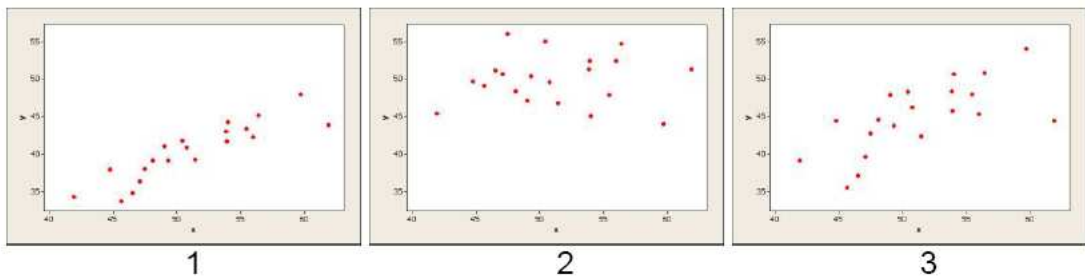


# Classroom Voting Questions: Elementary Statistics

## Correlation

1. The scatterplots below display three bivariate data sets. The correlation coefficients for these data sets are 0.03, 0.68, and 0.89. Which scatter plot corresponds to the data set with  $r = 0.03$ ?



- (a) Plot 1
- (b) Plot 2
- (c) Plot 3

*Answer: (b).*

by Roxy Peck for the textbooks: Roxy Peck and Jay Devore, *Statistics: The Exploration and Analysis of Data*, 6th Edition, Brooks/Cole Cengage Learning 2008 and Roxy Peck, Chris Olsen and Jay Devore, *Introduction to Statistics and Data Analysis*, 3rd Edition, Brooks/Cole Cengage Learning 2008.

STT.02.02.010

CC HZ MA207 F09: 5/**95**/0 time 1:10

CC KC MA207 F09: 17/**76**/7 time 1:45

AS DH MA3321 Su12: 0/**75**/25 time 2:30

AS DH MA1333 010 F12: 7/**93**/0 time 2:00

AS DH MA1333 020 F12: 0/**86**/14 time 2:00

AS DH 1333 010 S13: 0/**56**/44 time 2:00

AS DH 1333 020 S14: 4/**87**/9 time 2:10 ,

AS DH 3321 010 S14: 0/**100**/0 time 2:00 ,

AS DH 1333 010 F14: 12/**88**/0 time 1:50 ,

AS DH 3321 010 F14: 0/**85**/15 time 1:20 ,

AS DH 1333 020 S15: 0/**73**/27 time 2:10 ,

AS DH 1333 020 F15: 12/**59**/29 time 2:00 ,

CC KC MA207 F15: 0/**100**/0

CC KC MA315 F15: 7/**93**/0  
AS DH 1342 010 F17: 17/**79**/4 time 1:40

2. Joe Bob found a strong correlation in an empirical study showing that individuals' physical ability decreased significantly with age. Which numerical result below best describes this situation?
- (a)  $-1.2$
  - (b)  $-1.0$
  - (c)  $-0.8$
  - (d)  $+0.8$
  - (e)  $+1.0$
  - (f)  $+1.2$

*Answer:* (c). (A), (F) The range of the correlation coefficient is  $|r| < 1$ .

(B) This is a perfect negative correlation, which is unlikely to happen with empirical data.

(C)\* correct The problem statement assumes increasing age, so the best answer is a strong, negative correlation.

(D) Although this correlation is strong, it is also positive, whereas the problem statement implies that the correlation should be negative.

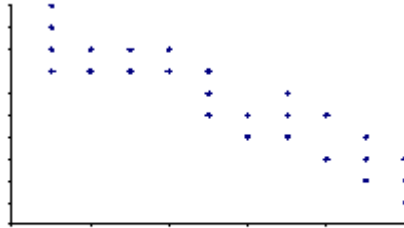
(E) This correlation is both perfect (unlikely with empirical data) and positive (whereas the problem statement implies that the correlation should be negative).

by Murphy, McKnight, Richman, and Terry

STT.02.02.020

CC HZ MA207 F09: 5/5/**85**/5/0/0 time 0:50  
CC KC MA207 F09: 7/7/**72**/3/10/0 time 1:00  
AS DH MA3321 Su12: 0/17/**83**/0/0/0 time 2:20  
AS DH MA1333 010 F12: 0/14/**79**/7/0/0 time 1:50  
AS DH MA1333 020 F12: 14/14/**71**/0/0/0 time 1:50  
AS DH 1333 010 S13: 0/39/**61**/0/0/0 time 2:10  
AS DH 1333 020 S14: 0/26/**70**/4/0/0 time 2:00 ,  
AS DH 3321 010 S14: 0/0/**100**/0/0/0 time 2:10 ,  
AS DH 1333 010 F14: 0/8/**88**/4/0/0 time 1:30 ,  
AS DH 3321 010 F14: 0/25/**75**/0/0/0 time 1:40 ,  
AS DH 1333 020 S15: 17/50/**25**/8/0/0 time 2:00 ,  
AS DH 1333 020 F15: 0/12/**88**/0/0/0 time 1:40 ,  
CC KC MA207 F15: 0/23/**77**/0/0/0  
CC KC MA315 F15: 0/31/**69**/0/0/0 time 1:00

3. Which correlation best describes the scatterplot?



- (a)  $-0.7$
- (b)  $-0.3$
- (c)  $0$
- (d)  $+0.3$
- (e)  $+0.7$

*Answer: (a).* (A)\* correct The relationship appears to be strong and negative; this correlation is the only one of the available options that meets both criteria.

(B) This correlation is too weak to match the relationship in the graph. Some students might select this answer because the axis scales are different.

(C) The points in the graph are not sufficiently random to indicate a 0 correlation.

(D), (E) These correlations are positive, whereas the pictured relationship is negative.

by Murphy, McKnight, Richman, and Terry

STT.02.02.030

CC HZ MA207 F09: **95**/0/0/0/5 time 0:30

CC KC MA207 F09: **83**/17/0/0/0 time 1:10

AS DH MA3321 Su12: **100**/0/0/0/0 time 2:10

AS DH MA1333 010 F12: **93**/0/0/7/0 time 1:40

AS DH MA1333 020 F12: **100**/0/0/0/0 time 1:00

AS DH 1333 010 S13: **89**/11/0/0/0 time 1:00

AS DH 1333 020 S14: **100**/0/0/0/0 time 1:30 ,

AS DH 1333 010 F14: **92**/8/0/0/0 time 1:10 ,

AS DH 1333 020 S15: **93**/7/0/0/0 time 1:00 ,

AS DH 1333 020 F15: **95**/0/5/0/0 time 1:30 ,

CC KC MA207 F15: **62**/38/0/0/0

CC KC MA315 F15: **100**/0/0/0/0 time 0:30  
AS DH 1342 010 F17: **83**/13/0/0/4 time 1:00

4. If you believed strongly in the idea that the more hours per week full-time students work in a job, the lower their GPA would be, then which correlation would you realistically expect to find?
- (a)  $-0.97$
  - (b)  $-0.72$
  - (c)  $-0.20$
  - (d)  $+0.20$
  - (e)  $+0.72$
  - (f)  $+0.97$

*Answer: (b).* (A) Although this correlation is appropriately negative, it is unrealistically strong.

(B)\* correct This correlation is appropriately negative and strong.

(C) This correlation is weaker than a person with a strong belief is likely to expect.

(D), (E), (F) Among other issues, these correlations are all positive, whereas the expected correlation would be negative.

by Murphy, McKnight, Richman, and Terry

STT.02.02.040

CC HZ MA207 F09: 10/**85**/0/0/0/0 time 1:00

CC KC MA207 F09: 21/**79**/0/0/0/0 time 1:30

AS DH MA3321 Su12: 8/**92**/0/0/0/0 time 1:50

AS DH MA1333 010 F12: 50/**36**/7/7/0/0 time 2:00

AS DH MA1333 020 F12: 0/**86**/14/0/0/0 time 1:30

AS DH 1333 010 S13: 0/**94**/6/0/0/0 time 1:40

AS DH 1333 020 S14: 47/**47**/7/0/0/0 time 1:30 ,

AS DH 1333 010 F14: 62/**38**/0/0/0/0 time 1:50 ,

AS DH 1333 020 S15: 7/**87**/0/0/0/7 time 1:30 ,

AS DH 1333 020 F15: 30/**70**/0/0/0/0 time 1:50 ,

CC KC MA207 F15: 0/**100**/0/0/0/0

CC KC MA315 F15: 37/**62**/0/0/0/0

5. A researcher found that  $r = +.92$  between the high temperature of the day and the number of ice cream cones sold at Cone Island. This result tells us that
- (a) high temperatures cause people to buy ice cream.

- (b) buying ice cream causes the temperature to go up.
- (c) some extraneous variable causes both high temperatures and high ice cream sales.
- (d) temperature and ice cream sales have a strong positive linear relationship.

*Answer: (d).* (A) This claim may be true, but correlation tells us only about the strength and direction of a relationship, not about the cause-effect aspect of the relationship.

(B) Correlation does not imply causation, in either direction.

(C) Correlation does not imply the existence of a lurking variable.

(D)\* correct A correlation of  $r = +.92$  implies a strong, positive, linear relationship.

by Murphy, McKnight, Richman, and Terry

STT.02.02.050

CC HZ MA207 F09: 45/0/0/**55** time 0:50

CC KC MA207 F09: 55/3/0/**41** time 1:00

AS DH MA3321 Su12: 0/8/0/**92** time 1:30

AS DH MA1333 010 F12: 0/13/0/**88** time 1:50

AS DH MA1333 020 F12: 14/0/0/**86** time 1:40

AS DH 1333 010 S13: 0/0/0/**100** time 1:20

AS DH 1333 020 S14: 0/0/13/**87** time 2:10 ,

AS DH 3321 010 S14: 0/0/0/**100** time 2:30 ,

AS DH 1333 010 F14: 8/0/19/**73** time 2:30 ,

AS DH 3321 010 F14: 0/0/5/**95** time 2:00 ,

AS DH 1333 020 S15: 0/0/0/**100** time 2:00 ,

AS DH 3321 010 S15: 0/0/3/**97** time 1:30 ,

AS DH 1333 020 F15: 5/0/5/**90** time 2:00 ,

AS DH 3321 010 F15: 0/0/0/**100** time 1:40 ,

CC KC MA207 F15: 0/0/0/**100**

CC KC MA315 F15: 6/0/0/**94**

AS DH 3321 010 F16: 6/0/0/**94** time 1:50

AS DH 1342 010 F17: 0/0/8/**92** time 2:00

6. You are conducting a correlation analysis between a response variable and an explanatory variable. Your analysis produces a significant positive correlation between the two variables. Which of the following conclusions is the *most* reasonable?
- (a) Change in the explanatory variable causes change in the response variable.
  - (b) Change in the explanatory variable is associated with in change in the response variable.
  - (c) Change in the response variable causes change in the explanatory variable.
  - (d) All from (a)-(c) are equally reasonable conclusions.

*Answer: (b).* by Murphy, McKnight, Richman, and Terry (087v2)

(A), (C) Correlation does not imply causation.

(B)\* correct - Correlation tells us only about the strength and direction of a relationship, not about the cause-effect aspect of the relationship.

(D) Only (B) is a reasonable (correct) conclusion from the information given.

STT.02.02.055 DH 190

AS DH MA1333 010 F12: 0/**88**/13/0 time 1:00

AS DH MA1333 020 F12: 0/**43**/0/57 time 1:00

AS DH 1333 010 S13: 20/**53**/20/7 time 1:30

AS DH 1333 020 S14: 0/**9**/4/87 time 1:30 ,

AS DH 3321 010 S14: 0/**100**/0/0 time 1:30 ,

AS DH 1333 010 F14: 23/**77**/0/0 time 1:30 ,

AS DH 1333 020 S15: 0/**83**/0/17 time 1:30 ,

AS DH 1333 020 F15: 36/**29**/0/36 time 1:50 ,

CC KC MA207 F15: 18/**82**/0/0 time 1:30

CC KC MA315 F15: 12/**76**/6/6

AS DH 1342 010 F17: 0/**65**/6/29 time 1:30

7. The salary and the numbers of years of teaching experience were recorded for 20 social studies teachers in rural west Texas. When the data points were plotted, there was a roughly linear relationship and a positive correlation between salary and number of years of teaching experience, with  $r = 0.8$ . What percentage of the variation in the salaries is explained by the linear relationship between salary and years of service?

(a) 80%

(b) 64%

(c) 36%

(d) 20%

*Answer: (b).*

by David A. Huckaby

STT.02.02.060 DH 10

AS DH MA1333 010 F12: 0/**88**/13/0 time 2:00

AS DH MA1333 020 F12: 0/**100**/0/0 time 1:40

AS DH 1333 010 S13: 100/**0**/0/0 time 2:20

AS DH 1333 020 S14: 0/**100**/0/0 time 1:50 ,

AS DH 1333 010 F14: 0/**92**/8/0 time 2:40 ,

AS DH 1333 020 S15: 33/**67**/0/0 time 1:30 ,

AS DH 1333 020 F15: 5/**95**/0/0 time 2:30 ,

AS DH 1342 010 F17: 0/**100**/0/0 time 1:30