Class Practice on Correlation Coefficient #2

Determine the coefficient of correlation, r, for the following set of bivariate data and show a scatter diagram.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
First we display the scatter diagram.

Next we make the 5 column summary needed to compute $r$.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
<th>$x^2$</th>
<th>$y^2$</th>
<th>$xy$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>1</td>
<td>36</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>4</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>16</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>14</td>
<td>30</td>
<td>62</td>
<td>27</td>
</tr>
</tbody>
</table>

$SS(xy) = \sum xy - \left(\frac{\sum x}{n}\right)\left(\frac{\sum y}{n}\right) = 27 - \frac{10 \cdot 14}{4} = 27 - 35 = -8$

$SS(x) = \sum x^2 - \left(\frac{\sum x}{n}\right)^2 = 30 - \frac{10^2}{4} = 30 - 25 = 5$

$SS(y) = \sum y^2 - \left(\frac{\sum y}{n}\right)^2 = 62 - \frac{14^2}{4} = 62 - 49 = 13$

So, then $r = \frac{SS(xy)}{\sqrt{SS(x) \cdot SS(y)}} = \frac{-8}{\sqrt{5 \cdot 13}} = \frac{-8}{\sqrt{65}} = -0.9922778768 \approx -0.99$ (This should not be surprising, since the scatter diagram shows what appears to be a strong negative correlation between $x$ and $y$.)