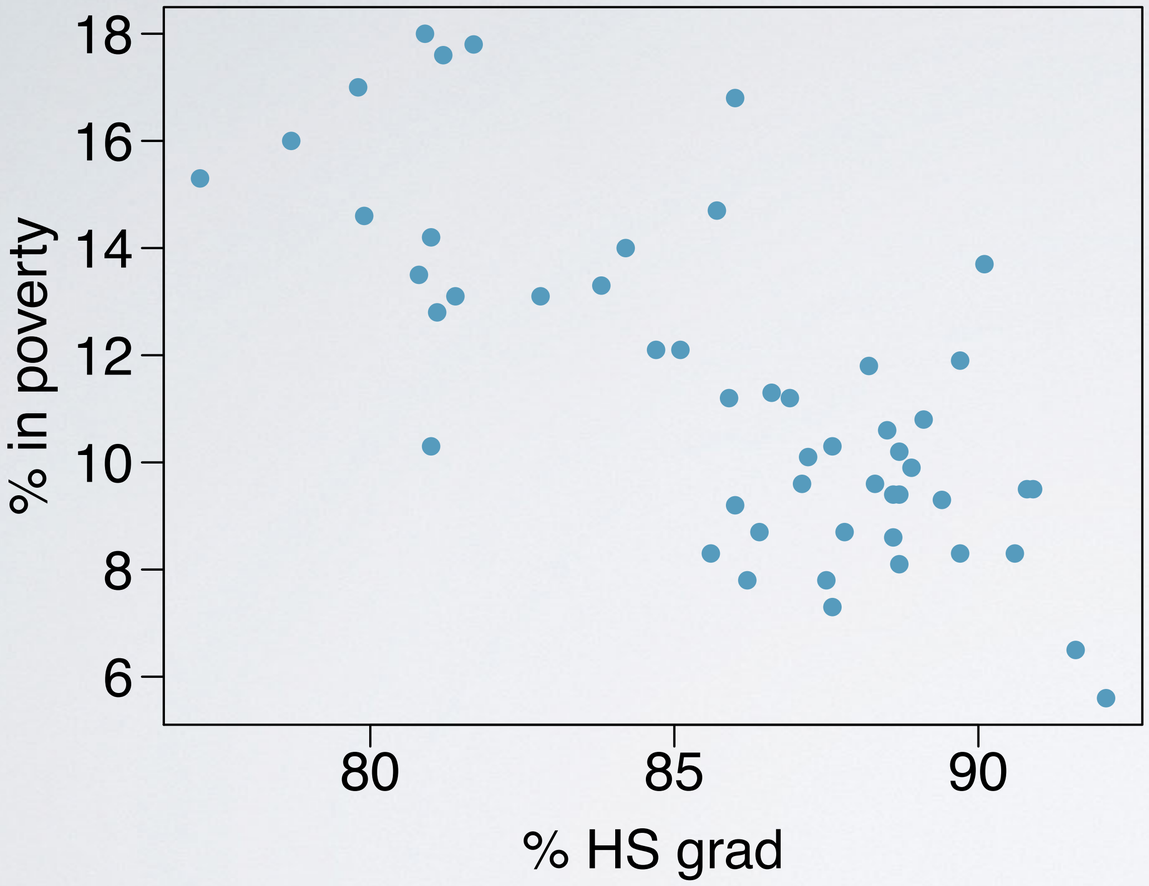
correlation

- definition
- properties

Duke
UNIVERSITY

Dr. Mine Çetinkaya-Rundel
Duke University

poverty vs. HS grad rate



- data: 50 states + DC
- poverty line: income below $23,050 for a family of 4 in 2012

Response? *% in poverty*

Explanatory? *% HS grad*

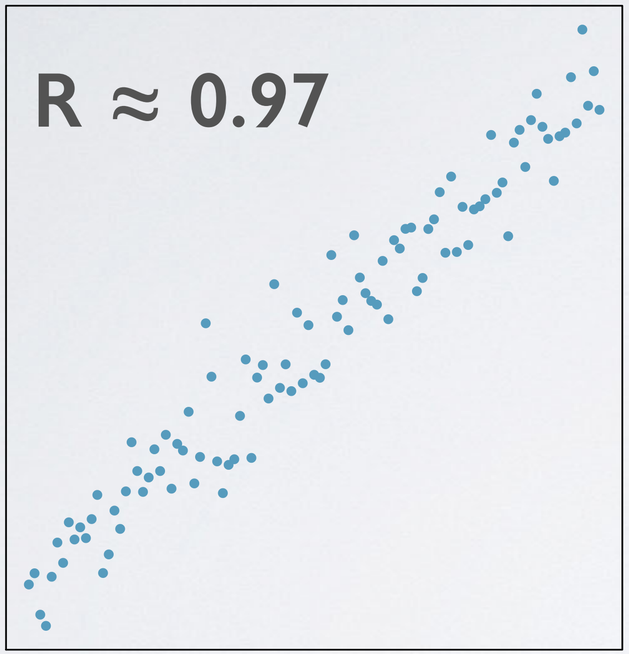
Relationship? *linear, negative, moderately strong*

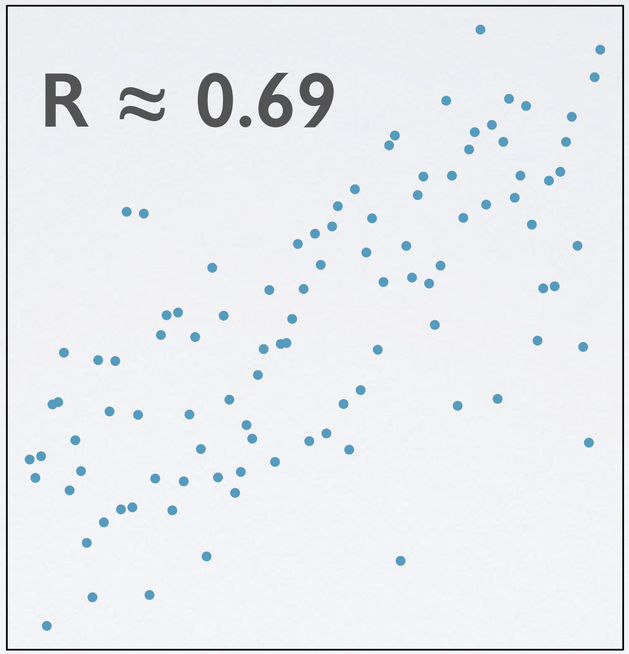
correlation

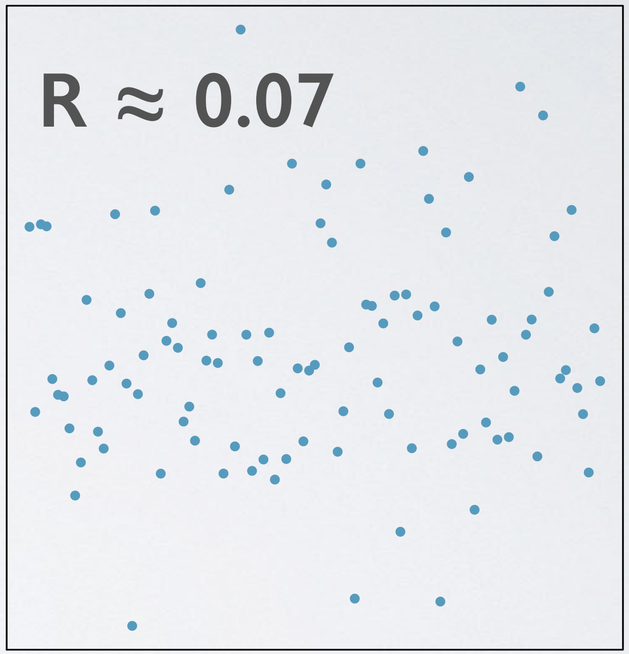
- describes the strength of the linear association between two variables
- denoted as R

properties (I)

the magnitude (absolute value) of the correlation coefficient measures the strength of the linear association between two numerical variables

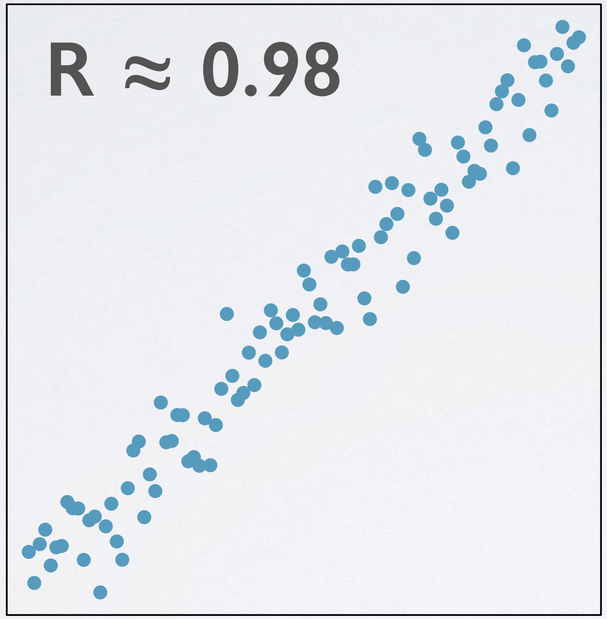


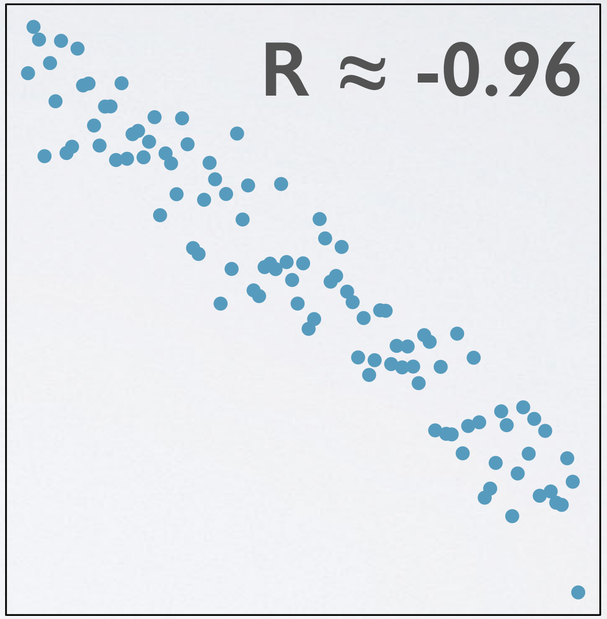




properties (2)

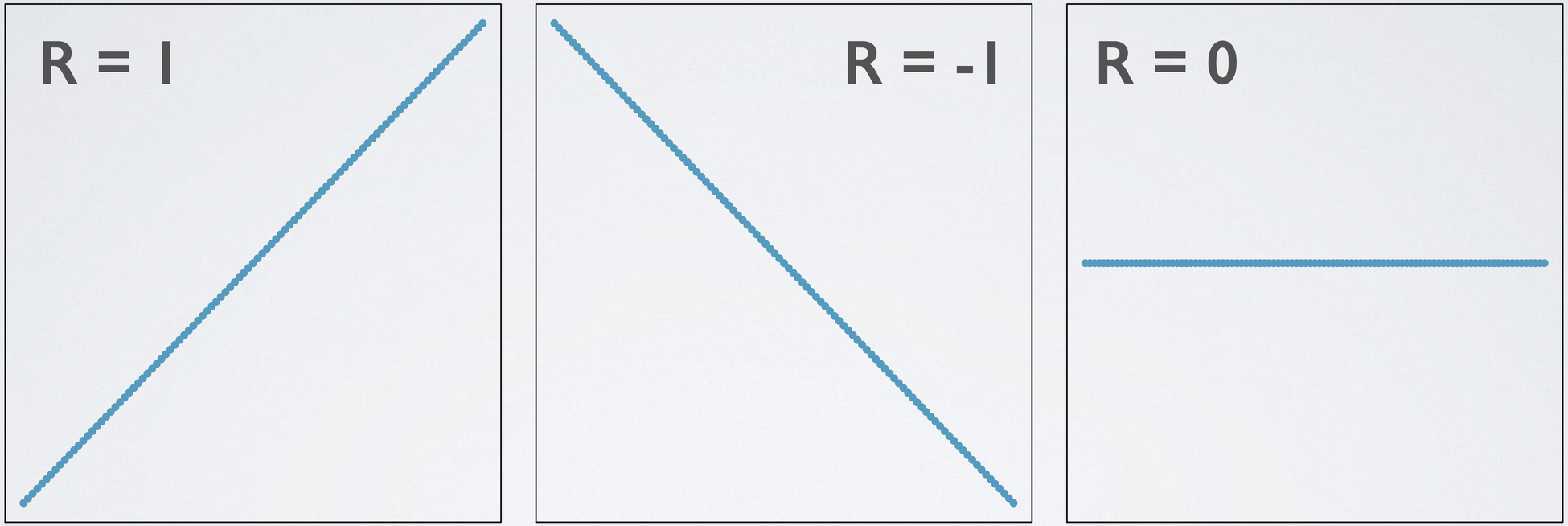
the sign of the correlation coefficient indicates the direction of association





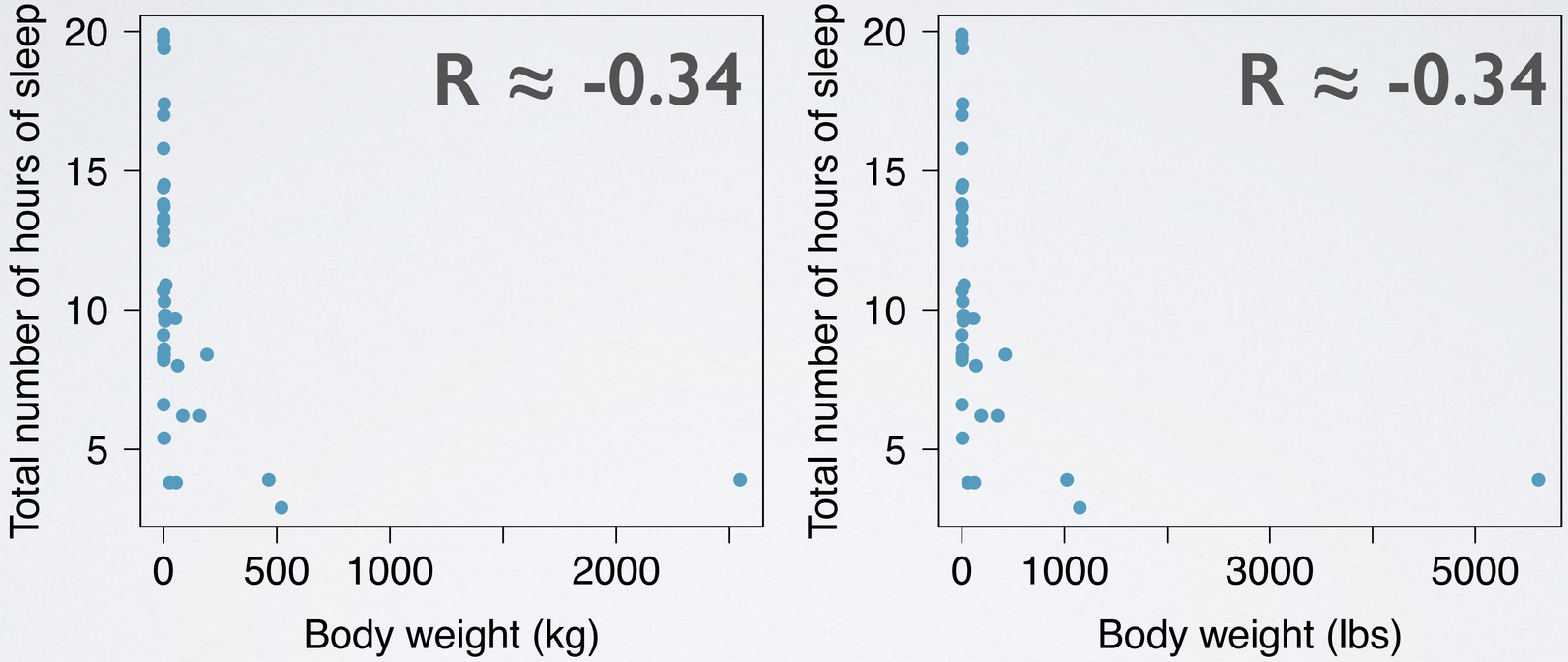
properties (3)

- the correlation coefficient is always between -1 (perfect negative linear association) and 1 (perfect positive linear association)
- R = 0 indicates no linear relationship



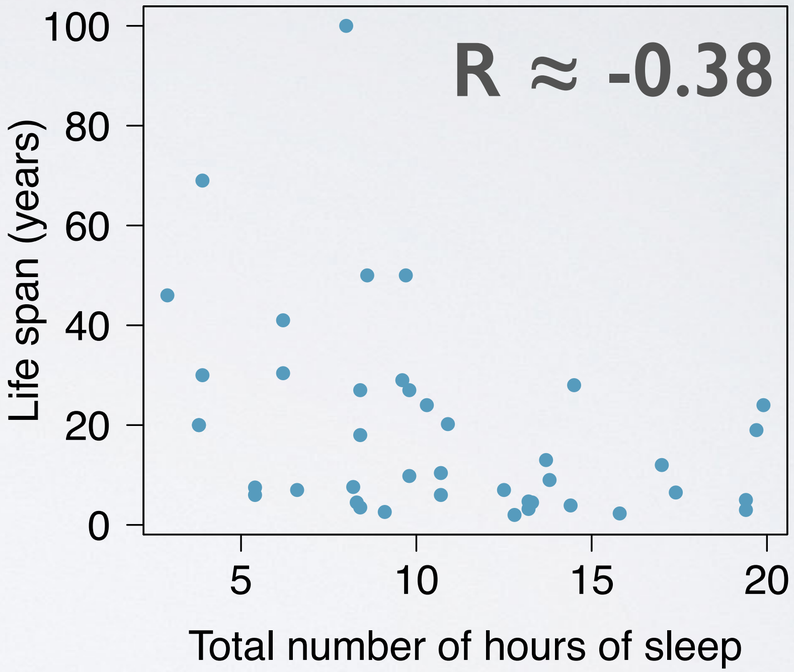
properties (4)

the correlation coefficient is unitless, and is not affected by changes in the center or scale of either variable (such as unit conversions)



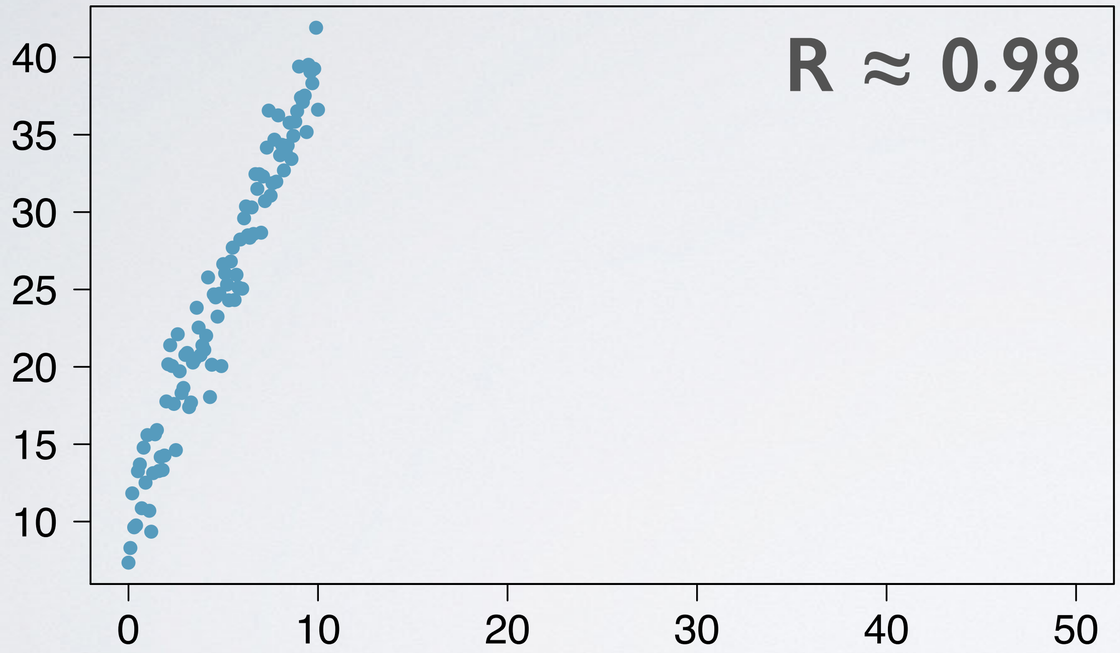
properties (5)

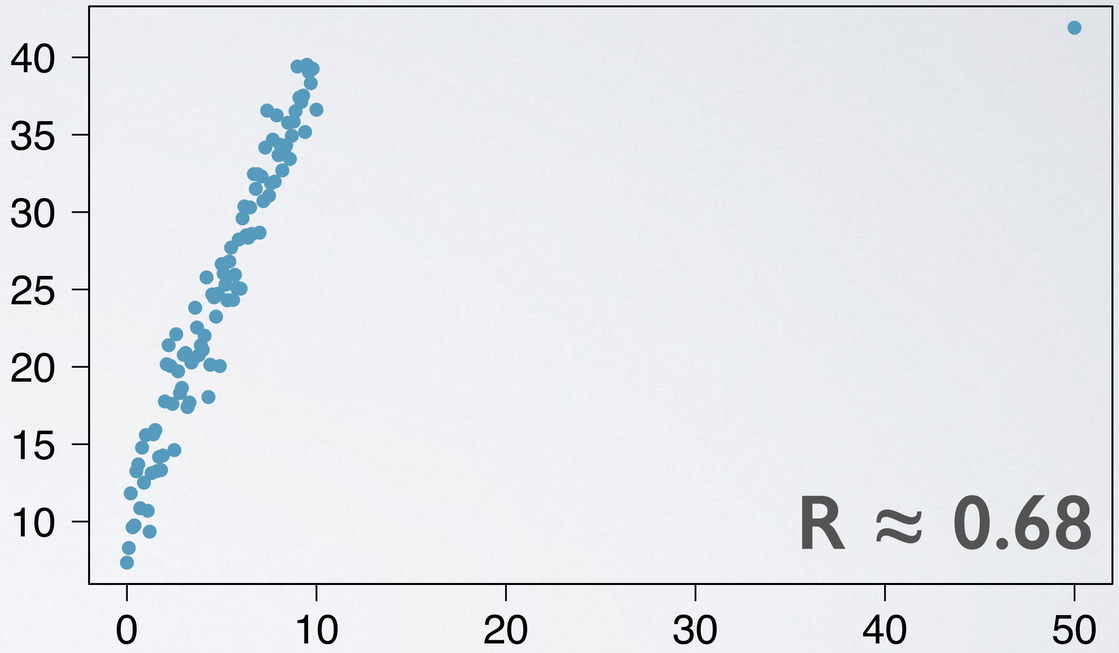
the correlation of X with Y is the same as of Y with X



properties (6)

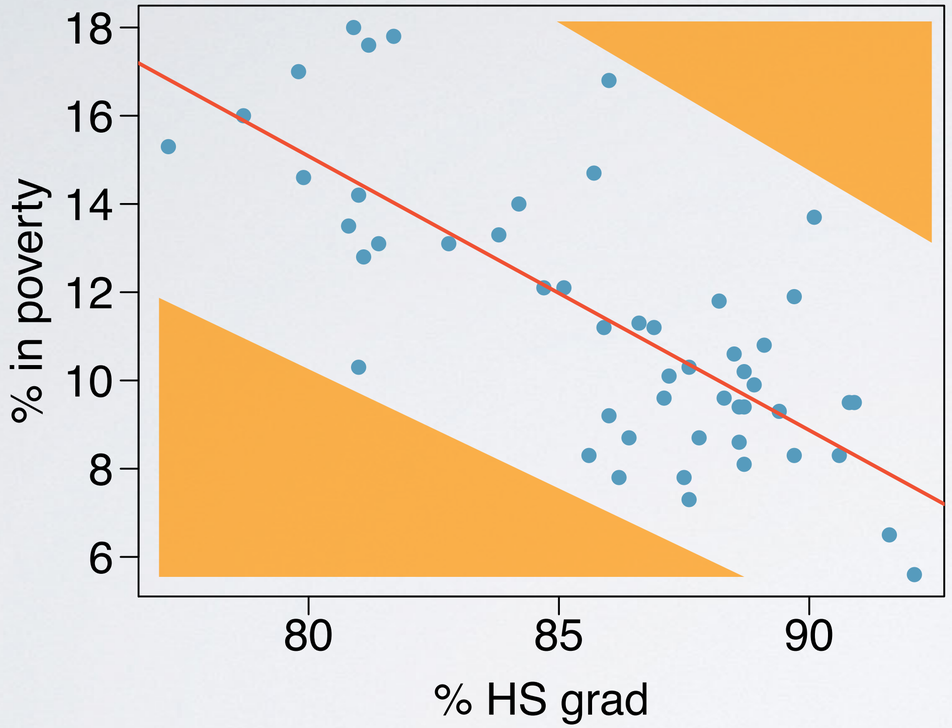
the correlation coefficient is sensitive to outliers





practice

Which of the following is the best guess for the correlation between % in poverty and % HS grad?



(a) 0.6

(b) -0.75

(c) -0.1

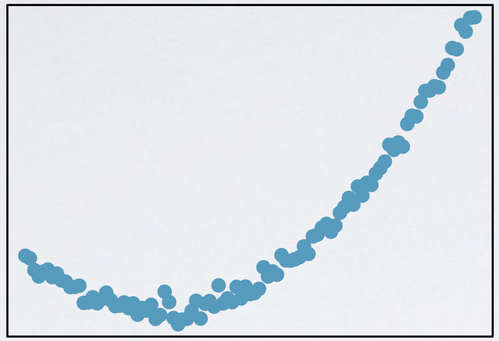
(d) 0.02

(e) -1.5

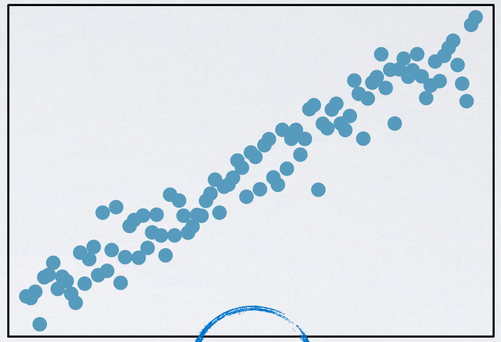
practice

Which of the following has the strongest correlation, i.e. correlation coefficient closest to +1 or -1?

very strong, but not linear



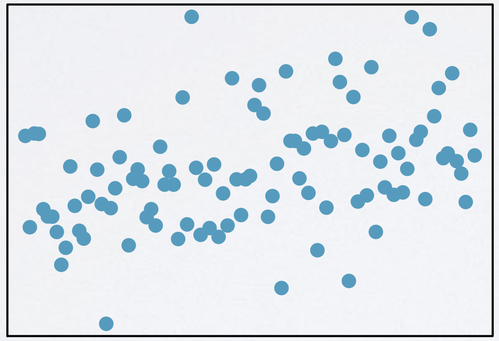
(a)



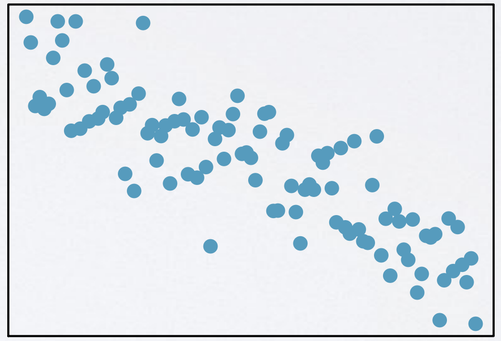
(b)

strongest linear

even weaker



(c)



(d)

weaker