

Linear Regression

Objectives

- 1 Determine and interpret the linear correlation coefficient

Linear Correlation Coefficient

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In this section, we will examine the correlation type the way it is done in the real world: calculating the linear correlation coefficient (r).

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- $r > 0$: positive linear correlation
- $r = 0$: no linear correlation
- $r < 0$: negative linear correlation

Linear Correlation Coefficient

$$r = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sqrt{\sum(x - \bar{x})^2 \cdot \sum(y - \bar{y})^2}}$$

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The closer r is to 1 (or -1), the more the data points “fall in line”

Linear Correlation Coefficient

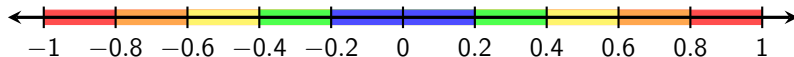
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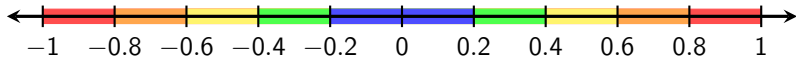
The closer r is to 0, the more the data points resemble a “cloud”

Interpreting r



None
Weak
Moderate
Strong
Very Strong

Interpreting r



None
Weak
Moderate
Strong
Very Strong

Note: These interpretations are not universal.

Example 1

Find and interpret the linear correlation coefficient, r , for each.

(a)

x	y
7.6	19.1
9.2	22.9
3.3	10.3
1.1	6.6
3.7	10.6
3.9	11.3
4.6	12.9
2.3	8.6
5.1	15.2
5.3	15.1
2.5	13
3.4	11.2
3.1	10.6
1.7	6.8
3.7	13.7

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Very strong positive linear correlation

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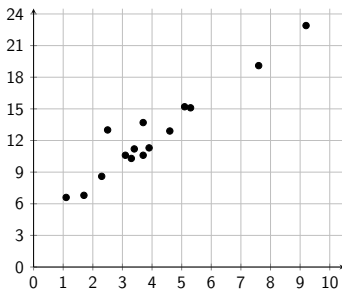
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Example 1

(b)

x	y
7.6	11.0
9.2	3.6
6.3	8.9
1.1	14.9
6.7	8.1
3.9	12.0
4.6	9.4
2.3	10.3
5.1	11.4
5.3	12.4
2.5	9.0
3.4	8.9
3.1	14.2
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5.1	11.4
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$$r \approx -0.6273$$

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4.6	9.4
2.3	10.3
5.1	11.4
5.3	12.4
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3.4	8.9
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Strong negative linear correlation

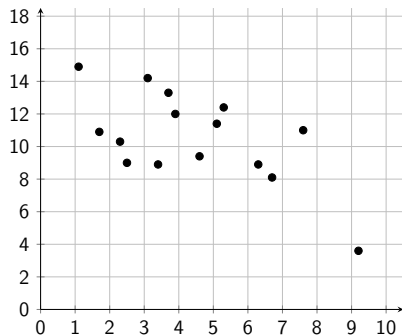
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5.3	12.4
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Strong negative linear correlation



Example 1

(c)

x	y
6.9	3.4
7.7	4.5
0.9	9.8
3.4	1.5
8.9	3.3
5.7	8.9
3.1	8.4
2.2	8.1
4.5	6.8
4.1	0.5
5.0	0.4
7.8	8.4
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