

Averages and Range – W/C 11th May 2020

At the beginning of December, we did some work on this topic, looking mostly at discrete data. This week you are going to have the chance to practice those skills and extend them further to include finding the mean from grouped continuous data.

First some Vocabulary:

Discrete Data – This is data that can only take on certain values (usually whole numbers). It is often things that you can count e.g. number of goals scored, marks in a test, number of children, shoe sizes

Continuous Data – This is data that can have an infinite number of different values, but is rounded off to be able to use it. It is always measured e.g. Heights, Weights, Time, Area, Capacity

Mean, Median and Mode are different types of Average.

Mean = $\frac{\text{sum of all values}}{\text{Number of values}}$ This can give distorted information, if the data contains any extreme values i.e. very high or very low values that are different to the rest of the data.

Mode is the most frequently occurring value or group. This is sometimes called the modal value or group. Find the highest number in the frequency column, the mode is the value or group that this corresponds to. Sometimes there is NO mode. Do not write this as 0, because this means that 0 is the value that occurs the most often – just say NO MODE.

Median is the middle value of the SORTED data. Sometimes there is not an exact middle, so you find the mean (or the middle) of the two values (i.e add them together and divide by 2)

Range is a measure of the Spread of the data. It is the Highest Value – Lowest Value

Below are some model examples for you to work through. I have tried to explain every step – so look at the detail carefully

Averages	Mean From a Table	Averages From a Table	Averages From Grouped																																																
<p>Find the mean, median, mode and range of:</p> <p>0,5,7,9,8,13,5,2,0,8</p> <p>First sort the data</p> <p>0, 0, 2, 5, 5, 7, 8, 8, 9, 13</p> <p>(check you have the correct number of pieces of data!)</p> <p>Sum = 0+0+2+5+5+7+8+8+9+13 =57</p> <p>Mean = $\frac{57}{10} = 5.7$</p> <p>Median = $\frac{5+7}{2} = 6$ (Between 5 and 7 – see blue arrow)</p> <p>Mode = NO MODE 0, 5 and 8 all occur twice so no mode</p> <p>Range = 13 – 0 = 13</p>	<p>Find the mean:</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Mark</th> <th>Frequency</th> <th>M x F</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>1</td> <td>7</td> </tr> <tr> <td>8</td> <td>6</td> <td>48</td> </tr> <tr> <td>9</td> <td>5</td> <td>45</td> </tr> <tr> <td>10</td> <td>9</td> <td>90</td> </tr> <tr> <td>TOTAL</td> <td>21</td> <td>190</td> </tr> </tbody> </table> <p>Everything in red I have added to answer the question – sometimes you have to add the column as well!</p> <p>Mean = $\frac{190}{21} = 9.0 (1 dp)$</p>	Mark	Frequency	M x F	7	1	7	8	6	48	9	5	45	10	9	90	TOTAL	21	190	<p>Find the mode and range:</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Mark</th> <th>Frequency</th> <th>M x F</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>1</td> <td>7</td> </tr> <tr> <td>8</td> <td>6</td> <td>48</td> </tr> <tr> <td>9</td> <td>5</td> <td>45</td> </tr> <tr> <td>10</td> <td>9</td> <td>90</td> </tr> <tr> <td>TOTAL</td> <td>21</td> <td>190</td> </tr> </tbody> </table> <p>Mode = 10 (This mark occurred the most)</p> <p>Range = 10 – 7 = 3</p> <p>Median = 9 (see below)</p> <p>To find the median, imagine this data written in a long list. There are 21 values so the middle one is the 11th value (you can find this by doing $\frac{21+1}{2} = 11$)</p> <p>The 11th value is 9 because there is 1 '7' and 6 – '8's taking us to the 7th value the 8th – 12th piece of data are all 9 – see the red numbers above</p> <p>If this confuses you write out all the values!</p>	Mark	Frequency	M x F	7	1	7	8	6	48	9	5	45	10	9	90	TOTAL	21	190	<p>Work out the Estimated mean:</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Time taken (<i>m</i> minutes)</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>0 < <i>m</i> ≤ 10</td> <td>3</td> </tr> <tr> <td>10 < <i>m</i> ≤ 20</td> <td>8</td> </tr> <tr> <td>20 < <i>m</i> ≤ 30</td> <td>11</td> </tr> <tr> <td>30 < <i>m</i> ≤ 40</td> <td>9</td> </tr> <tr> <td>40 < <i>m</i> ≤ 50</td> <td>9</td> </tr> </tbody> </table> <p>This is an example of continuous data. Notice the use of the inequality signs for each row.</p> <p>10 < <i>m</i> ≤ 20 means the time in minutes is between 10 and 20; however it can be exactly 20 but it can NOT be 10.</p> <p>Notice it asks for an Estimated mean because we do not have the exact values i.e 3 people took between 0 and 10 minutes to do the task, but we have no idea the exact time they took. We make an assumption that they took 5 minutes, which is the mid-point.</p> <p>I need more space to do this so will finish the question below.</p>	Time taken (<i>m</i> minutes)	Frequency	0 < <i>m</i> ≤ 10	3	10 < <i>m</i> ≤ 20	8	20 < <i>m</i> ≤ 30	11	30 < <i>m</i> ≤ 40	9	40 < <i>m</i> ≤ 50	9
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Time Taken (m minutes)	Frequency	Mid-point (of the time taken)	Mid-point x Frequency
$0 < m \leq 10$	3	5	15
$10 < m \leq 20$	8	15	120
$20 < m \leq 30$	11	25	275
$30 < m \leq 40$	9	35	315
$40 < m \leq 50$	9	45	405
TOTAL	40		1130

45 is the mid-point of 40 and 50

Do not total mid-points- it would be meaningless!

Estimated Mean = $\frac{1130}{40} = 28.25$ minutes (check this looks sensible, which in this case it does)

Please make sure you have read through the notes I have made above carefully (it took me several hours to do!!) – this should include making sure you understand the worked examples.

Now you need to work through the tasks below:

As usual make notes in your exercise book, copy and complete the tables and show all of your workings.

Task 1:

Watch the following mathswatch clip:

Clip 62	Averages and Range
Clip 130a	Averages from a table
Clip 130b	Estimate for the mean

Task 2: In your book write out the solutions for the following questions:

SECTION A

Find the **mean, median, mode and range:**

a) 2,4,6,10,2,2,2

b) 1,4,5,1,4

c) 1,7,10

d) 2,7,1,8,2,9,1,2

e) 1,1,1,2,1,2,1,1,2,8

f) 7,9,1,3,5

SECTION B Work out the **mean** for these tables: Remember to add the extra columns when you write them out

Mark	Frequency
4	3
5	1
6	2
7	8
8	6
9	5
10	5

Mark	Frequency
0	6
1	17
2	52
3	22
4	3
Total	100

Number of drawing pins	Frequency	
29	2	
30	5	
31	2	
32	1	

SECTION C: Work out the **mode/range/median** for these tables: (For these you do not need to add an extra column but you do need to add up the frequency to find the middle value – writing them out may be a bit boring! – see the third example above)

Mark	Frequency
4	3
5	1
6	2
7	8
8	6
9	5
10	5

Mark	Frequency
0	6
1	17
2	52
3	22
4	3
Total	100

Number of drawing pins	Frequency	
29	2	
30	5	
31	2	
32	1	

SECTION D: Work out the **ESTIMATED MEAN** for these grouped tables:

Height (h cm) of plants	Frequency		
$0 < h \leq 10$	2		
$10 < h \leq 20$	8		
$20 < h \leq 30$	9		
$30 < h \leq 40$	7		
$40 < h \leq 50$	4		

Recovery time (m minutes)	Number of people
$0 < m \leq 4$	2
$4 < m \leq 8$	7
$8 < m \leq 12$	29
$12 < m \leq 16$	26
$16 < m \leq 20$	16
$20 < m \leq 24$	10

Weight (w grams) of plants	Frequency		
$0 < w \leq 30$	0		
$30 < w \leq 50$	14		
$50 < w \leq 60$	16		
$60 < w \leq 70$	21		
$70 < w \leq 100$	9		

SECTION D: Mixed Exam Questions

The table shows information about the ages of 24 students.

Age (years)	Number of students
16	9
17	3
18	8
19	4

(a) Write down the mode of these ages.

[1 mark]

(b) Calculate the mean of these ages.

(b) Find the median of these ages.

[2 marks]

[3 marks]

The table shows the heights of 30 students in a class.

Height, h , (cm)	Number of students
$140 < h \leq 144$	4
$144 < h \leq 148$	5
$148 < h \leq 152$	8
$152 < h \leq 156$	7
$156 < h \leq 160$	5
$160 < h \leq 164$	1

By using the midpoints of each group, calculate an estimate of the mean height.

[3 marks]

A road has 30 houses.

The number of letters delivered to each house on one day is given in the frequency table.

Number of letters	Frequency
0	4
1	6
2	4
3	3
4	7
5	6

(a) Calculate the mean number of letters delivered to each house.

[3 marks]

(b) A house is chosen at random. What is the probability that it has more than 3 letters delivered to it?

[2 marks]

Task 3: The FINAL TASK is to complete the Assignment on mathswatch, which is due by 18th May

There are a couple of questions that are a little more challenging – consider what you know and do your best to answer them all!