

## Correlation Coefficients

Task 1. The table shows the Birth rate and GNP growth in 12 countries. Analyse the correlation between the Birth rate and the GNP growth. Find and interpret Pearson's correlation coefficient.

COUNTRY	BIRTH RATE	GNP GROWTH
BRAZIL	30	5.1
COLOMBIA	29	3.2
COSTA RICA	30	3
INDIA	35	1.4
MEXICO	36	3.8
PERU	36	1
PHILIPPINES	34	2.8
SENEGAL	48	0.3
SOUTH KOREA	24	6.9
SRI LANKA	27	2.5
TAIWAN	21	6.2
THAILAND	30	4.6

Hint:

No.	$x$	$y$	$x - \bar{x}$	$y - \bar{y}$	$(x - \bar{x})^2$	$(y - \bar{y})^2$	$(x - \bar{x})(y - \bar{y})$
1	30	5.10	-1.67	1.70	2.78	2.89	-2.84
2	29	3.20	-2.67	-0.20	7.11	0.04	0.53
3	30	3.00	-1.67	-0.40	2.78	0.16	0.7
4	35	1.40	3.33	-2.00	11.11	4.00	-6.66
5	36	3.80	4.33	0.40	18.78	0.16	1.73
6	36	1.00	4.33	-2.40	18.78	5.76	-10.39
7	34	2.80	2.33	-0.60	5.44	0.36	-1.39
8	48	0.30	16.33	-3.10	266.78	9.61	-50.62
9	24	6.90	-7.67	3.50	58.78	12.25	-26.84
10	27	2.50	-4.67	-0.90	21.78	0.81	4.20
11	21	6.20	-10.67	2.80	113.78	7.84	-29.88
12	30	4.60	-1.67	1.20	2.78	1.44	-2.00
Sum					530.67	45.32	-123.5

Task 2. Work experience and productivity of the company's employees are shown in the table. Find and interpret the Pearson's correlation coefficient. .

EXPERIENCE	PRODUCTIVITY
1	120
5	115
10	132
8	123
9	128
1	102
2	106
4	109
5	112

(Hint: use the alternative formula for standard deviation and covariance:  $s = \sqrt{\frac{\sum x^2}{n} - \bar{x}^2}$ ,

$$\text{cov}(X, Y) = \frac{1}{n} \sum x_i y_i - (\bar{x}\bar{y})$$

Lp.	$x$	$y$	$x^2$	$y^2$	$xy$
1	1	120	1	14400	120

2	5	115	25	13225	575
3	10	132	100	17424	1320
4	8	123	64	15129	984
5	9	128	81	16384	1152
6	1	102	1	10404	102
7	2	106	4	11236	212
8	4	109	16	11881	436
9	5	112	25	12544	560
Sum	45	1047	317	122627	5461

Task 3. For a given set of data

$$\sum x = 680 \quad \sum y = 996 \quad \sum x^2 = 20154 \quad \sum y^2 = 34670 \quad \sum xy = 24844 \quad n = 30 .$$

Find the product-moment correlation coefficient.

Task 4. The following data relate to the percentage unemployment and percentage change in wages over several years. Calculate the product moment correlation coefficient between unemployment and change in wages.

% UNEMPLOYMENT (X)	% CHANGE IN WAGES (Y)
1,6	5
2.2	3.2
2.3	2.7
1.7	2.1
1.6	4.1
2.1	2.7
2.6	2.9
1.7	4.6
1.5	3.5
1.6	4.4

Task 5. (Statistica) The data are available in the file "Activities.sta". Create a scatterplot. Find and interpret the Pearson's correlation coefficient between work experience (variable "Work") and childcare (variable "Children").

Task 6. (Statistica) The data are available in the file "Activities.sta". Create a scatterplot. Find and interpret the Pearson's correlation coefficient between work experience (variable "Work") and taking care of house (variable "Household").

Task 7. The following table shows the results of 8 students in "Business Mathematics" and "Statistics". Find and interpret the value of Spearman's rank correlation coefficient.

„BUSINESS MATHEMATICS” [%]	68	54	19	72	50	44	92	37
“STATISTICS” [%]	51	76	32	85	62	25	74	59

Task 8. The table shows the original marks of six candidates in two examinations. Calculate and interpret the coefficient of rank correlation.

CANDIDATE	A	B	C	D	E	F
MANAGEMENT	38	62	56	42	59	48
MONETARY POLICY	64	84	84	60	73	69

Task 9. (Statistica) Characteristics of despotism and striving to gain high social status were examined among a sample of men. The data are available in the file Striving.sta. Find and interpret the Spearman's rank, Gamma and Kendall-Tau correlation coefficients.