This page shows how you can derive the simple form of the LSLR slope using only algebra:

from its original definition.

Denominator looks a bit like variance:

So we can rewrite b as:

And the factors of the numerator look a bit like z-scores…

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So we can rewrite the numerator:

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And now we can rewrite b, using our simplified b from above:

But since standard deviation is a scalar (just a number, not a list of numbers), we can take it outside the summation:

But this summation above should remind you of the simple form of Pearson’s correlation formula!

So we can finally rewrite the slope of the LSLR line as:

Note that if x has zero standard deviation, then b is undefined! But that’s ok, because that means x is a constant, and therefore has no predictive power for y anyway.

In R code, b is given by:

lslr\_slope = (sd(y)/sd(x))\*cor(x, y)