Statistics Unit 2 worksheet: The correlation coefficient

Name _____ Date _____ Period _____

1. Six sets of paired data have these correlation coefficients:

$$r = 0.45, \quad r = -0.83, \quad r = 0.07, \quad r = -0.50, \quad r = 0.91, \quad r = -0.96$$

(a) List the six values in order, from the strongest straight-line relationship to the weakest.

(b) Which of the six scatter plots fall from left to right?

(c) Which set shows little or no straight-line pattern?

2. For each pair of variables, measured on many individuals, say whether you would expect r to be positive, negative or near 0, and why. If r cannot be found for the pair at all, say so and explain.

(a) The outdoor temperature on a winter day and the number of cups of hot chocolate a ski lodge cafe sells that day.

(b) The number of pages in a hardcover book and the mass of the book.

(c) The age of a used car and its selling price.

(d) A student's height and the last digit of the student's house number.

(e) A student's favorite color and the student's height.

(f) The length of a running race and the winning time.

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3. Without technology, decide for each data set whether $r = 1$, $r = -1$, r cannot be found, or none of these. When it is none of these, say whether r is positive or negative and then find r with technology.

(a) $(1, 7), (2, 5), (3, 3), (4, 1)$

(b) $(2, 4), (2, 6), (2, 9)$

(c) $(0, 3), (5, 13), (10, 23)$

(d) $(1, 2), (2, 4), (3, 8), (4, 16)$

(e) $(-2, 5), (0, 5), (3, 5)$

(f) $(1, 10), (2, 8), (3, 7), (4, 4)$

4. A library recorded, on five weekdays, the hours it was open and the number of books borrowed (made-up data), as pairs (hours, books): (6, 140), (8, 210), (9, 170), (10, 230), (12, 260).

(a) Find the center of the cloud: the mean number of hours and the mean number of books.

(b) For each point, say whether it pushes r up, pushes it down, or pushes neither way, and why.

(c) From (b), predict the sign of r. Then find r with technology and describe the relationship.

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5. Two weather stations each recorded, on six summer days, the hours of sunshine and the highest temperature in degrees Celsius (made-up data), as pairs (hours, temperature).

   Station A: (2, 14), (3, 16), (5, 15), (7, 19), (9, 20), (10, 24)

   Station B: (1, 19), (4, 23), (5, 17), (6, 22), (8, 18), (12, 21)

   (a) Find r for each station with technology.

   (b) At which station does sunshine have the stronger straight-line relationship with temperature? Describe the relationship at each station.

   (c) The forecaster at Station B says, "Our r is positive too, so here as well sunnier days tend to be warmer." Is that a fair reading of Station B's r? Explain.

6. A town counted its public charging points for electric cars at the end of each year from 2016 to 2025. For the pairs (year, number of charging points), technology gives $r = 0.95$. A news report says: "The number of charging points rose by 0.95 each year."

   (a) Explain what is wrong with the report.

   (b) What does $r = 0.95$ tell you about these data?

   (c) What number should the report have used to say how fast the count rose each year, and how would you find it?

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