Averages from a frequency table

40 cars are observed driving along a particular road, and the number of passengers (excluding the driver) in each car is recorded in the following table:

<table>
<thead>
<tr>
<th>Passengers</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

This means there were 15 cars with no passengers.

If this information were written out in a list:
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 3, 3, 4, 4, 4, 4, 4, 4, 4, 6

This is the total frequency (total number of cars).

To find the **mean average** from a frequency table, you need to first multiply each number by the frequency:

<table>
<thead>
<tr>
<th>Passengers</th>
<th>Frequency</th>
<th>Passengers x Freq</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15</td>
<td>0 x 15 = 0</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>1 x 10 = 10</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>2 x 5 = 10</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>3 x 2 = 6</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>4 x 7 = 28</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>5 x 0 = 0</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>6 x 1 = 6</td>
</tr>
</tbody>
</table>

If this information were written out in a list we:
0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 1 + 1 + 1 + 1 + 1 + 1 + ... + 1 + 1 + 1 + 2 + 2 + 2 + 2 + 2 + 3 + 3 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 6 = 60

This is the total number of passengers in all cars.

\[
\text{Mean} = \frac{\text{Total Passengers}}{\text{Total Cars}} = \frac{60}{40} = 1.5 \text{ passengers per car}
\]

To find the **median average** from a frequency table, you need to first calculate the cumulative frequency (the running total of the frequency):

<table>
<thead>
<tr>
<th>Passengers</th>
<th>Frequency</th>
<th>Cumulative Freq</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>15 + 10 = 25</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>25 + 5 = 30</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>30 + 2 = 32</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>32 + 7 = 39</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>39 + 0 = 39</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>39 + 1 = 40</td>
</tr>
</tbody>
</table>

This means that there were 30 cars.

This is the total number of passengers. We need this to calculate the median.

Median will be the \(\frac{40 + 1}{2}\)th number: 20.5th (between 20th and 21st).

\[\text{Median} = 1 \text{ passenger per car}\]

Since there are 15 cars with no passengers and 25 with 0 or 1, the 20th and 21st in the list must be 1.

To find the **modal average** from a frequency table, you need to identify the value with the highest frequency (if more than one are joint highest, all of them are modes):

<table>
<thead>
<tr>
<th>Passengers</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

The largest frequency is 15, so more cars had 0

\[\text{Mode is the value with the highest frequency (not the frequency itself)}\]

Mode = 0