1. The following frequency distribution table represents the diameters (in cm) of the balls produced by a factory.

<table>
<thead>
<tr>
<th>Diameter (cm)</th>
<th>Number of balls</th>
<th>( f )</th>
<th>( x )</th>
<th>( f^2x )</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.0 - 24.9</td>
<td>6</td>
<td>22.45</td>
<td>134.70</td>
<td></td>
</tr>
<tr>
<td>25.0 - 29.9</td>
<td>10</td>
<td>27.45</td>
<td>741.00</td>
<td></td>
</tr>
<tr>
<td>30.0 - 34.9</td>
<td>13</td>
<td>32.45</td>
<td>1055.9</td>
<td></td>
</tr>
<tr>
<td>35.0 - 39.9</td>
<td>15</td>
<td>37.45</td>
<td>1456.6</td>
<td></td>
</tr>
<tr>
<td>40.0 - 44.9</td>
<td>7</td>
<td>42.45</td>
<td>1803.9</td>
<td></td>
</tr>
<tr>
<td>45.0 - 49.9</td>
<td>4</td>
<td>47.45</td>
<td>2299.3</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>55</td>
<td></td>
<td></td>
<td>1879.75</td>
</tr>
</tbody>
</table>

\[ \sum f^2 x = 1879.75 \]

a) Find the mean (average) of the diameters.

\[
\bar{d} = \frac{\sum f^2 x}{\sum f} = \frac{1879.75}{55} = 34.18 \approx 34.2
\]

b) Find the median diameter of the balls.

The median diameter lies in 30.0 - 34.9 \( \Rightarrow L_1 = 29.95 \) \( c = 5 \)

\[
d_{\text{med}} = L_1 + \left[ \frac{n - (\frac{f}{2})}{f_{\text{med}}} \right] (c)
\]

\[ = 29.95 + \left[ \frac{55 - 16}{13} \right] (5) \Rightarrow d_{\text{med}} = 34.4 \]

c) Find the modal diameter (mode) of the balls.

The mode diameter lies in 35.0 - 39.9

\[
d_{\text{mod}} = L_1 + \left[ \frac{\Delta_1}{\Delta_1 + \Delta_2} \right] (c)
\]

\[ = 34.95 + \left[ \frac{2}{1 + 2} \right] (5)
\]

\[ = 35.95 \approx 36.0 \]

\[ L_1 = 34.95 \]
\[ \Delta_1 = 15 - 13 = 2 \]
\[ \Delta_2 = 15 - 7 = 8 \]
\[ c = 5 \]