

Student	GPA (X)	Number of Beers Consumed Weekly (Y)	X Squared	Y Squared	XY
1	2.4	25	5.76	625	60
2	3.2	12	10.24	144	38.4
3	1.7	33	2.89	1089	56.1
4	3.4	4	11.56	16	13.6
5	3.3	15	10.89	225	49.5
6	3.1	13	9.61	169	40.3
7	2.5	10	6.25	100	25
8	2	2	4	4	4
9	3.6	18	12.96	324	64.8
10	4	8	16	64	32
sum	29.2	140	90.16	2760	383.7

$$\begin{aligned}
 r &= \frac{\sum XY - \frac{(\sum X)(\sum Y)}{n}}{\sqrt{\sum X^2 - \frac{(\sum X)^2}{n}} \sqrt{\sum Y^2 - \frac{(\sum Y)^2}{n}}} = \frac{383.7 - \frac{(29.2)(140)}{10}}{\sqrt{90.16 - \frac{(29.2)^2}{10}} \sqrt{2760 - \frac{(140)^2}{10}}} = \frac{383.7 - \frac{(4088)}{10}}{\sqrt{90.16 - \frac{(29.2)^2}{10}} \sqrt{2760 - \frac{(140)^2}{10}}} = \\
 &= \frac{383.7 - 408.8}{\sqrt{90.16 - \frac{(29.2)^2}{10}} \sqrt{2760 - \frac{(140)^2}{10}}} = \frac{-25.1}{\sqrt{90.16 - \frac{(29.2)^2}{10}} \sqrt{2760 - \frac{(140)^2}{10}}} = \\
 &= \frac{-25.1}{\sqrt{90.16 - \frac{(852.64)}{10}} \sqrt{2760 - \frac{(140)^2}{10}}} = \frac{-25.1}{\sqrt{90.16 - 85.264} \sqrt{2760 - \frac{(140)^2}{10}}} = \frac{-25.1}{\sqrt{4.896} \sqrt{2760 - \frac{(140)^2}{10}}} = \frac{-25.1}{(2.2126) \sqrt{2760 - \frac{(140)^2}{10}}} = \\
 &= \frac{-25.1}{(2.2126) \sqrt{2760 - \frac{19600}{10}}} = \frac{-25.1}{(2.2126) \sqrt{2760 - 1960}} = \frac{-25.1}{(2.2126) \sqrt{800}} = \frac{-25.1}{(2.2126)(28.2842)} = \frac{-25.1}{62.5816} = -.4010
 \end{aligned}$$

Student	GPA (X)	Number of Beers Consumed Weekly (Y)	(X-mean)	(X-mean) ²	(Y-mean)	(Y-mean) ²	(X-mean)(Y-Mean)
1	2.4	25	-0.52	0.2704	11	121	-5.72
2	3.2	12	0.28	0.0784	-2	4	-0.56
3	1.7	33	-1.22	1.4884	19	361	-23.18
4	3.4	4	0.48	0.2304	-10	100	-4.8
5	3.3	15	0.38	0.1444	1	1	0.38
6	3.1	13	0.18	0.0324	-1	1	-0.18
7	2.5	10	-0.42	0.1764	-4	16	1.68
8	2	2	-0.92	0.8464	-12	144	11.04
9	3.6	18	0.68	0.4624	4	16	2.72
10	4	8	1.08	1.1664	-6	36	-6.48
sum	29.2	140	0	4.896	0	800	-25.1
mean	2.92	14					

$$r = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum (X - \bar{X})^2} \sqrt{\sum (Y - \bar{Y})^2}} = \frac{-25.1}{\sqrt{4.896} \sqrt{800}} = \frac{-25.1}{(2.2126)(28.2842)} = \frac{-25.1}{62.5816} = -.4010$$

NOTE: $\sum (X - \bar{X})(Y - \bar{Y})$: is obtained by finding X minus the mean of X for each subject, Y minus the mean of Y for each subject, multiplying these two values together for each subject, and then summing across resulting product across all subject.

For example:

$$\text{For subject 1 } (X - \bar{X})(Y - \bar{Y}) = (2.4 - 2.92)(25 - 14) = (-.52)(11) = -5.72$$

$$\text{For subject 10 } (X - \bar{X})(Y - \bar{Y}) = (4 - 2.92)(8 - 14) = (1.08)(-6) = -6.48$$

Do this for each subject and then add them all up, just like the bottom row of the last column in the table above.