## Problems of Two–variables statistics: Linear regression

**1)** In the following table $x$ denotes the age (in years) of a sample of trees and $y$ denotes their height in centimeters.

**a)** Calculate the means and standard deviations of $x$ and $y$ and the covariance.

**b)** Find out the coefficient of correlation and the regression line (least squares method).

**c)** Estimate the height $\hat{y}$ if a tree is 18 years old.

**d)** Construct a scatterplot and draw the regression line.

| $x_i$ | $y_i$ |
|---|---|
| 8 | 105 |
| 11 | 142 |
| 14 | 177 |
| 17 | 215 |

**2)** The table shows the age $x$ in days for a sample of wild birds and their body mass $y$ in grams.

**a)** Find out the means and standard deviations of $x$ and $y$ and the covariance.

**b)** Calculate the coefficient of correlation and the regression line (least squares method).

**c)** Estimate the body mass $\hat{y}$ for a bird that is 25 days old.

**d)** Construct a scatterplot and draw the regression line.

| $x_i$ | $y_i$ |
|---|---|
| 16 | 85 |
| 18 | 102 |
| 20 | 114 |
| 22 | 131 |
| 24 | 153 |

**3)** Below is a table of $x$ and $y$ values.

**a)** Calculate the means and standard deviations of $x$ and $y$ and the covariance.

**b)** Find out the coefficient of correlation and the regression line $y = f(x)$ (least squares method).

**c)** Estimate the value of $\hat{y}$ if $\hat{x} = 36$.

**d)** Construct a scatterplot and draw the regression line.

| $x_i$ | $y_i$ |
|---|---|
| 22 | 21 |
| 25 | 24 |
| 28 | 20 |
| 31 | 21 |
| 34 | 24 |
| 37 | 26 |

## Problems of Two–variables statistics: Linear regression

**4)** The following table shows the height $x$ in centimeters for a sample of people and their body mass $y$ in kilograms.

**a)** Find out the means and standard deviations of $x$ and $y$ and the covariance.

**b)** Calculate the coefficient of correlation and the regression line (least squares method).

**c)** Estimate the body mass $\hat{y}$ when the height $\hat{x}$ is 158 cm.

**d)** Construct a scatterplot and draw the regression line.

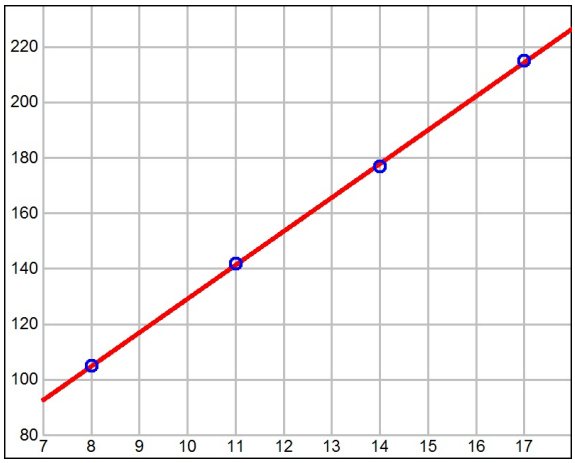
| $x_i$ | $y_i$ |
|---|---|
| 134 | 55 |
| 141 | 67 |
| 148 | 76 |
| 155 | 89 |
| 162 | 100 |
| 169 | 106 |

**Answers:**

**1)** **a)** $\overline{x} = 12.5$ $\overline{y} = 159.75$ $\sigma_x = 3.354$ $\sigma_y = 40.813$ $\sigma_{xy} = 136.875$

**b)** $r = 0.9999$ $y = 12.1667\,x + 7.6667$; **c)** $\hat{y} = 226.667$ cm

**d)**

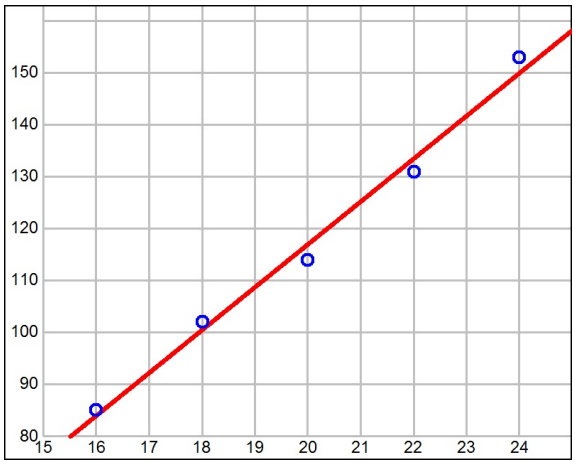


## Problems of Two–variables statistics: Linear regression

**2)** **a)** $\overline{x} = 20$ $\overline{y} = 117$ $\sigma_x = 2.828$ $\sigma_y = 23.452$ $\sigma_{xy} = 66$

**b)** $r = 0.995$ $y = 8.25\,x - 48$; **c)** $\hat{y} = 158.25$ g

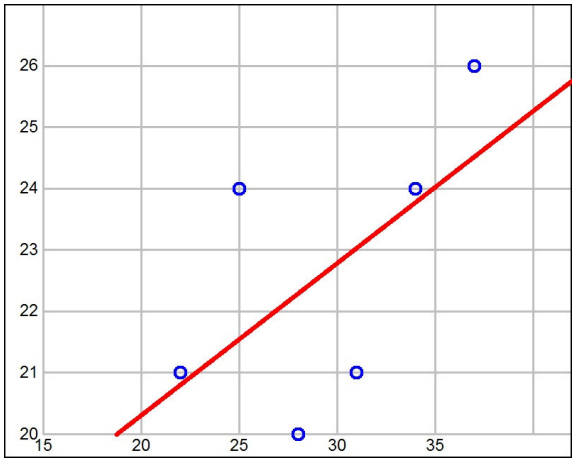
**d)**




**3)** **a)** $\overline{x} = 29.5$ $\overline{y} = 22.667$ $\sigma_x = 5.123$ $\sigma_y = 2.134$ $\sigma_{xy} = 6.5$

**b)** $r = 0.5944$ $y = 0.2476\,x + 15.3619$; **c)** $\hat{y} = 24.276$

**d)**



## Problems of Two–variables statistics: Linear regression

**4)** **a)** $\overline{x} = 151.5$ $\overline{y} = 82.167$ $\sigma_x = 11.955$ $\sigma_y = 17.976$ $\sigma_{xy} = 214.083$

**b)** $r = 0.9962$ $y = 1.498\ x\ -\ 144.7741$; **c)** $\hat{y} = 91.903$ kg

**d)**