A#43 CORRELATION - THE PMCC

AEM questions are taken from past exam papers - they have been carefully chosen to represent a typical exam question at each level of difficulty. If you can do these questions, you’re ready to move onto past papers for this topic.

APPRENTICE

Fourteen candidates each sat two test papers, Paper 1 and Paper 2, on the same day. The marks, out of a total of 50, achieved by the students on each paper are shown in the table. Calculate the value of of the product moment correlation coefficient, \( r \), between the marks on Paper 1 and those on Paper 2.

<table>
<thead>
<tr>
<th>Candidate</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark on</td>
<td>36</td>
<td>29</td>
<td>33</td>
<td>17</td>
<td>42</td>
<td>26</td>
<td>45</td>
<td>12</td>
<td>25</td>
<td>19</td>
<td>26</td>
<td>15</td>
<td>28</td>
<td>11</td>
</tr>
<tr>
<td>Paper 1 (( x ))</td>
<td>46</td>
<td>18</td>
<td>34</td>
<td>24</td>
<td>45</td>
<td>21</td>
<td>37</td>
<td>15</td>
<td>35</td>
<td>17</td>
<td>38</td>
<td>11</td>
<td>44</td>
<td>21</td>
</tr>
</tbody>
</table>

EXPERT

The table shows the heights, \( x \) cm, and the arm spans, \( y \) cm, of a random sample of 12 men aged between 21 years and 40 years.

\[
\begin{array}{cccccccccccc}
\hline
x & 152 & 166 & 154 & 159 & 179 & 167 & 155 & 168 & 174 & 182 & 161 & 163 \\
y & 143 & 154 & 151 & 153 & 168 & 160 & 146 & 163 & 170 & 175 & 155 & 158 \\
\hline
\end{array}
\]

a. Calculate the value of the product moment correlation coefficient between \( x \) and \( y \).
b. Interpret, in context, your value calculated in part (a).
c. The regression line for this data is used to estimate the arm span of men who are 160 cm tall.
   Give two reasons why this estimate would be reliable and one reason why it might not be.

MASTER

Each of 10 cows was given an additive (\( x \)) every day for four weeks to see if it would improve the milk yield (\( y \)). At the beginning, the average milk yield per day was 4 gallons. The milk yield of each cow was measured on the last day of the four weeks. The data collected is shown in the table.

<table>
<thead>
<tr>
<th>Cow</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additive, ( x ) (25gm units)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Yield, ( y ) (gallons)</td>
<td>4.0</td>
<td>4.2</td>
<td>4.3</td>
<td>4.5</td>
<td>4.5</td>
<td>4.7</td>
<td>5.2</td>
<td>5.2</td>
<td>5.1</td>
<td>5.1</td>
</tr>
</tbody>
</table>

a. Use your calculator to find the value of the product moment correlation coefficient for the first seven cows.
b. State which is the response variable and which is the explanatory variable.
c. Without further calculation, write down, with a reason, how the product moment correlation coefficient for all 10 cows would differ from your answer to b.