Averages (F)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

<table>
<thead>
<tr>
<th>Name:</th>
<th>Manjaret</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Marks:</td>
<td></td>
</tr>
</tbody>
</table>

1. Hardeep asks 25 people how many portions of fruit and vegetables they ate yesterday.

   The results are shown in this table.

   (a) Calculate the mean number of portions.

<table>
<thead>
<tr>
<th>Number of portions</th>
<th>Frequency</th>
<th>4 x 4 = 16</th>
<th>5 x 6 = 30</th>
<th>6 x 8 = 48</th>
<th>7 x 5 = 35</th>
<th>8 x 2 = 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>4</td>
<td>145</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td></td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td></td>
<td></td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

   Total: 25

   \[ \frac{145 \div 25}{\text{Total}} = \frac{5.8}{145} \]

   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]

   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]

   \[ \text{Total: 25} \]

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   \[ \text{Total: 25} \]

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   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]

   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]

   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]

   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]

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   \[ \text{Mean: 5.8} \]

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   \[ \text{Mean: 5.8} \]

   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]

   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]

   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]

   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]

   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]

   \[ \text{Total: 25} \]

   \[ \text{Mean: 5.8} \]
Her results are shown in this bar chart.

Find the median number of holidays.

\[
\text{middle} \quad 10 \text{m} \quad 1
\]

\[
\text{middle} \quad 11 \text{m} \quad 2
\]

\[
\text{median between} 10\text{m} \quad 11\text{m}
\]

\[
\text{................. } 10 \text{ holidays}
\]

in a year

3. The diagram shows information about the scores of Class 3A in a spelling test.

![Class 3A frequency chart]

(a) A student is chosen at random from Class 3A.

Work out the probability that the student’s score was the mode for the class.

\[
\frac{9}{27} \quad \text{is the probability a student gets the mode.}
\]

\[
\text{Therefore probability } = \frac{1}{3}
\]

The diagram shows information about the scores of Class 3B in the same test.

![Class 3B frequency chart]

(b) Show that Class 3A had more consistent scores than Class 3B.

Use the data from both diagrams.

Range of 3A = 8 - 4 = 4

Range of 3B = 8 - 3 = 5

Class 3A has a smaller range than 3B so its scores are more consistent.
(c) Lucy is one of the 29 students in Class 3B.

Her score was the same as the median score for her class.

Work out her score.

\[ \text{is her score} \] [2]

4. Here is a list of numbers

\[ \begin{array}{cccccccc}
11 & 12 & 12 & 12 & 15 & 15 & 15 & 17 & 19 \\
12 & 19 & 12 & 15 & 15 & 12 & 13 & 17 & \\
\end{array} \]

Find the median.

\[ \text{middle} \] [2]

5. The table shows some information about the foot lengths of 40 adults.

<table>
<thead>
<tr>
<th>Foot length (f cm)</th>
<th>Number of adults</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 ( \leq f &lt; 18 )</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>18 ( \leq f &lt; 20 )</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>20 ( \leq f &lt; 22 )</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>22 ( \leq f &lt; 24 )</td>
<td>12</td>
<td>23</td>
</tr>
<tr>
<td>24 ( \leq f &lt; 26 )</td>
<td>9</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>876</strong></td>
</tr>
</tbody>
</table>

(a) Write down the modal class interval.

\[ 22 \leq f < 24 \] [1]

(b) Calculate an estimate for the mean foot length.

\[ \frac{876}{40} = 21.9 \] 

Check: 21.9 is reasonable.

\[ 21.9 \] cm [3]

6. The table shows information about the ages of all the people at a party.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 - 20</td>
<td>6</td>
</tr>
<tr>
<td>21 - 30</td>
<td>16</td>
</tr>
<tr>
<td>31 - 40</td>
<td>10</td>
</tr>
<tr>
<td>41 - 50</td>
<td>8</td>
</tr>
</tbody>
</table>
(a) Work out the total number of these people who were aged 40 or less.

\[ \text{Total number} = 32 \]  

[1]

Andy says that the range of ages is 39 years because \(50 - 11 = 39\).
(b) The range may not be 39 years.

Explain why.

[1]

7. Rachel carried out a survey of 10 people to find out the type of fruit they like best.

The table gives information about her results.

<table>
<thead>
<tr>
<th>Type of fruit</th>
<th>Number of people</th>
</tr>
</thead>
<tbody>
<tr>
<td>apple</td>
<td>2</td>
</tr>
<tr>
<td>banana</td>
<td>5</td>
</tr>
<tr>
<td>orange</td>
<td>3</td>
</tr>
</tbody>
</table>

Which type of fruit is the mode?

Most: banana  

[1]

8. The stem and leaf diagram gives information about the speeds of 27 cars.

\[ \text{Key:} \quad 3 \mid 8 \text{ means 38 miles per hour} \]

(a) Find the median speed.

\[ \frac{27 + 1}{2} = 14 \text{ th position in the middle values} \]

\[ \text{median speed} = 56 \text{ miles per hour} \]  

[1]

(b) Work out the range.

\[ \text{largest} - \text{smallest} = \frac{76}{2} - \frac{32}{2} = 32 \text{ miles per hour} \]  

[1]
One of the cars is chosen at random.

Jack says,

"The probability that the speed of this car is more than 60 miles per hour is \( \frac{1}{3} \)"

(c) Jack is wrong.

Explain why.

\[
\text{Number cars more than 60 is 8} \quad \frac{8}{27} + \frac{1}{3} \quad \left( \frac{9}{27} = \frac{1}{3} \right)
\]

There are only 8 cars with speed greater than 60.

You would need 9 for Jack to be correct.

[2]

9. Ross rolled an ordinary dice 30 times.

The frequency table gives information about his results.

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

Ross worked out the mean score as 8

(a) Explain why it is impossible for the mean score to be 8

Because you can only get scores 1-6. The mean should be between 1 and 6 (including).

[1]

Graham also worked out the mean score.

Here is his working.

\[1 \times 7 + 2 \times 5 + 3 \times 4 + 4 \times 4 + 5 \times 6 + 6 \times 4 = 99\]

\[99 \div 6 = 16.5\]

The mean score is 16.5
(b) Describe the mistake Graham made in his method to work out the mean score.

Supposed divide by 30 not 60 because there are 30 scores.

10. Here are seven numbers.

\[
\begin{array}{cccccccc}
13 & 6 & 12 & 7 & 6 & 4 & 8 \\
\end{array}
\]

(a) Work out the [underline]range[/underline] of the seven numbers.

Circle your answer.

\[13 - 4 = 9\]

\[
\begin{array}{ccccccc}
5 & 6 & 7 & 8 & 9 \\
\end{array}
\]

(b) What is the [underline]mode[/underline] of the seven numbers?

Circle your answer.

\[
\begin{array}{ccccccc}
5 & 6 & 7 & 8 & 9 \\
\end{array}
\]

11. The table shows information about the marks of 30 students in a test.

<table>
<thead>
<tr>
<th>Mark</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>13</td>
</tr>
</tbody>
</table>

Total = 30

Students who scored less than the mean mark have to retake the test.

How many students have to retake the test?

You must show your working.

\[495 \div 30 = 16.5\] mean

\[2 + 10 + 2 = 14\] students need to retake the test.

\[
\begin{array}{cccc}
10 \times 2 = 200 \\
5 \times 30 = 150 & 450 \\
1 \times 30 = 30 & 480 \\
0.5 \times 30 = 15 & 495 \\
\end{array}
\]
12. The times that 80 customers waited at a supermarket checkout are shown.

<table>
<thead>
<tr>
<th>Time, ( t ) (minutes)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 0 \leq t &lt; 2 )</td>
<td>32</td>
</tr>
<tr>
<td>( 2 \leq t &lt; 4 )</td>
<td>19</td>
</tr>
<tr>
<td>( 4 \leq t &lt; 6 )</td>
<td>20</td>
</tr>
<tr>
<td>( 6 \leq t &lt; 8 )</td>
<td>7</td>
</tr>
<tr>
<td>( 8 \leq t &lt; 10 )</td>
<td>2</td>
</tr>
</tbody>
</table>

(a) In which class interval is the median? Circle your answer.

\[\begin{align*}
\text{middle} & \frac{80 + 1}{2} = 40.52, \\
& \text{between } 40 \text{ and } 41.
\end{align*}\]  [1]

(b) The manager of the supermarket says,

"90\% of our customers wait less than 6 minutes."

Does the data support this statement?

You must show your working.

\[\begin{align*}
32 & \leq 71, \\
19 & \leq 80, \\
20 & \leq 71, \\
71 & \leq 80.
\end{align*}\]  [2]

13. Adam and six other men ran a race.

The times, in seconds, of the six other men are shown.


The mean time for all seven men was 9.83 seconds.

Did Adam win the race?

You must show your working.

\[9.88 \times 7 = 69.16\text{ in total}.\]

\[68.81 - 58.14 = 10.67 \text{ \(\approx\) Adam's time}.

Yes, Adam won as he was quickest in 10.67s.

[3]

14. Susan recorded the temperature outside her house five times on one day.

She recorded the first temperature at 7:00 a.m. and repeated the process every three hours.
The temperatures she recorded are shown in the table below.

(a) Complete the table to show the times at which she recorded the other three temperatures.

<table>
<thead>
<tr>
<th>Time</th>
<th>7:00 a.m.</th>
<th>10:00 am</th>
<th>1:00 pm</th>
<th>4:00 pm</th>
<th>7:00 p.m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>14°C</td>
<td>18°C</td>
<td>23°C</td>
<td>19°C</td>
<td>16°C</td>
</tr>
</tbody>
</table>

(b) What was the range of the temperatures that Susan recorded?

\[ 23 - 14 = 9^\circ C \text{ range} \]

(c) What was the mean of the temperatures that Susan recorded?

\[ 14 + 18 + 23 + 19 + 16 = 90 \]
\[ \frac{90}{5} = 18^\circ C \text{ mean} \]

(d) Explain why the answers you have found may not be the correct mean and range of the temperature for the whole time between 7:00 a.m. and 7:00 p.m.

It may have been hotter during the day and much cooler at 1pm.

15. Angela plays netball for her local team.

The number of goals she has scored in her first seven games is 3, 4, 5, 5, 6, 8 and 9.

(a) Explain why the mode is 5.

Mode is 5 because that is the most frequent number of goals in a game.

(b) Angela’s coach thinks that it is possible for Angela to achieve a median of 6 and a range of 7 after two more games are completed.

Give a possible number of goals scored in each of the next two games that would allow Angela to achieve this.

3, 4, 5, 5, 6, 8, 9.

Any score so median needs to be 5th place, so scores of 6 and 7 would give a median of 6.

In fact any score greater than 5 would work.

16. (a) When visiting a hat shop, each customer had the circumference of their head measured.

The table shows the results for the customers who bought a hat during December.
<table>
<thead>
<tr>
<th>Head circumference, $c$ (cm)</th>
<th>Number of customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>$50 \leq c &lt; 54$</td>
<td>12</td>
</tr>
<tr>
<td>$54 \leq c &lt; 58$</td>
<td>32</td>
</tr>
<tr>
<td>$58 \leq c &lt; 62$</td>
<td>14</td>
</tr>
<tr>
<td>$62 \leq c &lt; 66$</td>
<td>2</td>
</tr>
</tbody>
</table>

Calculate an estimate for the mean head circumference.

\[
\begin{align*}
12 \times 52 &= 624, \\
32 \times 56 &= 1792, \\
14 \times 60 &= 840, \\
2 \times 64 &= 128.
\end{align*}
\]

\[
\frac{3384}{60} = 56.4
\]

Estimate for mean is $56.4$ cm.

(b) The hat shop sells 4 different sizes of hats.

The conversion table from head circumference to hat size is shown below

<table>
<thead>
<tr>
<th>Head circumference, $c$ (cm)</th>
<th>Hat size</th>
</tr>
</thead>
<tbody>
<tr>
<td>$50 \leq c &lt; 54$</td>
<td>1</td>
</tr>
<tr>
<td>$54 \leq c &lt; 58$</td>
<td>2</td>
</tr>
<tr>
<td>$58 \leq c &lt; 62$</td>
<td>3</td>
</tr>
<tr>
<td>$62 \leq c &lt; 66$</td>
<td>4</td>
</tr>
</tbody>
</table>

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.

\[
32 \text{ or } 60 \text{ is nearer } \frac{1}{2} \text{ than } \frac{1}{4}. \text{ So the salesman is correct based on the number of customers that currently buy hats.}
\]
17. The manager of a clothes shop recorded the size of each dress sold one morning.

\[
\begin{array}{cccccccc}
10 & 10 \\
12 & 12 \\
14 & 14 & 14 & 14 & 14 & 14 \\
16 & 16 & 16 & 16 \\
18 & 18 & 18 \\
20 & 20 & 20 \\
\end{array}
\]

The sizes of dresses are always even numbers.

The mean size of the dresses sold that morning is 15.3

The manager says: "The mean size of the dresses is not a very useful average."

(i) Explain why the manager is right.

It would be better to give an actual dress size rather than the mean value. 15 or 15.3 doesn't mean anything.

(ii) Which is the more useful average for the manager to know, the median or the mode?

You must give a reason for your answer.

\[ \text{I would use mode because that tells you the most popular dress size which is 14.} \]

18. The grouped frequency table gives information about the heights of 30 students.

<table>
<thead>
<tr>
<th>Height (h cm)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 &lt; h ≤ 140</td>
<td>1</td>
</tr>
<tr>
<td>140 &lt; h ≤ 150</td>
<td>7</td>
</tr>
<tr>
<td>150 &lt; h ≤ 160</td>
<td>8</td>
</tr>
<tr>
<td>160 &lt; h ≤ 170</td>
<td>10</td>
</tr>
<tr>
<td>170 &lt; h ≤ 180</td>
<td>4</td>
</tr>
</tbody>
</table>

(a) Write down the modal class interval.

\[ 160 < h ≤ 170 \]

This incorrect frequency polygon has been drawn for the information in the table.
(b) Write down two things wrong with this incorrect frequency polygon.

1. Need to plot the middle value of each interval, not the first value.

2. There shouldn't be a line joining up the first and last point.

[2]

19. Jenny works in a shop that sells belts.

The table shows information about the waist sizes of 50 customers who bought belts from the shop in May.

<table>
<thead>
<tr>
<th>Belt size</th>
<th>Waist (w inches)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>(28 &lt; w \leq 32)</td>
<td>24</td>
</tr>
<tr>
<td>Medium</td>
<td>(32 &lt; w \leq 36)</td>
<td>12</td>
</tr>
<tr>
<td>Large</td>
<td>(36 &lt; w \leq 40)</td>
<td>8</td>
</tr>
<tr>
<td>Extra Large</td>
<td>(40 &lt; w \leq 44)</td>
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Total: 50

30 x 2
34 x 12
38 x 8
42 x 6
1684
(a) Calculate an estimate for the mean waist size.

\[
\frac{1684}{50} = 33.68
\]

\[33.68\] inches [3] ...........................

Belts are made in sizes Small, Medium, Large and Extra Large.

Jenny needs to order more belts in June.
The modal size of belts sold is Small.

Jenny is going to order \(\frac{3}{4}\) of the belts in size Small.

The manager of the shop tells Jenny she should not order so many Small belts.

(b) Who is correct, Jenny or the manager?

You must give a reason for your answer.

The manager. I think she should order about half her belts as small based on her data collected since 24 out of 50 is very half

20. At a nursery, the mean age of 4 children is 31 months.

Katy joins the nursery.

The mean age of all 5 children is now 30 months.

Work out the age of Katy.

\[30 \times 5 = 150\] months (total of ages) afterwards.

\[31 \times 4 = 124 + 4 = 124\] months (total of ages before).

\[150 - 124 = 26\] months.

Katy is 26 months.
### Credits and Notes

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**Notes:**

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board’s (similarly any errors I have corrected from the originals are also my corrections and not theirs!).

Please also note that the layout in terms of fonts, answer lines and space given to each question does not reflect the actual papers to save space.

These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics “could” be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won’t appear in the “live” papers from a specific exam board or that examination of a topic will be as shown in these questions.

**Links:**


OCR [http://ocr.org.uk/gcsemaths](http://ocr.org.uk/gcsemaths)


WJEC Eduqas [http://www.eduqas.co.uk/qualifications/mathematics/gcse/](http://www.eduqas.co.uk/qualifications/mathematics/gcse/)

**Contents:**

This version contains questions from:

AQA – Sample Assessment Material, Practice set 1 and Practice set 2

OCR – Sample Assessment Material and Practice set 1

Pearson Edexcel – Sample Assessment Material, Specimen set 1 and Specimen set 2.

WJEC Eduqas – Sample Assessment Material