Instruction

Guided Practice 4.3.2

Example 1

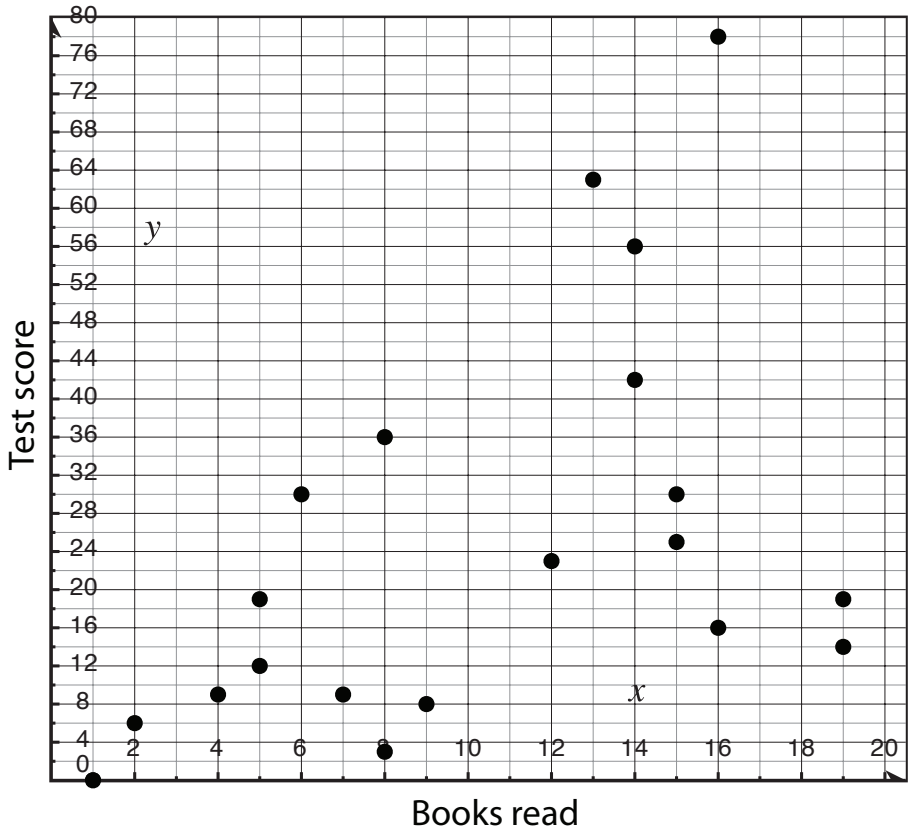
An education research team is interested in determining if there is a relationship between a student's vocabulary and how frequently the student reads books. The team gives 20 students a 100-question vocabulary test, and asks students to record how many books they read in the past year. The results are in the table below. Is there a linear relationship between the number of books read and test scores? Use the correlation coefficient, *r*, to explain your answer.

Books read	Test score
12	23
8	3
19	14
9	8
14	56
19	19
15	25
6	30
2	6
14	42
5	12
15	30
8	36
5	19
1	0
13	63
4	9
16	78
16	16
7	9

Instruction

1. Create a scatter plot of the data.

   Let the *x*-axis represent books read and the *y*-axis represent test score.



2. Describe the relationship between the data using the graphical representation.

   It appears that the higher scores were from students who read more books, but the data does not appear to lie on a line. There is not a strong linear relationship between the two events.

3. Calculate the correlation coefficient on your graphing calculator. Refer to the steps in the Key Concepts section.

   The correlation coefficient, *r*, is approximately 0.48.

4. Use the correlation coefficient to describe the strength of the relationship between the data.

   A correlation coefficient of 1 indicates a strong positive correlation, and a correlation of 0 indicates no correlation. A correlation coefficient of 0.48 is about halfway between 1 and 0, and indicates that there is a weak positive linear relationship between the number of books a student read in the past year and his or her score on the vocabulary test.

Example 2

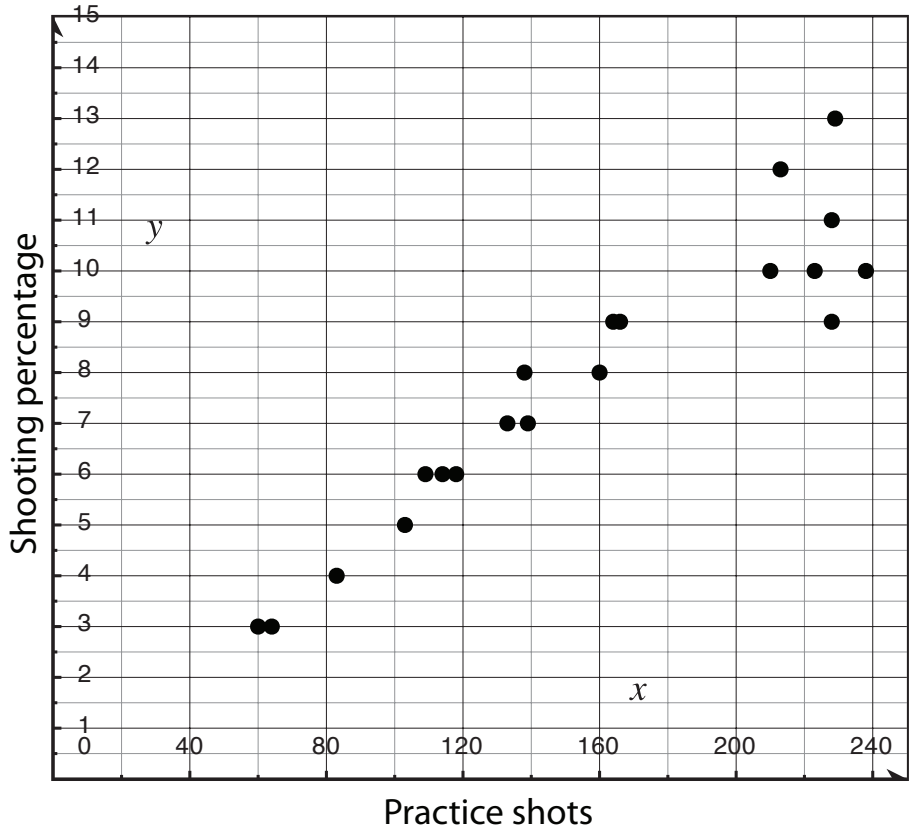
A hockey coach wants to determine if players who take many practice shots during practice have a higher shooting percentage. The shooting percentage is calculated by dividing the number of goals scored by the number of shots taken. The coach records the number of practice shots 20 players take each practice, and compares the number with each player's shooting percentage over the season. Is there a linear relationship between the practice shots and shooting percentage? Use the correlation coefficient, *r*, to explain your answer.

Practice shots	Shooting percentage	Practice shots	Shooting percentage
228	9	223	10
164	9	133	7
64	3	238	10
213	12	228	11
166	9	138	8
60	3	139	7
109	6	118	6
83	4	210	10
229	13	103	5
160	8	114	6

Instruction

1. Create a scatter plot of the data.

   Let the *x*-axis represent the number of practice shots and the *y*-axis represent the shooting percentage.



2. Describe the relationship between the data using the graphical representation.

   It appears that there is a linear relationship between shots taken per practice and shooting percentage. As the number of practice shots increases, shooting percentage also increases, and the graph appears to have a linear shape.

3. Calculate the correlation coefficient on your graphing calculator. Follow the steps in the Key Concepts section.

   The correlation coefficient, *r*, is 0.94.

4. Use the correlation coefficient to describe the strength of the relationship between the data.

   A correlation coefficient of 1 indicates a strong positive correlation, and a correlation of 0 indicates no correlation. A correlation coefficient of 0.94 is close to 1, and indicates that there is a strong positive linear relationship between the number of shots taken and the shooting percentage. ✓

Example 3

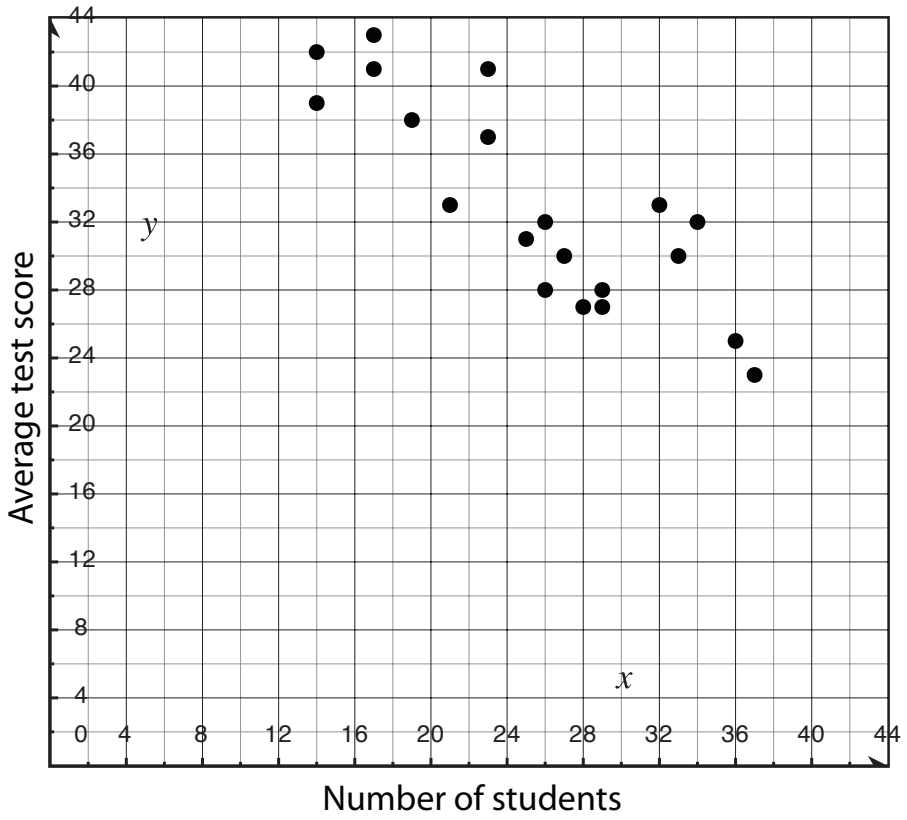
Caitlyn thinks that there may be a relationship between class size and student performance on standardized tests. She tracks the average test performance of students from 20 different classes, and notes the number of students in each class in the table below. Is there a linear relationship between class size and average test score? Use the correlation coefficient, *r*, to explain your answer.

Class size	Average student test score	Class size	Average student test score
26	28	32	33
36	25	27	30
29	27	21	33
26	32	28	27
19	38	23	41
34	32	29	28
17	43	37	23
14	42	14	39
23	37	25	31
17	41	33	30

Instruction

1. Create a scatter plot of the data.

   Let the *x*-axis represent the number of students in each class and the *y*-axis represent the average test score.



2. Describe the relationship between the data using the graphical representation.

   As the class size increases, the average test score decreases. It appears that there is a linear relationship with a negative slope between the two variables.

3. Calculate the correlation coefficient on your graphing calculator. Follow the steps in the Key Concepts section.

   The correlation coefficient, *r*, is approximately –0.84.

Instruction

4. Use the correlation coefficient to describe the strength of the relationship between the data.

   A correlation coefficient of –1 indicates a strong negative correlation, and a correlation of 0 indicates no correlation. A correlation coefficient of –0.84 is close to –1, and indicates that there is a strong negative linear relationship between class size and average test score.