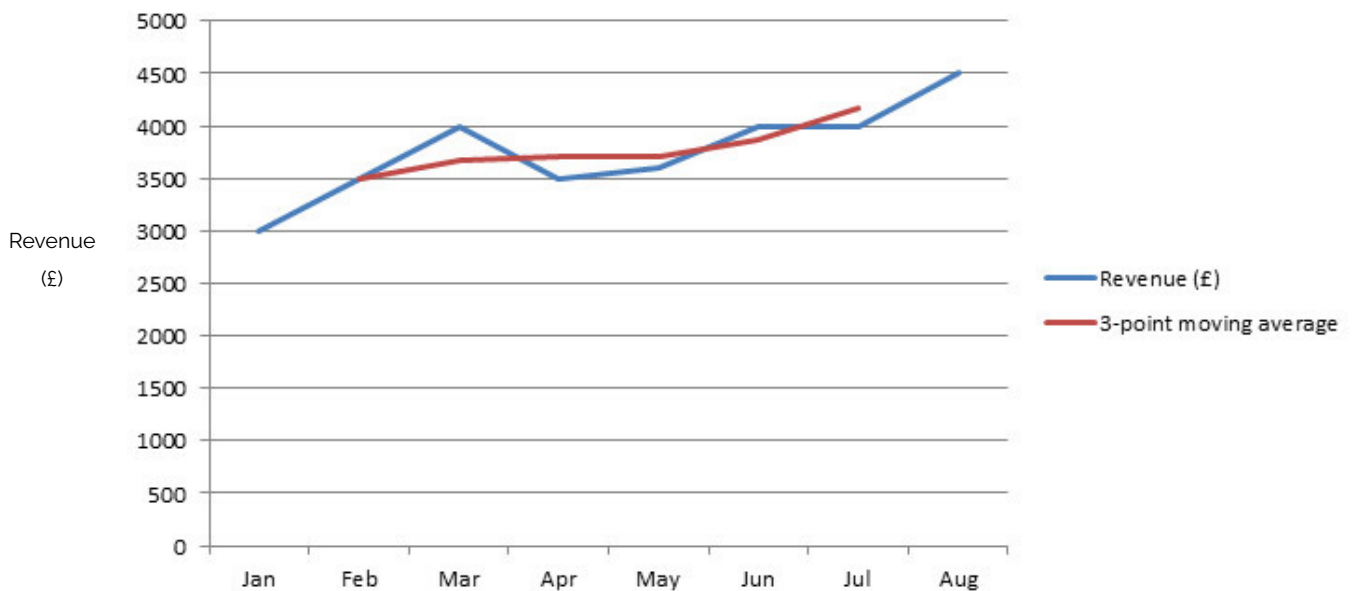
As you can see from the data in the line graphs, the 3-point moving average has smoothed the fluctuations of the revenue over each month. Calculating and plotting the 3-point moving average can make it easier for this hair and beauty salon to help predict their revenue in future months, if their business continues to grow at a similar rate.

Example 1

Calculate the 3-point moving average for the data below based on the sales of a local car mechanic:

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Revenue (£)	45 000	39 500	35 500	29 000	26 000	28 000	31 000	32 500

Answer:

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Revenue (£)	45 000	39 500	35 500	29 000	26 000	28 000	31 000	32 500
3-point moving average (£)								

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Example 2

Calculate the 3-point moving average for the data below based on the quarterly sales of a newsagent:

Year	2014				2015			
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Revenue (£)	240 000	245 000	275 000	260 000	250 000	265 000	280 000	270 000

Answer:

Year	2014				2015			
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Revenue (£)	240 000	245 000	275 000	260 000	250 000	265 000	280 000	270 000
3-point moving average (£)								

Example 3

Calculate the 3-point moving average for the data below based on the annual earnings of a self-employed electrician over the past 10 years:

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Revenue (£000's)	18	20	22	28	32	34	38	38	41	43

Answer:

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Revenue (£000's)	18	20	22	28	32	34	38	38	41	43
3-point moving average (£)										

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Example 4

The data below shows the number of people that enter through the doors of a busy shopping centre on each date shown. Calculate the average number of people entering the shopping centre during this period.

Date	01-Sep	02-Sep	03-Sep	04-Sep	05-Sep	06-Sep	07-Sep	08-Sep	09-Sep	10-Sep
Number of people	47 000	96 000	150 000	135 000	56 000	43 000	46 000	65 000	101 000	155 000

Answer:

Example 5

The data below shows the number of people called by a charity each month over a 12-month period to talk to people about donating money. Calculate the average number of people called between the months of Jan to Jun, and then the average number of people called between Jul and Dec.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Number of people (000's)	45	30	35	37	32	31	31	35	39	40	41	43

Answer:

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Example 6

The data below shows the percentage score for bakery stores that were part of a 'mystery shopping' survey to assess customer service standards. Calculate the average percentage score for the stores visited. Give your answer to 2.d.p. and use the correct unit of measurement.

Store	1	2	3	4	5	6	7
Score (%)	74	92	87	91	85	78	79

Answer:

Example 7

The table below shows the profit for a village bakery over a number of years. Calculate the average profit during the period shown.

Year	2010	2011	2012	2013	2014	2015
Profit (£000s)	67	98	125	129	134	141

Answer:

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Example 8

Calculate the 3-point moving average for the data below. In which midpoint year is the 3-point moving average the highest?

Year	2008	2009	2010	2011	2012	2013	2014	2015
Revenue	£40 000	£41 500	£40 500	£39 500	£37 750	£35 000	£33 500	£32 000

Answer:

Example 9

The table below shows the number of complaints received by a T.V. channel about the adverts shown on their channel. Calculate the average number of complaints received in the period considered (round to the nearest whole number).

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Number of complaints	175	129	135	150	137	168	175	128

Answer:

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Example 10

The data below shows the output for three machines over a three month period. Which of the machines had the highest average output over the 3 month period?

Machine Number	1	1	1	2	2	2	3	3	3
Month	Jan	Feb	Mar	Jan	Feb	Mar	Jan	Feb	Mar
Output (units)	350	375	355	450	330	225	150	435	225

Answer:

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Example 1

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Revenue (£)	45 000	39 500	35 500	29 000	26 000	28 000	31 000	32 500
3-point moving average (£)		40 000	34 667	30 167	27 667	28 333	30 500	

Example 2

Year	2014				2015			
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Revenue (£)	240 000	245 000	275 000	260 000	250 000	265 000	280 000	270 000
3-point moving average (£)		253 333	260 000	261 667	258 333	265 000	271 667	

Example 3

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Revenue (£000's)	18	20	22	28	32	34	38	38	41	43
3-point moving average (£)		20	23	27	31	34	36	39	41	

Example 4

89 400 or 89400

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Example 5

Jan – Jun = 35 or 35 000 or 35000
Jul – Dec = 38.2 or 38 200 or 38200

Example 6

83.71%

Example 7

£116 000 or £116000

Example 8

2009

Example 9

150

Example 10

1 or machine 1