

Walking Talking - Averages

1.

1. The table below shows the shoe sizes of 20 people.

Shoe size	Number of people	Shoe size x freq
38	3	114
39	9	351
40	5	200
41	3	123
		788

Calculate the mean shoe size.

$$\frac{788}{20} = 39.4$$

[3]

2.

- (a) (i) When visiting a hat shop, customers had the circumference of their head measured. The table shows the results for the customers who bought a hat during December.

Head circumference, c cm	Number of customers	Mid	Mid \times Freq
$50 \leq c < 54$	12	52	624
$54 \leq c < 58$	32	56	1792
$58 \leq c < 62$	14	60	840
$62 \leq c < 66$	2	64	128
	60		3384

Calculate an estimate for the mean head circumference.

$$\frac{3384}{60} = 56.4$$

[4]

- (ii) The hat shop sells 4 different sizes of hats. The conversion table from head circumference to hat size is shown below.

Head circumference, c cm	Hat size
$50 \leq c < 54$	1
$54 \leq c < 58$	2
$58 \leq c < 62$	3
$62 \leq c < 66$	4

A salesman places an order for new stock for the hat shop. The salesman's order form shows that about half of the hats ordered are size 2. The owner of the shop says the order should show that about a quarter of the hats ordered are size 2. Who is more likely to be correct, the salesman or the owner of the shop? You must give a reason for your answer.

$\frac{32}{60}$ sold were size 2

$\frac{30}{60}$ is half $\frac{15}{60}$ is quarter

closer to this so the salesman is correct

[2]

(b) Sales of hats were recorded each season.

Season	Summer 2011	Autumn 2011	Winter 2012	Spring 2012	Summer 2012	Autumn 2012
Number of hats sold	348	184	266	170	320	160

(i) Calculate the 4-season moving averages and complete the table below.

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4-season time period ending:	Spring 2012	Summer 2012	Autumn 2012
4-season moving average:			

[3]

(ii) Explain why using the 4-season moving average is useful.

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[1]

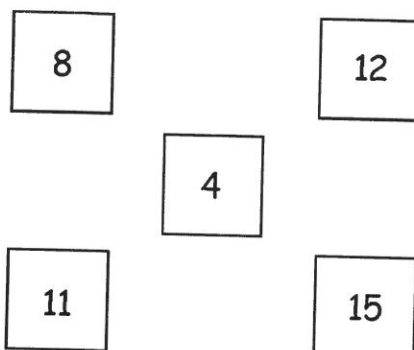
OLD SPEC.

3.

Matthew is playing a game that uses numbered tiles.

The game involves working out the range and mean of the numbers on five tiles.

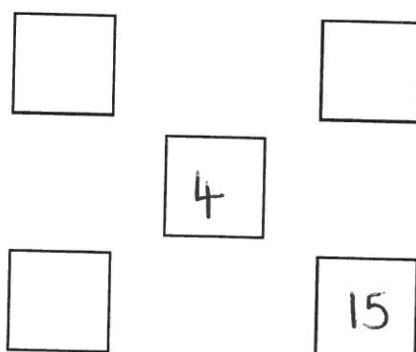
Matthew has these five tiles.



With his final move in a game, Matthew must replace **exactly two** of his tiles with two different tiles.

To win the game he must keep the **same range** as above but **increase the mean by 1**.

Fill in the numbers on the tiles below to show the three tiles he has kept, and the new numbers on the two tiles he has changed, if he is to win.



For working:

current range is $15 - 8 = 7$

current mean is $(8 + 12 + 4 + 11 + 15) \div 5 = 10$

keep range the same \therefore keep 15 and 4

new mean = 11 \therefore 5 tiles must add up to $5 \times 11 = 55$

[3]

4.

- (a) A survey was carried out to find the mass of each member of a gym who uses a rowing machine.
The stem and leaf diagram shows the results of the survey.

Women		Men
	9	0
	8	2 3
3	7	1 4 6 8 8
8 3	6	7 8
7 1 1	5	

Key: Women 3 | 7 means 73 kg
Men 6 | 7 means 67 kg

- (i) Complete the following table.

	Median in kg	Range in kg	Mode in kg
Women	60	22	51
Men	77	23	78

$$73 - 51 = 22$$

$$90 - 67 = 23$$

[3]

- (ii) Debbie states,

"In general the men weigh more than the women".

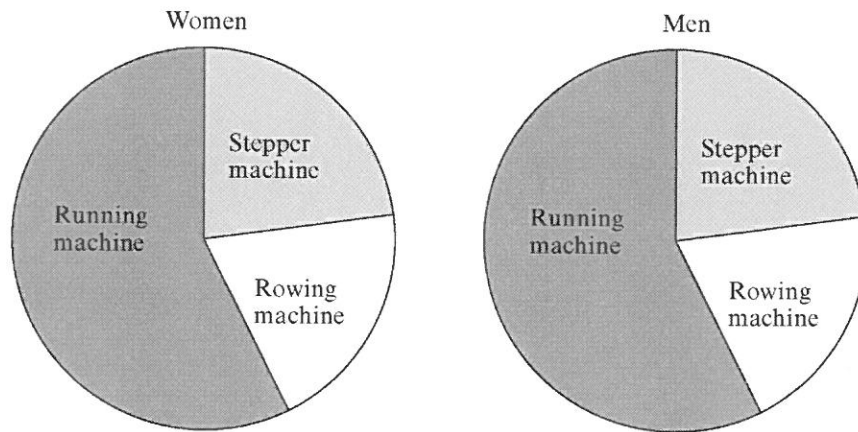
What statement can be made about the spread of the data?

The spread of data does not show that in general the men weigh more than the women.

[1]

- (b) The same men and women were asked, whilst at the gym, how much time they spent on each of three fitness machines, the rowing machine, the stepper machine and the running machine.

The gym instructor produced the following pie charts to display the results of this survey.



Tomas states,

"Men and women at the gym spend the same time on each of the three machines as each other".

Give a reason why Tomas may be wrong.

If either men or women spend a longer time in total in the gym then the time on each machine would be different.

[1]

5.

Fifty people took part in a charity walk.
The table shows a grouped frequency distribution of the amounts of money raised, to the nearest £.

Amount a , in £	Number of people	MID	Mid \times Freq
$10 \leq a \leq 19$	2	14.5	29
$20 \leq a \leq 29$	18	24.5	441
$30 \leq a \leq 39$	29	34.5	1000.5
$40 \leq a \leq 49$	1	44.5	44.5

- (a) Calculate an estimate for the mean amount of money raised per person.

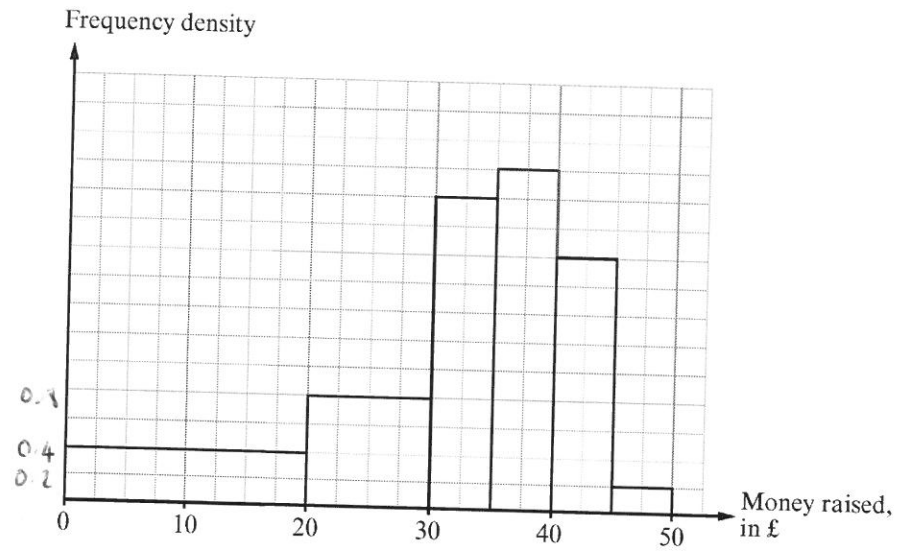
Total 50

Total 1515

$$\frac{1515}{50} = 30.3$$

[4]

- (b) Morgan arranged a charity run to raise money. She had drawn a histogram to show the distribution of money raised from the charity run.



Morgan has forgotten to write the scale on the vertical axis. She remembers that 16 people raised £30 or less. Calculate an estimate for the total money raised.

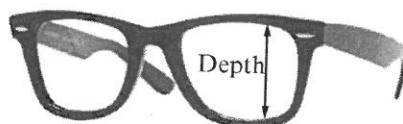
$$\begin{array}{rcl}
 20 \times 0.4 = 8 & \times 10 & = 80 \\
 10 \times 0.8 = 8 & \times 25 & = 200 \\
 5 \times 2.2 = 11 & \times 32.5 & = 357.5 \\
 5 \times 2.4 = 12 & \times 37.5 & = 450 \\
 5 \times 1.8 = 9 & \times 42.5 & = 382.5 \\
 5 \times 0.2 = 1 & \times 47.5 & = 47.5 \\
 \hline
 49 & & \pounds 1517.50
 \end{array}$$

$$\begin{array}{rcl}
 \text{[redacted]} & \times & \text{[redacted]} = \text{[redacted]} \\
 & & \text{[redacted]}
 \end{array}$$

[6]

6.

- (a) The depth of a lens in a pair of glasses is measured as shown below.



A number of people wearing glasses were surveyed.
The depth of the lens in their glasses was measured and recorded correct to the nearest mm.
The results are summarised in the table.

Depth of lens, x mm, to the nearest mm	Number of people	Mid	Mid \times Freq
$10 \leq x \leq 19$	6	14.5	87
$20 \leq x \leq 29$	28	24.5	686
$30 \leq x \leq 39$	48	34.5	1656
$40 \leq x \leq 49$	18	44.5	801
Total 100			

- (i) Calculate an estimate for the mean depth of a lens.

Total 3230

$$\frac{3230}{100} = 32.3$$

[4]

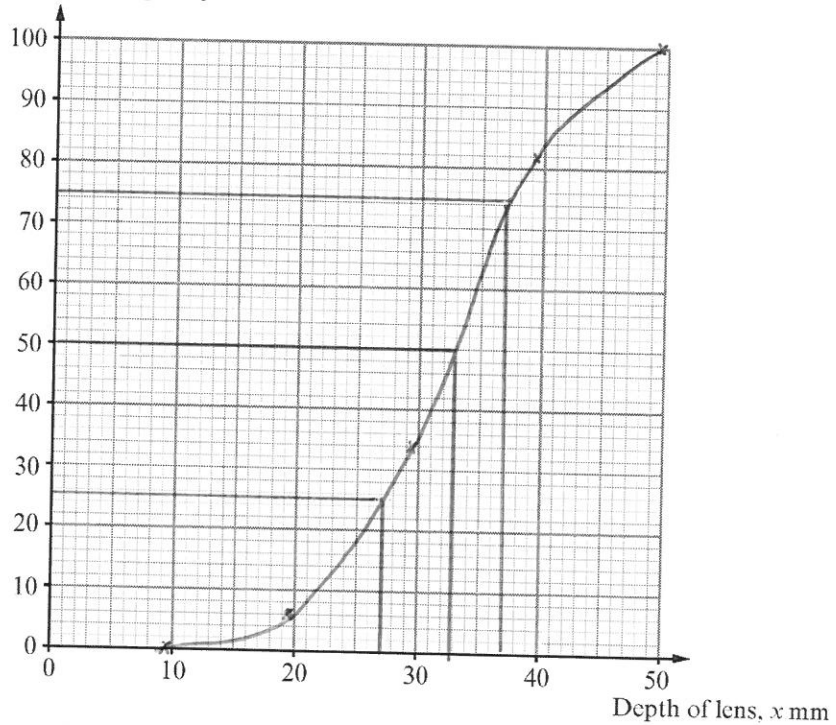
(ii) Complete the following cumulative frequency table.

Depth of lens, x mm	$x < 9.5$	$x < 19.5$	$x < 29.5$	$x < 39.5$	$x < 49.5$
Cumulative frequency	0	6	34	82	100

[1]

(iii) On the graph paper below, draw a cumulative frequency diagram to show this information. [2]

Cumulative frequency



(iv) Use your graph to estimate each of the following.
The median depth of a lens.

33 mm

The interquartile range for the depth of a lens.

$LQ = 27$

$UQ = 37$

$IQR = 37 - 27 = 10$

[3]

OLD SPEC.

- (b) An optician records the number of pairs of glasses she sells in each season.

Year	2011				2012	
Season	Winter	Spring	Summer	Autumn	Winter	Spring
Number of pairs of glasses	1084	2124	4326	1242	1348	2456

- (i) Calculate the 4-point moving averages and complete the table below.

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4 season time period ending:	Autumn 2011	Winter 2012	Spring 2012
4-point moving average:			

[3]

- (ii) In the summer of 2011 the optician had the following offer

Buy one pair and get a second pair half price.

She has decided not to repeat this offer in the summer of 2012, but instead to have a promotion in the autumn of 2012

Buy one pair get one free.

Explain fully what impact this may have on the 4-point moving average for the 4 season time period ending in the summer of 2012.

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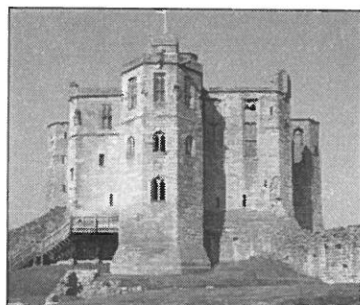
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[2]

7.

- (a) A number of adults were asked how much they would be willing to pay to visit an ancient monument.



The results are summarised in the table.

Amount of money, £ x	Number of adults	Mid	Mid \times freq
$1 \leq x < 4$	32	2.5	80
$4 \leq x < 7$	26	5.5	143
$7 \leq x < 10$	14	8.5	119
$10 \leq x < 13$	2	11.5	23

$$T = 74$$

$$T = 365$$

- (i) Calculate an estimate for the mean amount of money the adults would be willing to pay. [4]

$$\frac{365}{74} = 4.9324$$

- (ii) Find the greatest possible value of the range. [1]

Context money $12.99 - 1 = 11.99$

(b) The number of adults visiting the monument during the different seasons was recorded.

Season	Winter 2012	Spring 2012	Summer 2012	Autumn 2012	Winter 2013	Spring 2013	Summer 2013
Number of adult visitors	24	86	122	8	28	94	146

(i) Calculate 4-point moving averages and complete the table below. [3]

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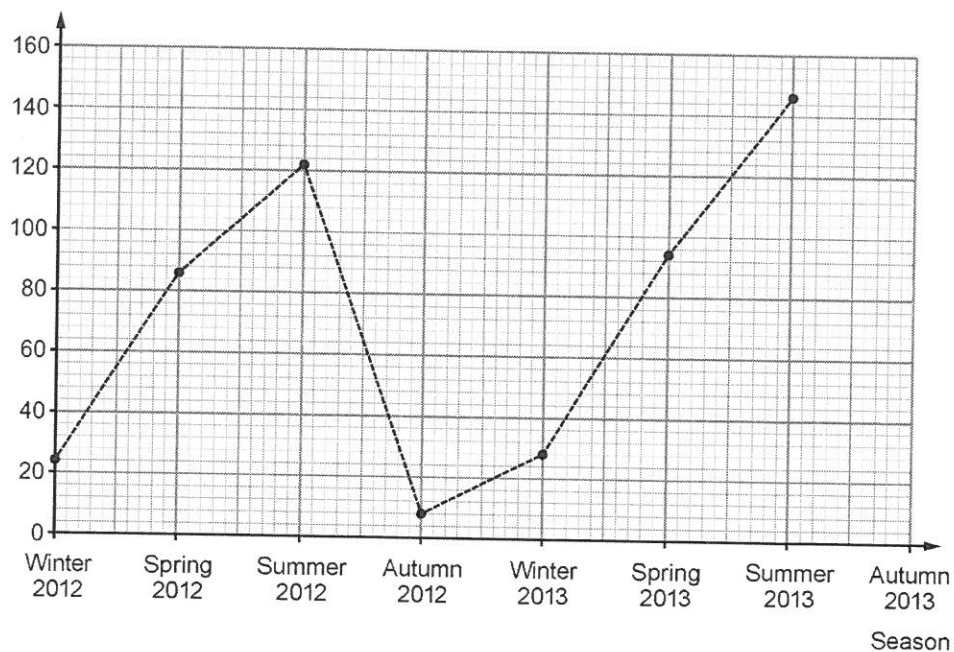
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4-point period:	Winter 2012 to Autumn 2012	Spring 2012 to Winter 2013	Summer 2012 to Spring 2013	Autumn 2012 to Summer 2013
4-point moving average:				

(ii) The time series graph for the number of adults visiting the monument during the different seasons has been plotted on the graph paper opposite.
On this graph paper, plot the 4-point moving averages and draw a trend line. [3]

OLD SPEC.

Number of adult visitors



- (iii) Use your graph to make two different comments about the **trend** in the number of adult visitors. One comment should refer to the time series and one comment to the trend line. [2]

Comment 1:

There has been a rise in visitors from 2012 to 2013

Comment 2:

Adult visitors drop off in winter and Autumn