Pick Up The Warm Up

Also have your "Graphing Calculator Basics" handy.

Can past funding of the arts predict future funding? Below you will see two variable data that was collected from the National Endowment of the Arts. The data might help answer the question above.

Year	1990	1991	1992	1993	1997
NEA Funding(millions of $)	170.8	166.5	163.0	159.7	151.2

With the help of the Graphing Calculator Basics, do the following:

a. Enter the data above (with the independent variable, Year, in list 1.

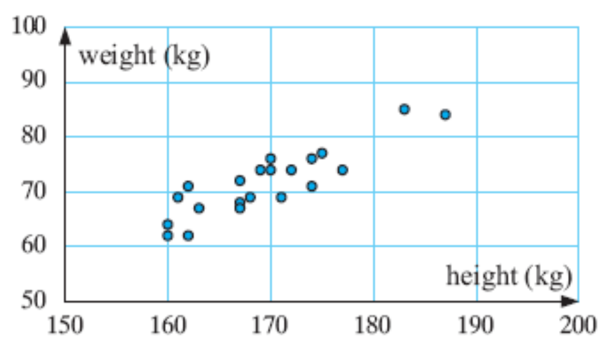
b. Make a Scatter Plot of the data on your GDC. (Help each other on this).

c. Looking at your GDC, make a labeled sketch here......

The line of best fit will always pass through the ***mean point*** of the two variables

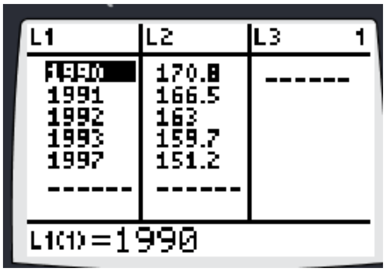
- $(\bar{x}, \bar{y})$

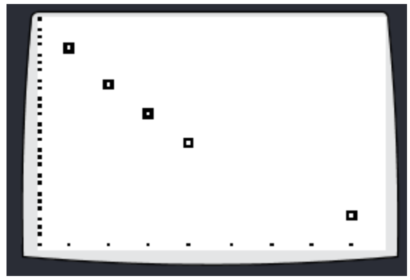
This mean point is also called the center of gravity of the data.



A scatter diagram is a method of plotting the values of two variables, using axes and plotting points , but without trying to join any of the points together.

The resulting distribution of dots or crosses can then*give us an idea of whether the relationship between the two variables is weak or strong* .





d. Now Calculate the LSRL (an accepted line of best fit) and write down it's equation in slope intercept form.

   i. $y = -2.71x + 5560$

e. Now follow the instructions to superimpose with your data by following the instructions.

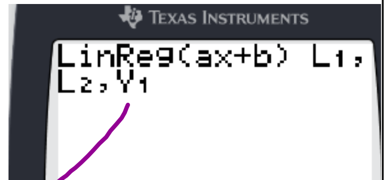
f. Lastly, try *tracing* both your data and your LSRL. If you ever need to graph your LSRL onto Graph Paper, the trace function or Table can be very helpful to draw it accurately on the paper. Graphing hint:

Viewing your line and your Scatter Plot simultaneously

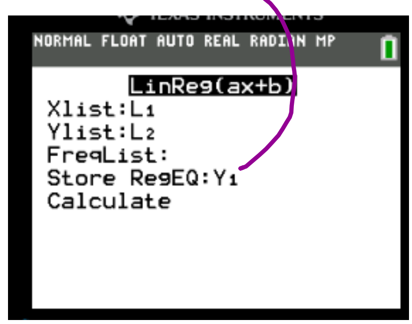
Select **STAT** then toggle to **CALC**, then to **LinReg(ax + b),** Then add one more comma and Y_1 , then **ENTER**. Then **ZOOM 9**

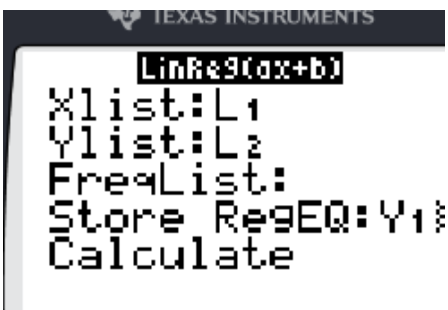
to find Y_1 look for **VARS** then toggle to **Y-VARS** then **Function**

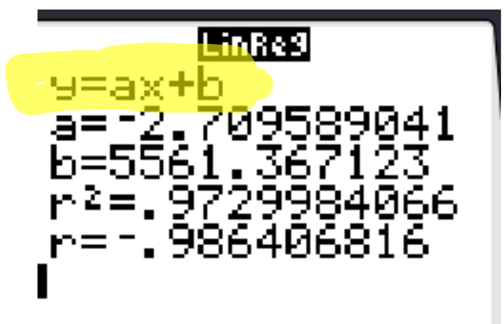
TI-84 Plus



TI-84 Plus C

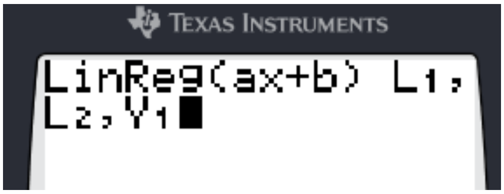


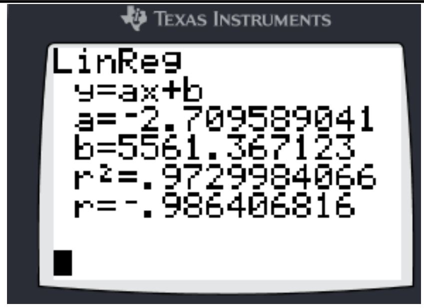




$y = -2.71x + 5561$

5560





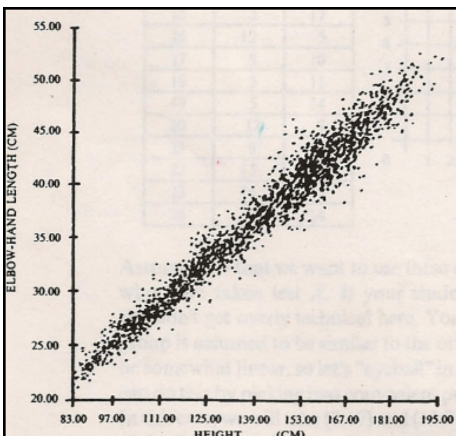
Look at the scatter plot you drew.

Is there a trend in the data ?

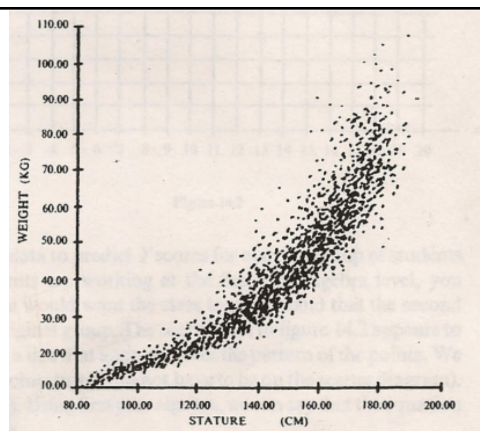
Is there a linear trend in the data ? If there is a strong linear trend, then there is a strong linear correlation between Year and NEA funding.

There seems to be a strong, negative, correlation between Year and NEA funding.

Oct - Deadline to register for all May 2018 IB exams.



Scatter Plot I
Elbow-Hand Length with Height



Scatter Plot II
Weight with Stature (Height)

Is there a strong relationship between the two variables in the first study? the second?

Day 3 Solutions (Normal Distribution)

p.307... 9

Speed of Cars $\mu = 56.3\ km\,h^{-1}$, $\sigma = 7.4\ km\,h^{-1}$

a) $P(60 < x < 75) = 0.303$ or 30.3%

b) at most is = less than or equal to

$P(x \leq 70) = 0.968 = 96.8\%$

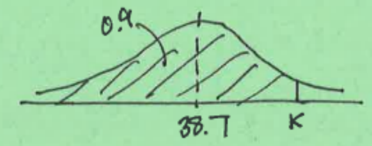
c) at least is same as greater than or equal to

$P(x \geq 60) = 0.309 = 30.9\%$

p.309 ... 2

$X \sim N(38.7, 8.2^2)$ so $\mu = 38.7$ $\sigma = 8.2$

a)

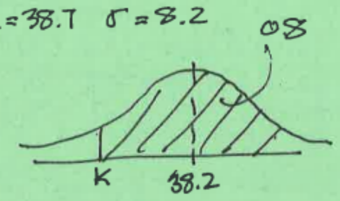


$P(X \le k) = 0.9$

$K = 49.2$

invNorm(.9, 38.7, 8.2)

b)



$P(X \ge k) = 0.8$

so

$P(X \le k) = 0.2$

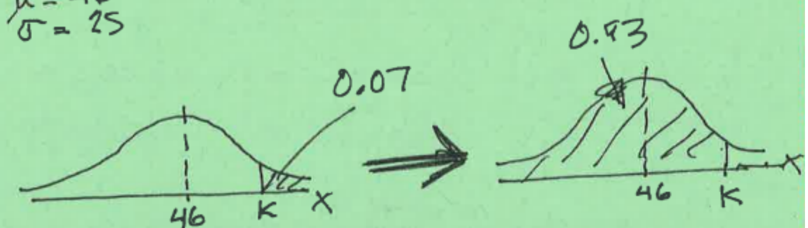
$K = 31.8$

invNorm(0.2, 38.7, 8.2

p.309... 5

Physics Test
$\mu = 46$
$\sigma = 25$

Top 7% will get an A



$P(X \le k) = 0.93$

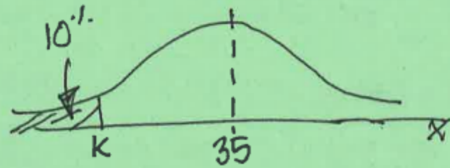
so $K = 82.9$

So, anyone earning a raw score of 82.9 (≈ 83) will get an A p.309 6

Fish $\mu = 35$ cm $\sigma = 8$ cm

$P(x \leq k) = 0.1$

so $k = 24.7$



So the smallest fish that can be harvested is 24.7 cm

Statistical Applications

Correlation

LSRL

The Chi-Square Test of Independ.

- Project Stuff

Next Test - Friday October 7th

Just a few notes

Today

-Understand Correlation

-Calculate PPMC "r"

Often a statistician will want to know how often two variables are "related" or "associated".

examples

outside temperature vs. # customers at Starbucks

incidence of heart disease vs. intake of Omega 3 oils

arm length vs. running speed

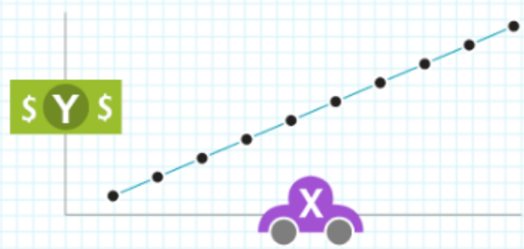
COST OF ENGAGEMENT RING VS Length of Marriage

Expensive Engagement Rings Linked to Higher Divorce Rates

Over a year ago by ROBERT MONTENEGRO

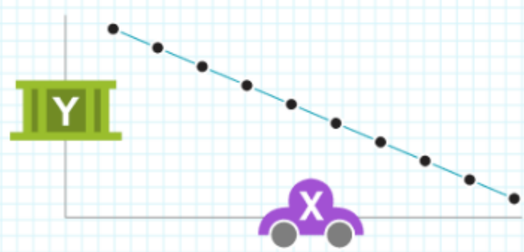
15.4k Shares

Example 1: Let's say **X** is the number of cars you buy, and **Y** is the amount of money you spend (assuming all the cars cost the same). The more cars you buy, the more money you spend.



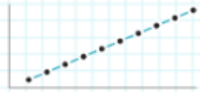
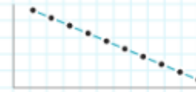
We call this a Positive Correlation.

Example 2: Let's say **X** is still cars, but now **Y** is your bank account balance. With each car you buy, your bank account gets smaller and smaller. As **X** goes up, **Y** goes down.

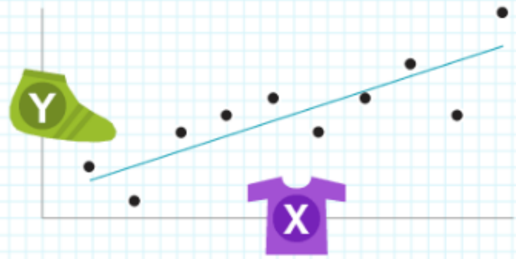


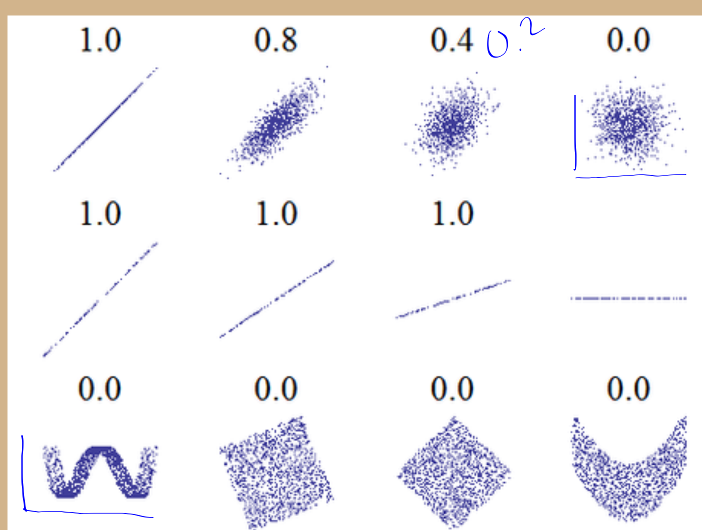
We call this a Negative Correlation.

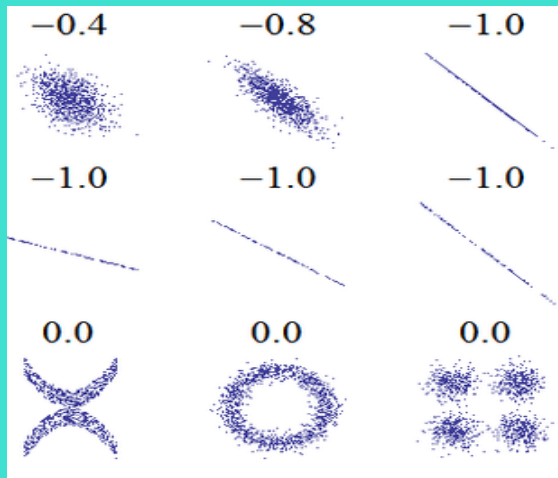
The **Correlation Coefficient (r)** measures the strength of the correlation.

Values for **(r)** range from **+1.0**  to **-1.0** 

Example 3: Let's try a less idealized example. Here, **X** is shirt size, and **Y** is shoe size. As one size goes up, so does the other, but the relationship varies from person to person. The correlation here is still positive, but it's not perfect (**r = +0.83**).

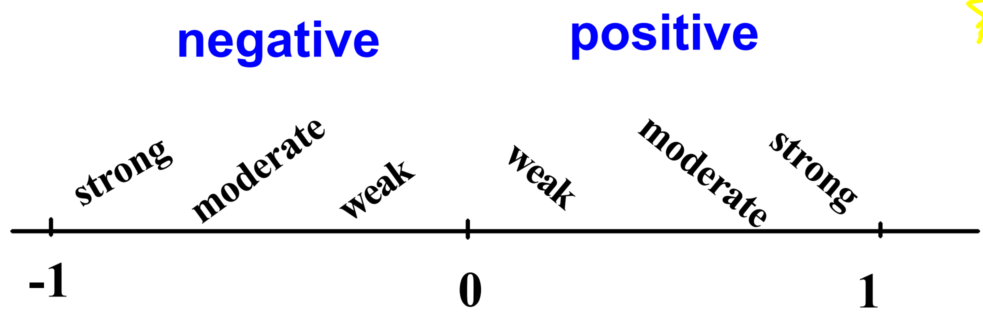






correlation viewing

http://wilderdom.com/301/int/cor-guess.html



Values of *r*

↑ Pearson's Product Moment Correlation Coefficient

−0.93 ____ 0.87 ____ −.5 ____ 0.4 ____

Strongest to weakest

1.2

Hand out on the Correlation Coefficient, r

Correlation Coefficient, *r*

The quantity ***r***, called the linear correlation coefficient. It measures the strength and the direction of a linear relationship between two variables. The linear correlation coefficient is sometimes referred to as the ***Pearson product moment correlation coefficient*** in honor of its developer Karl Pearson. The mathematical formula for computing r is:

☆

$$r = \frac{\sum(x-\overline{x})(y-\overline{y})}{\sqrt{\sum(x-\overline{x})^2\sum(y-\overline{y})^2}}$$

← Write down

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n(\sum x^2)-(\sum x)^2}\sqrt{n(\sum y^2)-(\sum y)^2}}$$

← don't

r = -1 indicates a **perfectly strong** *negative linear* relationship.

r = -0.8 indicates a **relatively strong** *negative* linear relationship

r = -0.5 indicates a **moderate** *negative* linear relationship

r = -0.2 indicates a **weak** *negative* linear relationship

r = 0 indicates **no** *linear* relationship

r = 0.5 indicates a **moderate** *positive* linear relationship

r = 0.8 indicates a **relatively strong** *positive* linear relationship

r = 1 indicates a **perfectly strong** *positive* linear relationship.

Note: There are different scales like this published and they all don't agree!

If there is reasonably strong correlation:

We can make predictions about things.

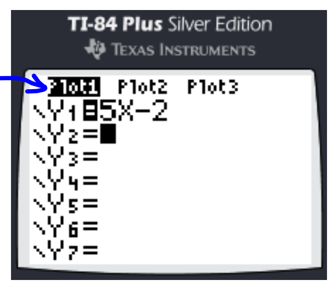
If two variables are correlated, we can predict one based on the other.

Calculating Pearson's Correlation coefficient with the graphing calculator

follow the instructions on the GDC basics

Conflicts

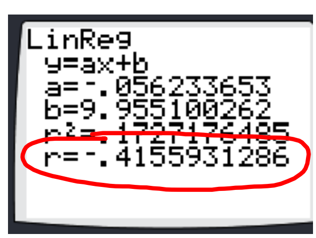
Scatter plots and other Stat Plots can cause trouble when you graph functions in the "Y=" menu.
Therefore, turn **off** Stat plots when you are done.
You can also see them turned on in the Y= menu



Linear Correlation Coefficient, r

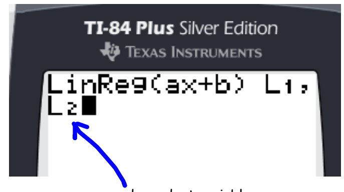
Same steps as LSRL
Notice the correlation coefficient, *r*, is given on the last line.

If you don't see it, then you need to turn your "DiagnosticsOn" in the Catalog.



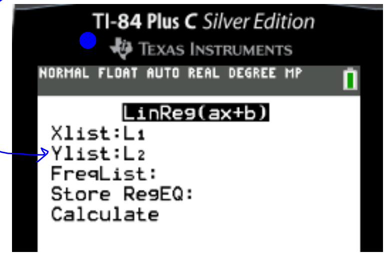
Calculating the Line of Best Fit (LSRL)

Select **STAT** then toggle to **CALC**, then to **LinReg(ax + b)**
Then the two lists which contain your data with a comma in between.

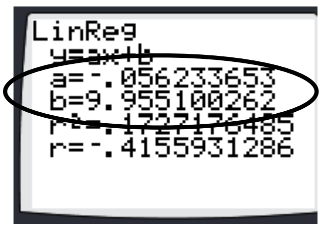


dependent variable

Select **ENTER** and the top two lines will give your *slope* and *y-intercept*



TI-83 or
TI-84
TI-84 Plus



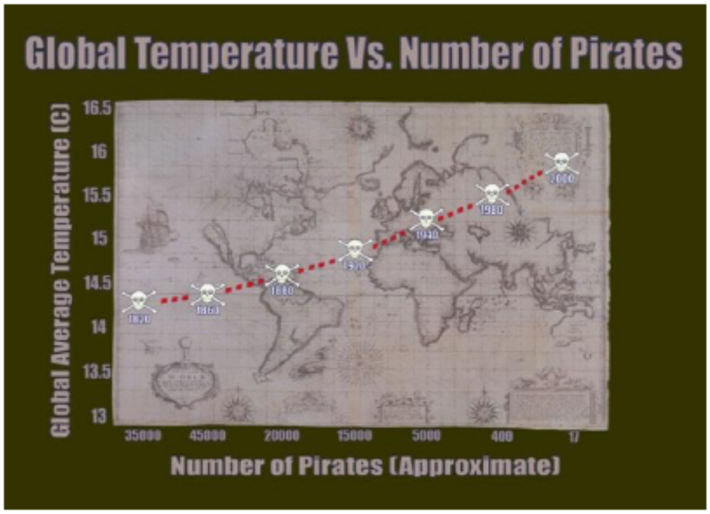
$y = -.056x + 9.96$

Now go to the data on the back side of the Warm Up

	1820	1860	1880	1920	1940	1980	2000	← Year
✓	35000	45000	20000	15000	5000	400	17	← x
✓	14.3	14.4	14.6	14.7	15.1	15.5	15.8	← y

Calculate Pearson's Correlation Coefficient, r

Year	1820	1860	1880	1920	1940	1980	2000
Pirates	35000	45000	20000	15000	5000	400	17
Temperature	14.3	14.4	14.6	14.7	15.1	15.5	15.8



Interpreting Correlation:

a) Comment on strength / direction.

b) **If** reasonably strong, also make a summary statement such as

Interpreting Correlation:

a) **Comment on strength / direction.**

There is a strong, negative, correlation between # of pirates and Global Temperatures

$-r > .6$

b) **If reasonably strong, also make a summary statement such as**

As the number of pirates increased, the Global Temperatures decreased.

Important Note

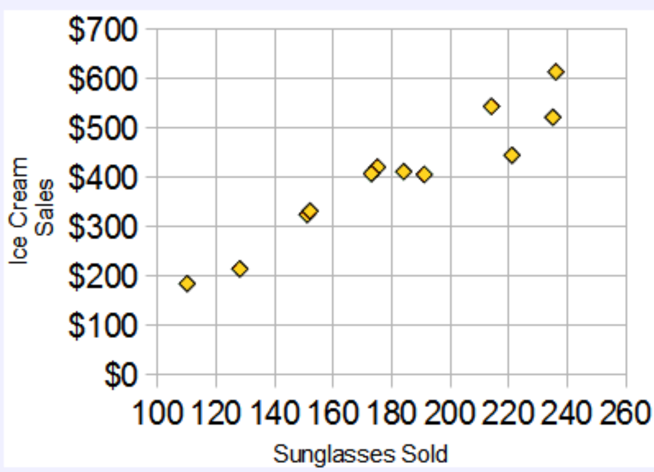
the existence of correlation does not, repeat NOT, imply that one variable is CAUSED by the other .

It simply shows that the two variables are related .

Both of them could be caused by a third variable you don't even know about.

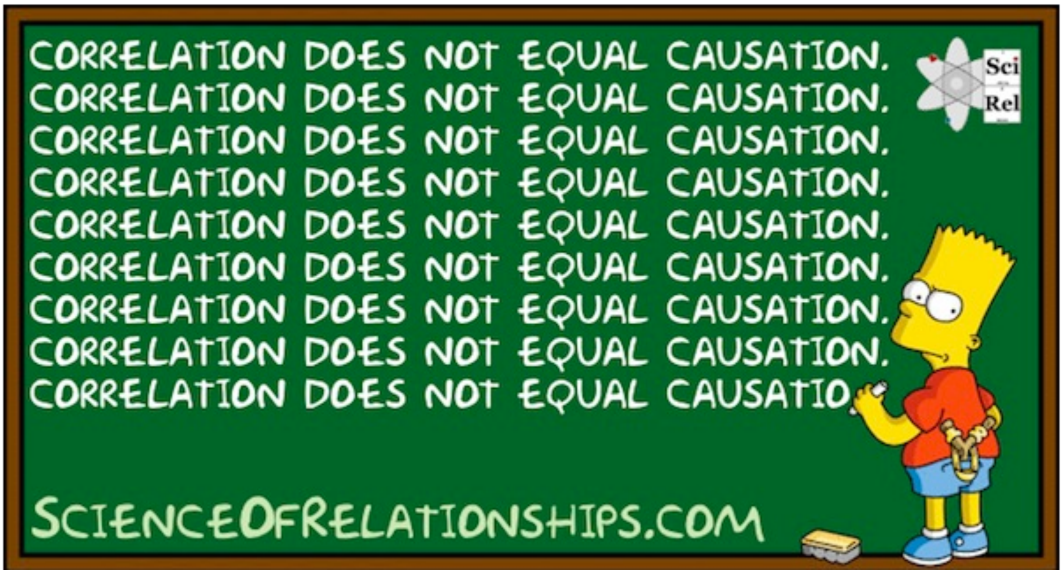
Example: Sunglasses vs Ice Cream

Our Ice Cream shop finds how many sunglasses were sold by a big store for each day and compares them to their ice cream sales:



The correlation between Sunglasses and Ice Cream sales is high

Does this mean that sunglasses make people want ice cream?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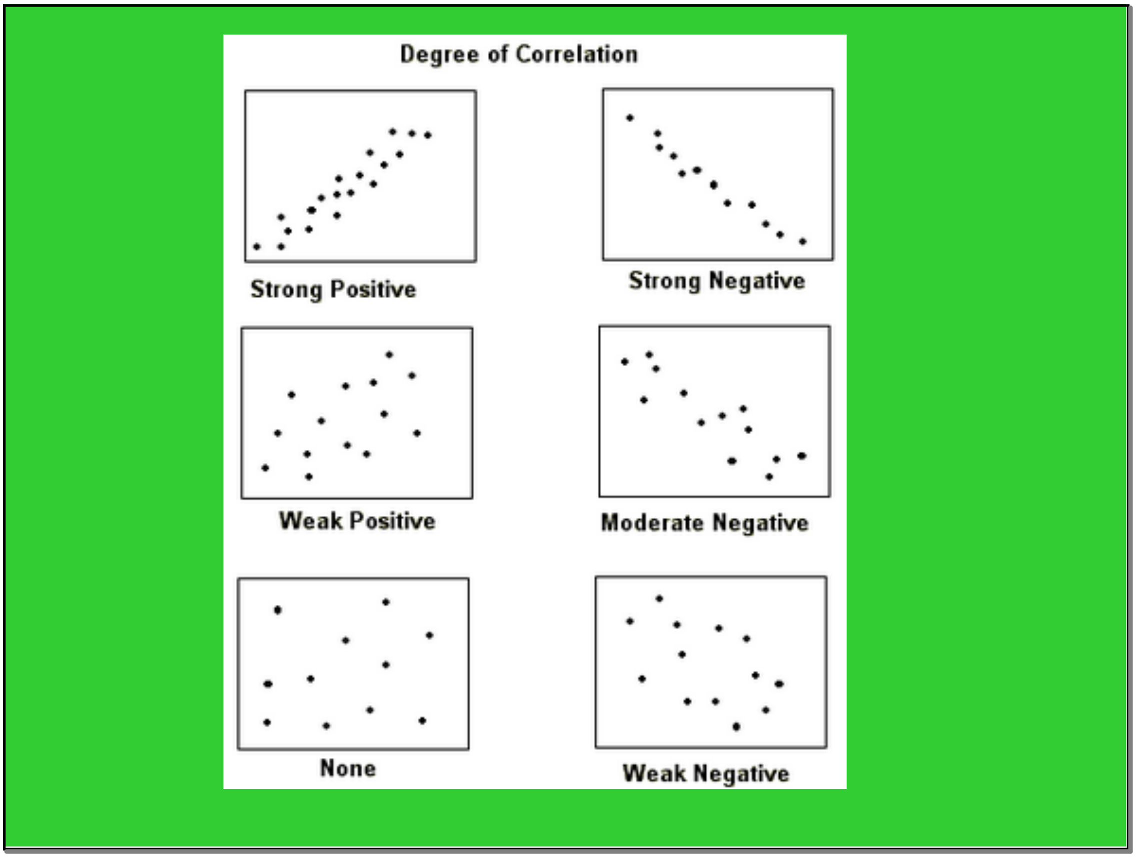
SCIENCEOFRELATIONSHIPS.COM

B.B

Project ideas

Turn in- **HW with recording sheet with HW stapled underneath in the order we did them.**

<u>Assignment:</u>
a handout


Degree of Correlation
Strong Positive
Strong Negative
Weak Positive
Moderate Negative
None
Weak Negative