

Regression Line Problem: Chapter 12

For the data set below, find:

- the average x and the average y .
- the SD of x and the SD of y .
- each x and y in the table, expressed in standard units.
- the correlation coefficient.
- the slope of the regression line.
- the x - and y -coordinates of a point that is known to be on the regression line.
- the equation of the regression line.
- the predicted y when $x = 12$.

(Be careful. The slope of the regression line is *not* the same as the correlation coefficient, and the point known to be on the regression line might not be one of the six points given in the problem.)

x	y
3	27
5	20
5	11
5	20
9	24
15	18

Answers.

- The average x is 7, and the average y is 20.
- The SD of x is 4, and the SD of y is 5.

- | x | y |
|------|------|
| -1 | 1.4 |
| -0.5 | 0 |
| -0.5 | -1.8 |
| -0.5 | 0 |
| 0.5 | 0.8 |
| 2 | -0.4 |

- $r = -0.9/6 = -3/20 = -0.15$.
- $m = (-(3/20)) \times (5/4) = -15/80 = -0.1875$. *Be careful; -0.15 is the value of r and not the slope of the regression line.*
- $(7, 20)$ is the point of averages and therefore on the regression line. *(You must plug in $(7, 20)$ and not one of the given points. The line need not pass through any given point of the scatter diagram.)*
- $y = -0.1875x + 21.3125$ or $y = (-15/80)x + 1705/80$.
- When $x = 12$, the regression equation provides us with a prediction of $y = -0.1875(12) + 21.3125 = 19.0625$.

It might be interesting to use the regression method of chapter 10 to verify the result.

The given x is 1.25 SDs above average.

The predicted y will have to be $r \times 1.25$ SDs above average. That's $-0.15 \times 1.25 = -0.1875$ SDs, which is 0.1875 SDs *below* average.

Since the SD of y is 5, that is $0.1875 \times 5 = .9375$ below the average of y .

Answer: $20 - 0.9375 = 19.0625$, which agrees with the prediction made by the equation of the regression line.