Statistical Reasoning Monday, Feb. 10th

When you finish your tedious task activity, turn it in to the bookcase and grab the 2 sheets on top. We will go over the notes shortly.

explanatory variable → x
response variable → y

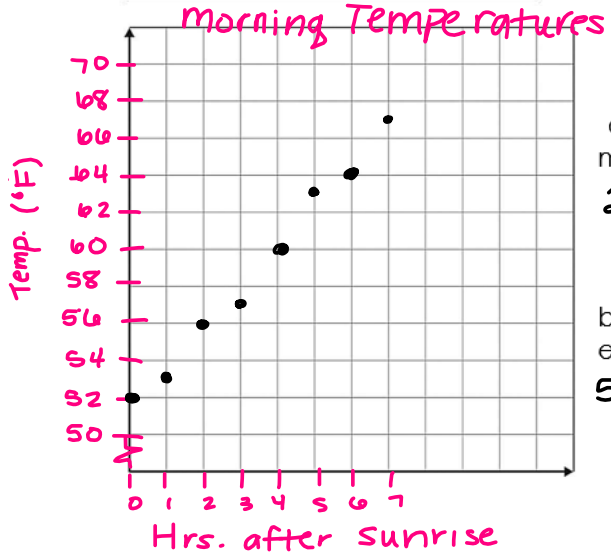
Statistical Reasoning
Linear Regression Notes

Name: _____

Scenario 1: A weather team records the weather each hour after sunrise one morning in May. The hours after sunrise and the temperature in degrees Fahrenheit are in the table below. Create a graph to represent the data and calculate a linear equation to represent the table.

x y

Hours after sunrise	Temperature in °F
0	52
1	53
2	56
3	57
4	60
5	63
6	64
7	67



Using your calculator to find the linear regression/least squares regression/line of best fit equation:

a = 2.2 b = 51.3 r^2 = .988 r = .994

y = ax + b

$y = 2.2x + 51.3$

a. Interpret what the slope of each equation means in terms of the problem context.

2.2 → every hr, temp increases by 2.2°F

b. Interpret what the y-intercept of each equation means in terms of the problem context.

51.3 → 0 hrs after sunrise, the temp is 51.3°F

c. Find the value of *r*. What does this tell you?

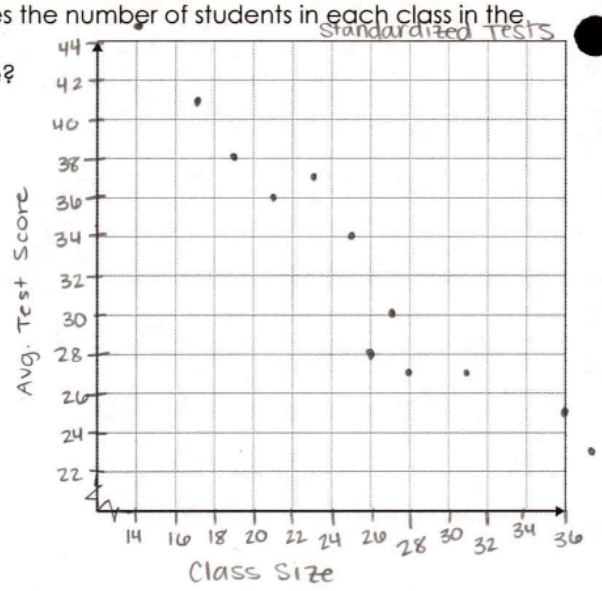
r = 0.994 → strong positive correlation
strength direction form is linear

d. Find the value of r^2. What does this tell you?

$r^2 = 0.988$ → 98.8% of the variation of our data is explained by regression equation

Scenario 2: Charles thinks there may be a relationship between class size and student performance on standardized tests. She tracks the average test performance of students from 12 different classes and notes the number of students in each class in the table below. Is there a linear relationship between class size and average test score?

Class Size	Average Test Score
14	45
17	41
19	38
21	36
23	37
25	34
26	28
27	30
28	27
31	27
36	25
37	23



a. Calculate the least-squares regression equation:

$y = -0.9x + 56.2$

b. Explain what the slope means in context of the problem scenario:

$-0.9 \rightarrow$ As class size ↑ by 1 student, average test score ↓ by 0.9 points

c. Explain what the y-intercept means in context of the problem scenario:

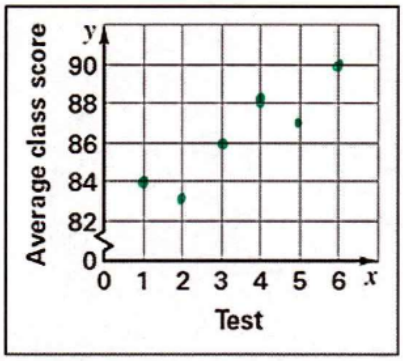
$56.2 \rightarrow$ If class size was 0, average test score would be 56.2 points

d. Describe the correlation:

$r = -0.957 \rightarrow$ strong negative correlation

Scenario 3: The table below gives the average test score, y, on each chapter test for the first six chapters, x, of the textbook. Calculate the linear regression model for this data. Then explain what the slope and y-intercept represent in context. Describe the correlation.

x	1	2	3	4	5	6
y	84	83	86	88	87	90



$y = 1.3x + 81.9$

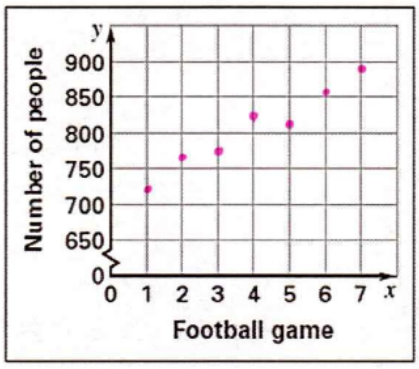
slope: 1.3 → with each chapter, average test score increases by 1.3 pts

y-int: 81.9 → on test 0, the average class score is 81.9

correlation: $r = 0.911$ → strong positive correlation

Scenario 4: The table below gives the number of people, y, who attended each of the first seven football games, x, of the season. Calculate the linear regression model for this data. Then explain what the slope and y-intercept represent in context. Describe the correlation.

x	1	2	3	4	5	6	7
y	722	763	772	826	815	857	897



$y = 27x + 699.4$

slope: 27 → for each football game played, attendence increases by 27 people

y-int: 699.4 → for the 0th football game, 699.4 people attended

correlation: $r = 0.976$ → strong positive correlation