

Summation Project

The following are measurements of the air velocity and evaporation coefficient of burning fuel droplets in an impulse engine:

x is air velocity measured in cm/sec	y is evaporation coefficient measured in mm ² /sec
20	0.18
60	0.37
100	0.35
140	0.78
180	0.56
220	0.75
260	1.18
300	1.36
340	1.17
380	1.65

Your goal is to fit a straight line to these data. And after you have found the equation of the line, to use it to estimate the evaporation coefficient of a droplet when the air velocity is 190 cm/sec. Note: For this problem, $n = 10$ throughout because there are 10 data points. In parts e) and f) the bar above denotes the average value. Keep at least 5 decimal places.

a) $\sum_{i=1}^n x_i =$ b) $\sum_{i=1}^n (x_i)^2 =$ c) $\sum_{i=1}^n y_i =$ d) $\sum_{i=1}^n x_i y_i =$

e) $\bar{x} =$ f) $\bar{y} =$ g) $\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y}) =$

h) $\sum_{i=1}^n (x_i - \bar{x})^2 =$ i) $\sum_{i=1}^n (y_i - \bar{y})^2 =$

j) $r = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \cdot \sum_{i=1}^n (y_i - \bar{y})^2}} =$

k) Solve this system for “a” and “b” $\begin{cases} \sum_{i=1}^n y_i = a \sum_{i=1}^n x_i + nb \\ \sum_{i=1}^n x_i y_i = b \sum_{i=1}^n x_i + a \sum_{i=1}^n (x_i)^2 \end{cases}$

l) Write the equation for the line $y = ax + b$ with your values for “a” and “b” that you found above.

m) Estimate the evaporation coefficient when the air velocity is 190 cm/sec.