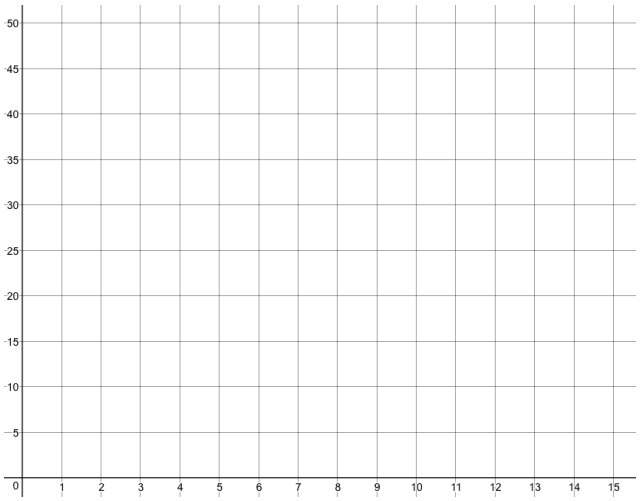
2.5 How safe is Barbie?

2.5 How Safe Is Barbie? Name:

How can we be sure the bungee cord we make for Barbie will keep her safe? Should you be worried if you used the wrong units or measured incorrectly? Stats to the rescue!

1. Below is the data for one group's Barbie bungee jump. Use technology to create a scatterplot and then fit the **Least Squares Regression Line (LSRL)** to the data, and sketch it on the axes provided.

# of bands	0	1	2	3	4	5	6	7
Distance traveled (in)	12	14	17	18	22	23	26	30



2. Write the equation of the **Least Squares Regression Line** (LSRL) below.

3. Analysts used a stats program to calculate the (LSRL). The computer output is shown below:

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	11.583333	0.525475	22.04	<.0001*
# of Rubber Bands	2.4761905	0.125613	19.71	<.0001*

   a. Where do you see the information about the slope and the y-intercept in the computer output? Circle it.

4. Use technology to find the correlation. $r =$_____

5. Interpret the correlation in context.

6. Use the correlation from this data to justify how safe you feel Barbie's bungee jump would be.

7. One of the group members snuck some extra rubber bands to collect more data. Draw the point (15 rubber bands, 49 in) to your **scatterplot** but don't add it to stapplet yet.

    a. How do you think this value will affect the correlation?

    b. Verify using technology. What is the new correlation? $r =$_____

Remove the point (15, 49) when you are done.

8. One group member accidently left off a digit. Change the point (6 rubber bands, 26 in) to (6 rubber bands, 6 in).

    a. How do you think this value will affect the correlation?

    b. Verify with technology. What is the new r? $r =$_____

9. Unfortunately, the group was supposed to measure the lowest point of Barbie's head in **centimeters**, not inches. To fix this they multiplied their data by 2.54 (1in = 2.54cm). The new data is below.

Number of rubber bands	0	1	2	3	4	5	6	7
Distance traveled (cm)	30.48	35.56	43.18	45.72	55.88	58.42	67.04	76.20

    a. How do you think these changes will affect the correlation?

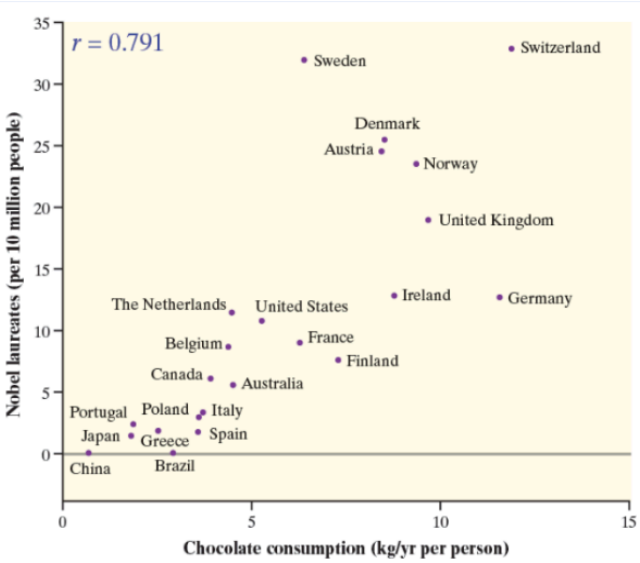
    b. Verify by calculating the correlation with technology. $r =$_____

Big Ideas

1. Any two quantitative variables have a correlation, even if it is zero.
2. Interpret the correlation.
3. Understand the basic properties of correlation, including how the correlation is influenced by unusual points.
4. Distinguish correlation from causation.

Check Your Understanding

Most people love chocolate for its great taste. But does it also make you smarter? A scatterplot like this one recently appeared in the New England Journal of Medicine. The explanatory variable is the chocolate consumption per person for a sample of countries. The response variable is the number of Nobel Prizes per 10 million residents of that country.



1. Interpret the correlation of $r = 0.791$.

2. If people in the United States started eating more chocolate, can we expect more Nobel prizes to be awarded to residents of the United States? Explain.

3. What effect does Switzerland have on the correlation? Explain.

Answers Check Your Understanding

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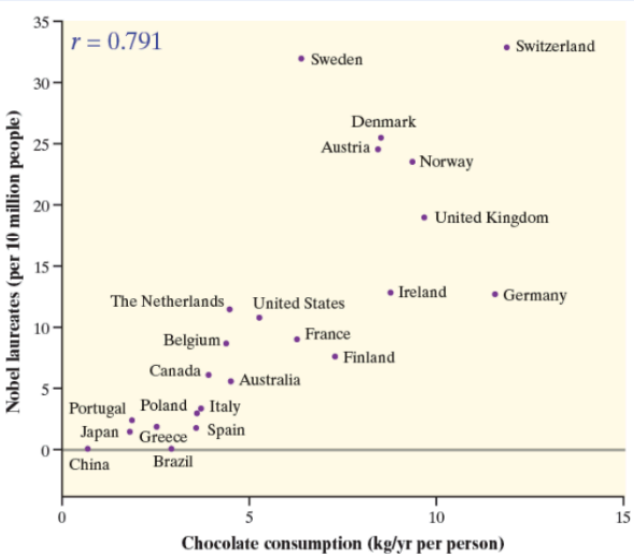

1. Interpret the correlation of $r = 0.791$.

The correlation of 0.791 indicates that there is a strong positive, linear relationship between chocolate consumption and nobel laureates.

2. If people in the United States started eating more chocolate, can we expect more Nobel prizes to be awarded to residents of the United States? Explain.

No, we cannot expect that eating more chocolate will directly lead to more Nobel Prizes in the United States. While the correlation of $r = 0.791$ indicates a strong positive linear relationship between chocolate consumption and the number of Nobel Prizes, correlation does not imply causation.

The observed relationship could be due to other factors (e.g., wealth, education systems, or research funding) that contribute both to higher chocolate consumption and to producing Nobel laureates. Simply increasing chocolate consumption would not necessarily impact the factors that lead to Nobel Prizes.

3. What effect does Switzerland have on the correlation? Explain.

Switzerland has a significant effect on the correlation because it is an **outlier** with both high chocolate consumption (around 12 kg/year per person) and a high number of Nobel laureates (about 32 per 10 million people).

Including Switzerland strengthens the positive correlation ($r = 0.791$) between chocolate consumption and Nobel laureates because it aligns well with the positive trend in the data. If Switzerland were removed, the correlation would likely decrease because the remaining data points would show a weaker overall linear association. Thus, Switzerland plays a key role in reinforcing the strength of the positive relationship.