**How to Find Pearson’s Correlation Coefficients By Hand**

Find the value of the correlation coefficient from the following table:

|  |  |  |
| --- | --- | --- |
| **Subject** | **Age x** | **Glucose Level y** |
| 1 | 43 | 99 |
| 2 | 21 | 65 |
| 3 | 25 | 79 |
| 4 | 42 | 75 |
| 5 | 57 | 87 |
| 6 | 59 | 81 |

**Step 1:** *Make a chart.* Use the given data, and add three more columns: xy, x2, and y2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subject** | **Age x** | **Glucose Level y** | **xy** | **x2** | **y2** |
| 1 | 43 | 99 |  |  |  |
| 2 | 21 | 65 |  |  |  |
| 3 | 25 | 79 |  |  |  |
| 4 | 42 | 75 |  |  |  |
| 5 | 57 | 87 |  |  |  |
| 6 | 59 | 81 |  |  |  |

**Step 2:** *Multiply x and y together to fill the xy column. For example, row 1 would be 43 × 99 =* ***4,257****.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subject** | **Age x** | **Glucose Level y** | **xy** | **x2** | **y2** |
| 1 | 43 | 99 | 4257 |  |  |
| 2 | 21 | 65 | 1365 |  |  |
| 3 | 25 | 79 | 1975 |  |  |
| 4 | 42 | 75 | 3150 |  |  |
| 5 | 57 | 87 | 4959 |  |  |
| 6 | 59 | 81 | 4779 |  |  |

**Step 3:** *Take the square of the numbers in the x column and put the result in the x2 column.*

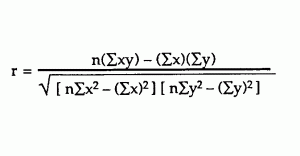
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subject** | **Age x** | **Glucose Level y** | **xy** | **x2** | **y2** |
| 1 | 43 | 99 | 4257 | 1849 |  |
| 2 | 21 | 65 | 1365 | 441 |  |
| 3 | 25 | 79 | 1975 | 625 |  |
| 4 | 42 | 75 | 3150 | 1764 |  |
| 5 | 57 | 87 | 4959 | 3249 |  |
| 6 | 59 | 81 | 4779 | 3481 |  |

**Step 4:** *Take the square of the numbers in the y column and put the result in the y2 column.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subject** | **Age x** | **Glucose Level y** | **xy** | **x2** | **y2** |
| 1 | 43 | 99 | 4257 | 1849 | 9801 |
| 2 | 21 | 65 | 1365 | 441 | 4225 |
| 3 | 25 | 79 | 1975 | 625 | 6241 |
| 4 | 42 | 75 | 3150 | 1764 | 5625 |
| 5 | 57 | 87 | 4959 | 3249 | 7569 |
| 6 | 59 | 81 | 4779 | 3481 | 6561 |

**Step 5:** *Add up all of the numbers in the columns and put the result at the bottom of the column.* The Greek letter sigma (Σ) is a short way of saying “sum of” or summation.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subject** | **Age x** | **Glucose Level y** | **xy** | **x2** | **y2** |
| 1 | 43 | 99 | 4257 | 1849 | 9801 |
| 2 | 21 | 65 | 1365 | 441 | 4225 |
| 3 | 25 | 79 | 1975 | 625 | 6241 |
| 4 | 42 | 75 | 3150 | 1764 | 5625 |
| 5 | 57 | 87 | 4959 | 3249 | 7569 |
| 6 | 59 | 81 | 4779 | 3481 | 6561 |
| Σ | 247 | 486 | 20485 | 11409 | 40022 |

**Step 6:** *Use the following correlation coefficient formula.*  
[](https://www.statisticshowto.com/wp-content/uploads/2009/11/pearsons.gif)

The answer is: **2868 / 5413.27 = 0.529809**

From our table:

* Σx = 247
* Σy = 486
* Σxy = 20,485
* Σx2 = 11,409
* Σy2 = 40,022
* n is the sample size, in our case = 6

The correlation coefficient =

* 6(20,485) – (247 × 486) / [√[[6(11,409) – (2472)] × [6(40,022) – 4862]]] = 0.5298

The range of the correlation coefficient is from -1 to 1. Our result is 0.5298 or 52.98%, which means the variables have a moderate positive correlation.