

Section 9.3: Calculating the Best-Fit Line

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three ways of calculating the best-fit line:

- ① using the "computing formula"
- ② using matrix algebra (covered in Math 251)
- ③ technology ← I highly recommend this approach!

computing formula:

- from your table of (x, y)

- calculate \bar{x} , s_x , \bar{y} , s_y

- calculate (z_x, z_y) for each point

- then

$$r = \frac{\sum z_x z_y}{n-1} \left[= \frac{\sum (x-\bar{x})(y-\bar{y})}{(n-1)s_x s_y} \right]$$

- so, finally:

$$\text{if } y = mx + b$$

then $m = r \cdot \frac{S_y}{S_x}$ (slope)

and $b = \bar{y} - m\bar{x}$ (y-intercept)

↑ ↑
means of x
+ y

if you want something that's easier to compute:

$$S_{xx} = \sum x^2 - \frac{(\sum x)^2}{n}$$

$$S_{yy} = \sum y^2 - \frac{(\sum y)^2}{n}$$

$$S_{xy} = \sum xy - \frac{(\sum x)(\sum y)}{n}$$

then $m = \frac{S_{xy}}{S_{xx}}$ and $b = \bar{y} - m\bar{x}$

$$r^2 = \frac{(S_{xy})^2}{S_{xx} S_{yy}}$$