



Exploring Bivariate Data

Student Activity

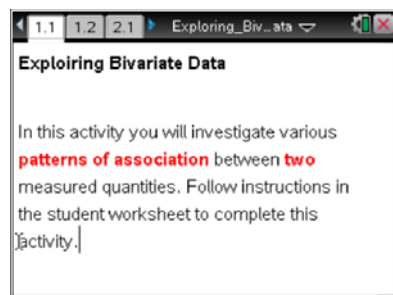


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Open the TI-Nspire document *Exploring_Bivariate_Data.tns*.

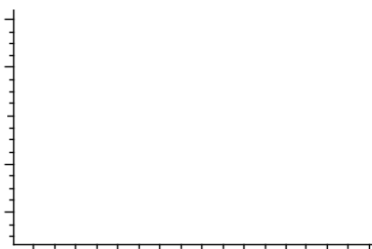
In this activity, you will investigate patterns of association in various sets of bivariate data. For each data set, you will construct the scatter plot and analyze the relationship between the two quantities.



1. The table below shows the total fat in grams and total calories for various fast food items. Does this data suggest that there is an association between the fat grams and total calories in fast food items? Support your answer.

Sandwich	Total fat (g)	Total Calories
Hamburger	9	260
Cheeseburger	13	320
Quarter Pounder	21	420
Quarter Pounder with Cheese	30	530
Big Mac	31	560
Arch Sandwich Special	31	550
Arch Special with Bacon	34	590
Crispy Chicken	25	500
Fish Fillet	28	560
Grilled Chicken	20	440
Grilled Chicken Light	5	300

2. A scatter plot can be used to visualize the association between fat and calories. Think about how the variables are related, and how the variables **fat** and **calories** should be placed on the coordinate axes. Label the axes on the graph below, and explain your choice of axes and variables.





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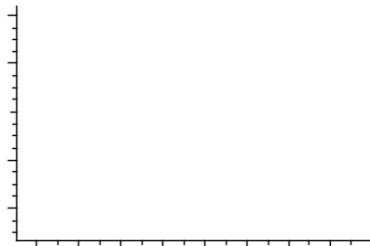
3. On Page 1.2, fat grams are stored as a variable **fat**. Total calories are stored as a variable **cal**. Construct a scatter plot for these two variables:
 - a. Select the **add variable** text at the bottom of the page where the horizontal axis should be placed, and select the variable of your choice.
 - b. Select the **add variable** text on the left of the page where the vertical axis should be placed, and select the variable of your choice.
4. Describe the scatter plot. What, if any, is the association between the fat grams and total calories in these fast food items? Explain your reasoning.
5. Do you think that the age at which a child begins to talk can be used to predict a child's mental ability in the future? The table below contains the age in months at which a child spoke his/her first word and the score on an aptitude test taken when the child was older. Does this data suggest that there is an association between child's age (at first spoken word) and the score on the later aptitude test? Support your answer.

Child	Age	Score
A	15	95
B	26	71
C	10	83
D	9	91
E	15	102
F	20	87
G	18	93

Child	Age	Score
H	11	100
I	8	104
J	20	94
K	7	113
L	9	96
M	10	83
N	11	84

Child	Age	Score
O	11	102
P	10	100
Q	12	105
R	42	57
S	17	102
T	11	86
U	10	100

6. Think about how the variables are related, and how the variables age and score should be placed on the coordinate axes. Label the axes on the graph at the right, and explain your choice of axes and variables.





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7. Age in months is stored as a variable **age**. Each child's score on the aptitude test is stored as a variable **score**. Construct a scatter plot for these two variables following steps 3a-b above.
8. Describe the scatter plot. What, if any, is the association between the child's age and the score? Explain your reasoning.



Tech Tip: You can trace the points on the graph by selecting **MENU > Analyze > Graph Trace**. Using **▶** or **◀** arrows, you can move from one point to another and the values of corresponding age and score will be displayed.



Tech Tip: You can trace the points on the graph by selecting **◀ >** **Analyze > Graph Trace**. Note that in some cases, you may need to back-out to the main Tools Menu **◀** to see the desired menu option.

9. Find the age and the score for the child who started to speak at the youngest age.
 - a. What can you say about the test score of this child compared to all the other children?
 - b. Compare the point representing this child to the points representing the other children. What do you notice?
10. Find the ages and the scores for the two children who were the oldest when they said their first words.
 - a. What can you say about the test scores of these children compared to the other children?
 - b. Compare the points representing these two children to the points representing the other children. What do you notice?
11. Can you determine the association of the two variables, the age and the score, if you remove these three points?



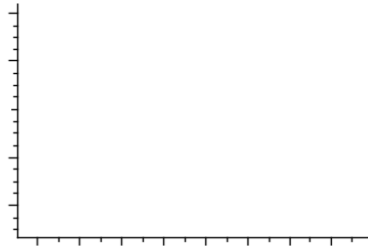
12. Is there an association between the price charged for a hot dog and the price charged for a 16-ounce soda in major league baseball parks? Explore the data shown in the table below (based on 1997 data), record your prediction, and support your answer.

Team	Hot Dog	Soda
Angels	2.5	1.75
Astros	2	2
Braves	2.5	1.79
Brewers	2	2
Cardinals	3.5	2
Dodgers	2.75	2
Expos	1.75	2

Team	Hot Dog	Soda
Giants	2.75	2.17
Indians	2	2
Marlins	2.25	1.8
Mets	2.5	2.5
Padres	1.75	2.25
Phillies	2.75	2.2
Pirates	1.75	1.75

Team	Hot Dog	Soda
Rangers	2	2
Red Sox	2.25	2.29
Rockies	2.25	2.25
Royals	1.75	1.99
Tigers	2	2
Twins	2.5	2.22
White Sox	2	2

13. Think about how the variables are related, and how the variables hot dog and soda should be placed on the coordinate axes. Label the axes on the graph to the right, and explain your choice of axes and variables.



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14. The price of a soda is stored as a variable **soda**. The price of a hot dog is stored as a variable **dog**. Construct a scatter plot for these two variables following steps 3a-b above.
15. Describe the scatter plot. What, if any, is the association between the price of soda and the price of a hot dog? Explain your reasoning.



16. Consider the data in the table below on life expectancy and number of people per TV in a single household for 36 different countries. Make a prediction about the association between these two quantities. Support your prediction.

Country	People per TV	Life expectancy	Country	People per TV	Life expectancy	Country	People per TV	Life expectancy
Argentina	4	70.5	Italy	3.8	78.5	Russia	3.2	69
Bangladesh	315	53.5	Japan	1.8	79	South Africa	11	64
Brazil	4	65	Korea, North	90	70	Spain	2.6	78.5
Canada	1.7	76.5	Korea, South	4.9	70	Sudan	23	53
China	8	70	Mexico	6.6	72	Taiwan	3.2	75
Colombia	5.6	71	Morocco	21	64.5	Thailand	11	68.5
Egypt	15	60.5	Myanmar (Burma)	592	54.5	Turkey	5	70
Ethiopia	503	51.5	Pakistan	73	56.5	Ukraine	3	70.5
France	2.6	78	Peru	14	64.5	United Kingdom	3	76
Germany	2.6	76	Philippines	8.8	64.5	United States	1.3	75.5
India	44	57.5	Poland	3.9	73	Venezuela	5.6	74.5
Indonesia	24	61	Romania	6	72	Vietnam	29	65

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17. People per TV data are stored as a variable **TV**. Life expectancy is stored as a variable **life**. Construct a scatter plot by plotting **TV** along the horizontal axis and **life** along the vertical axis.
18. What, if any, is the association between the life expectancy and people per TV? Explain your reasoning.
19. Describe the scatter plot. Identify clusters and influential points. Support your answer.



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20. Compare and contrast all four data sets you analyzed in this activity, and answer the following questions:
- What is the major difference in the appearance of the scatter plot for two quantities that have a positive association and the scatter plot for two quantities that have a negative association?
 - What is the major difference in the appearance of the scatter plot for two quantities that have a linear association and the scatter plot for two quantities that have a non-linear association?
 - What is the major difference in the appearance of the scatter plot for two quantities that have some association and the scatter plot for two quantities that have no association?
 - How can we determine influential points on the scatter plot? What are different types of influential points and why are they influential?