Pick Up The Warm Up

and New recording Sheet

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:

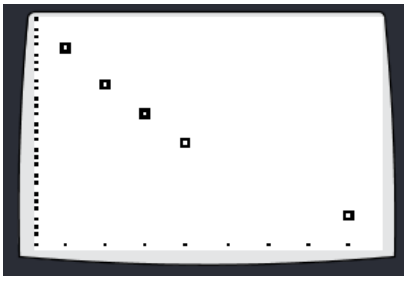
a. Enter the data above (with the independent variable, Year, in list 1.

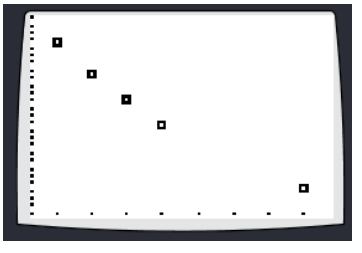
b. Make a Scatter Plot of the data on your GDC. (Help each other on this).

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

L1	L2	L3 1
1990	170.8	------
1991	166.5	
1992	163	
1993	159.7	
1997	151.2	
------	------	

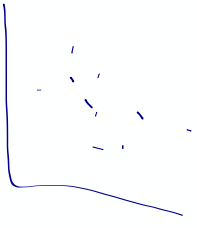
L1(1)=1990





NEA funding (millions of $)

Year



Mean Point $(\bar{x}, \bar{y})$

$\bar{x}$: average of x-values in L_1

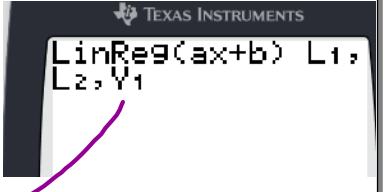
$\bar{y}$: average of y-values in L_2

Viewing your line and your Scatter Plot simultaneously

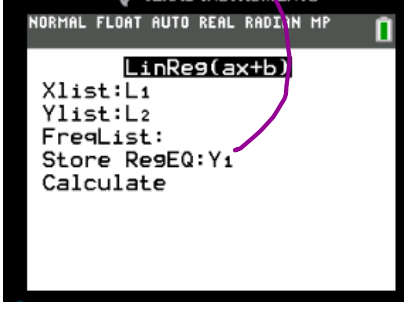
Select **STAT** then toggle to **CALC**, then to **LinReg(ax + b),** Then add one more comma and Y_1 , then **ENTER**. Then **ZOOM 9**

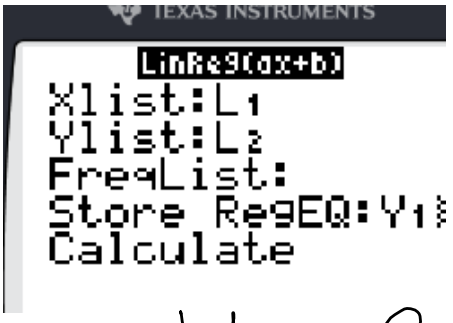
to find Y_1 look for **VARS** then toggle to **Y-VARS** then **Function**

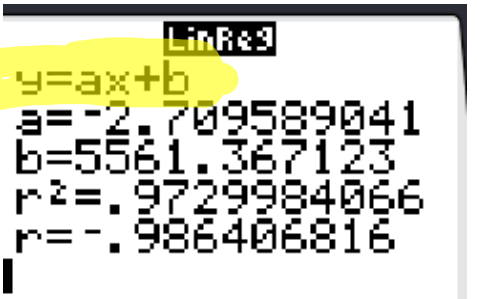
TI-84 Plus



TI-84 PLUS C







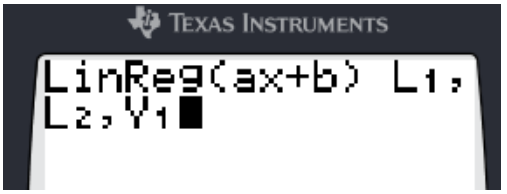
$y = -2.71x + 5561$

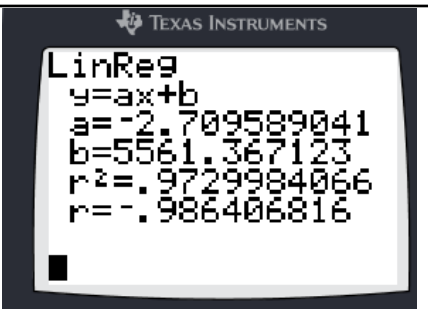
d. Now Calculate the LSRL (an accepted line of best fit) and write down it's equation in slope intercept form.

i. _____

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:





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.

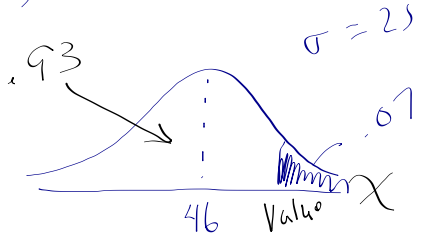
is the deadline to drop any class if you want no record on your transcript.

(Completed paperwork signed by parents must be in by tomorrow)

HW

questions

5) Physics Test



invNorm(.93, 46, 23)

=

$P(x > \text{value}) = .07$

$= P(x < \text{value}) = .93$

Value =

HW p. 307 #9

Speed $N \sim (56.3, 7.4^2)$

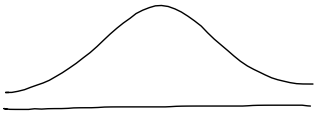
a) $P(60 \le x \le 75) =$

b) $P(\text{at most } 70) = P(x \le 70)$

c) $P(\text{at least}) = P(x \ge 60)$

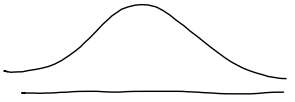
p. 309 ..... 2) $X \sim N(38.7, 8.2^2)$

a) $P(X \leq k) = .9$



find K

b) $P(X \geq k) = .8$



p. 309 .. 5

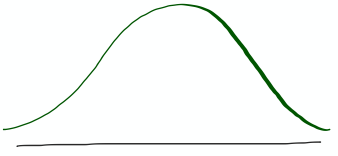
Class X

↓

physics Test

$\mu = 46$

$\sigma = 25$



top 7% get AN A

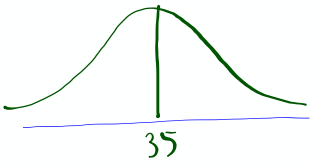
What would be the lowest score?

p. 309 • 6

Fish species $x \rightarrow N(35, 8^2)$

Smallest 10% get thrown back

$P(x < k) = 0.10$



Day 3 Solutions (Normal Distribution)

p. 307 9

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

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%

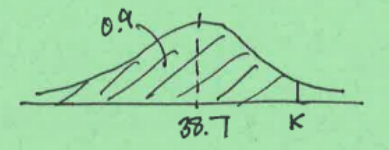
c) at least is same as greater than or equal to

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

p. 309 ... 2

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

a)

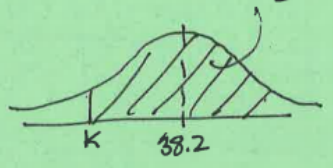


$P(X \leq k) = 0.9$

$k = 49.2$

invNorm(.9, 38.7, 8.2)

b)



$P(X \geq k) = 0.8$

so $P(X \leq k) = 0.2$

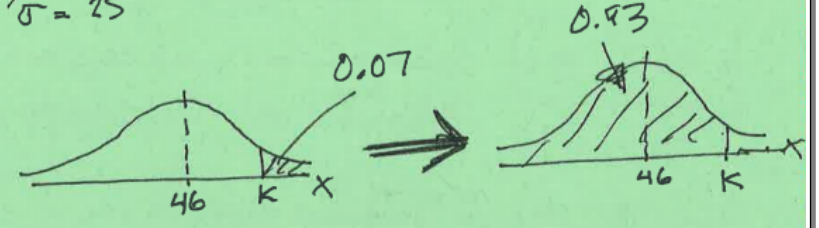
$k = 31.8$

invNorm(0.2, 38.7, 8.2

p. 309 ... 5

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

Top 7% will get an A



$P(X \leq k) = 0.93$

so $k = 82.9$

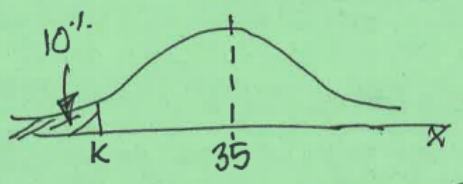
So, anyone earning a raw score of 82.9 (≈ 83) will get an A

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

Test - Mon. Oct 7th

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

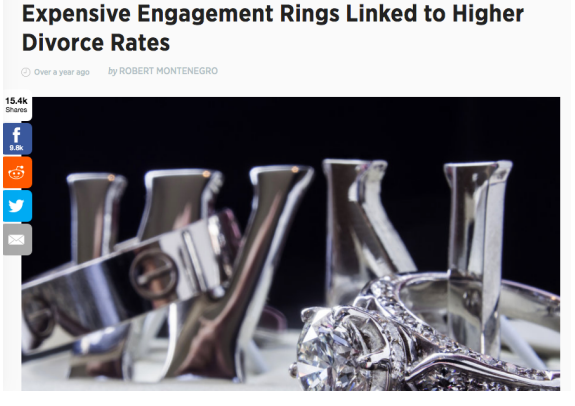
examples

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



notes

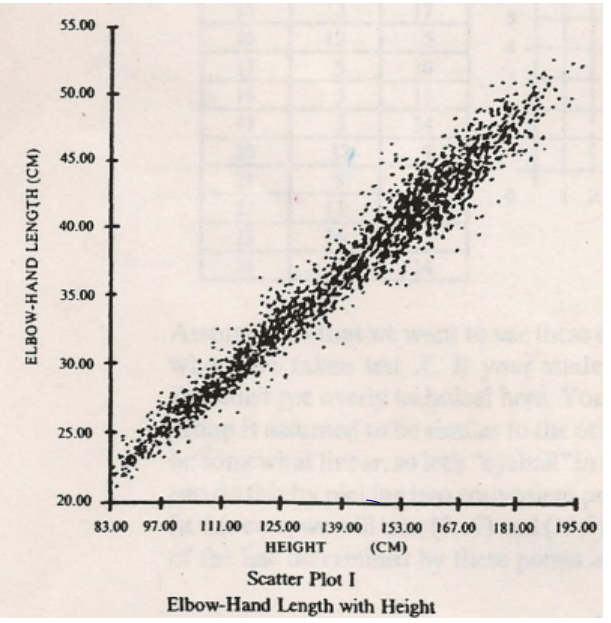
Today

Calculate and interpret correlation between two quantitative variables

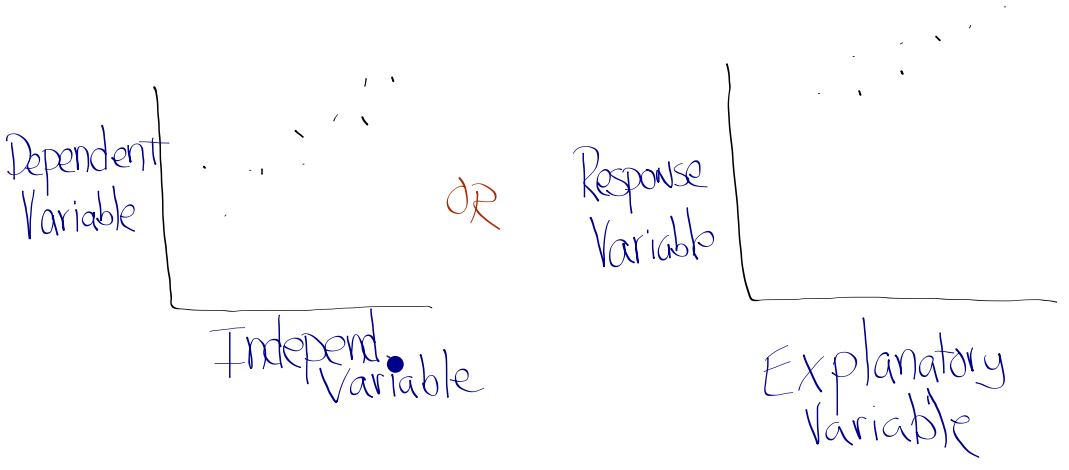
Correlation can be visually assessed from Scatter Plots

Survey of 10,000 children

many years ago



Scatter Plot I
Elbow-Hand Length with Height



http://www.learner.org/courses/againstallodds/unitpages/unit12.html

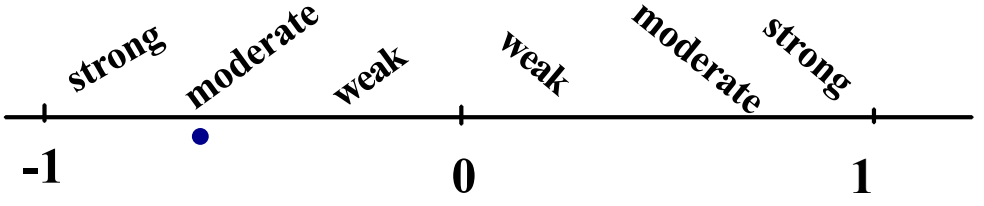
Pearson's Product-Moment Correlation Coefficient

PPMC

Linear correlation coefficient

r

not R not R^2



Values of *r*

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

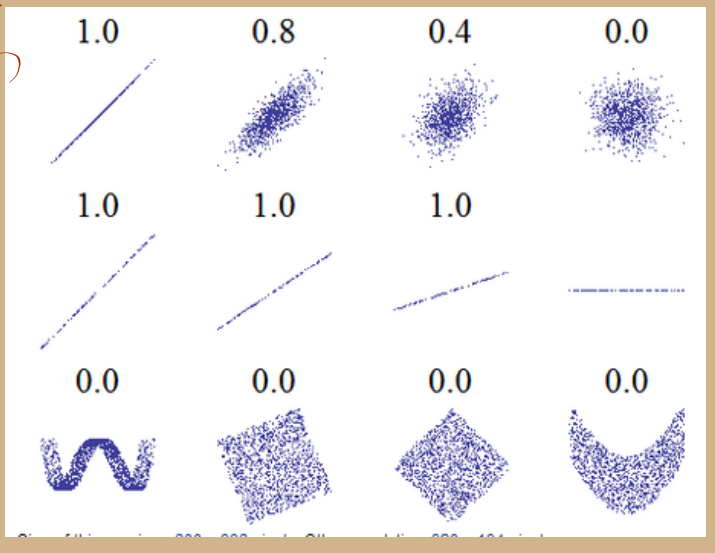
r = 1 indicates a **perfectly strong** *positive* linear relationship.

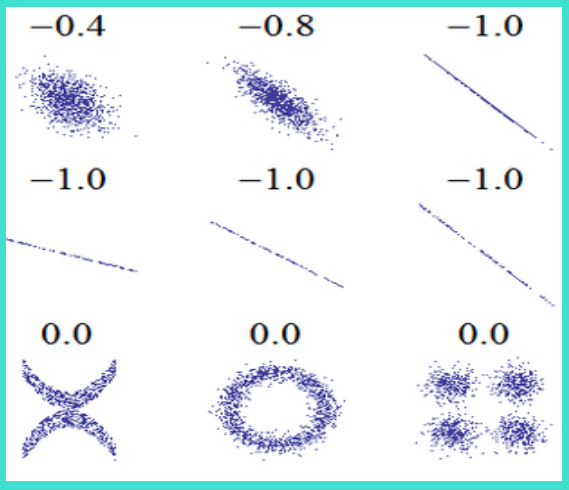
Note: There are different scales like this published and they all don't agree!

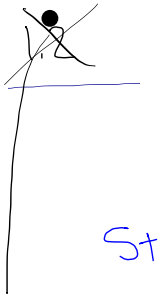
correlation guessing

http://istics.net/stat/Correlations/

Extreme cases





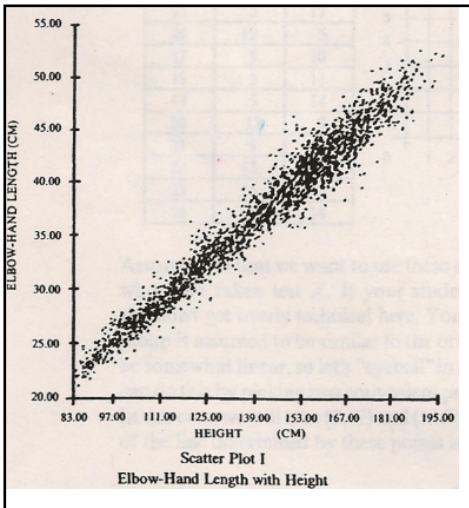


−0.93 0.87 −.5 0.4

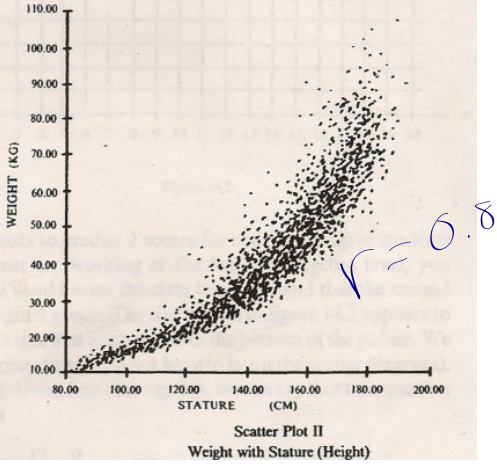
Strongest to weakest

We can make predictions if:

there is a strong correlation between two variables (as long as we are not extrapolating).



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?

Calculating r with GDC

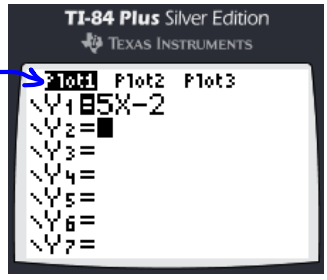
follow the instructions on the GDC basics

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

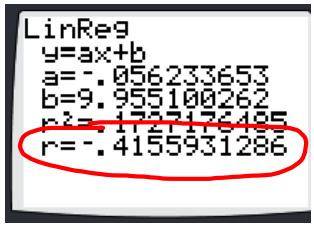


Linear Correlation Coefficient, r

Same steps as LSRL

Notice the correlation coefficient, *r*, is given on the last line.

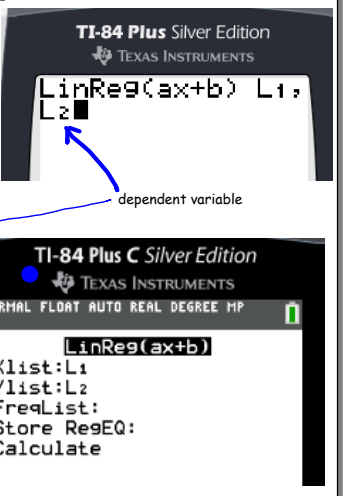
If you don't see it, then you need to turn your "DiagnosticsOn" in the Catalog.



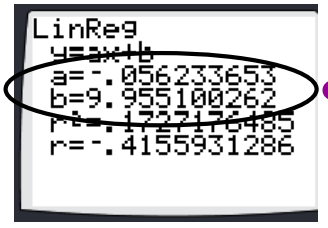
Calculating the Line of Best Fit (LSRL)

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

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
35000	45000	20000	15000	5000	400	17
14.3	14.4	14.6	14.7	15.1	15.5	15.8

Year → x
y

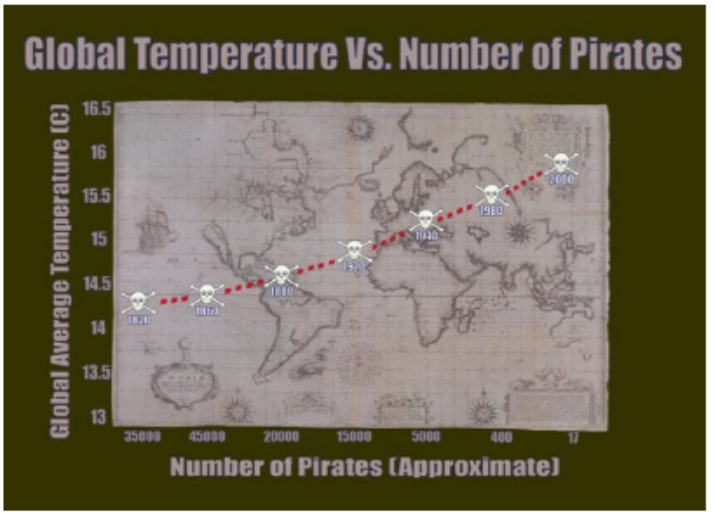
r =

now reverse the coordinates

1-var Stats L_2, L_1

$r =$

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

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

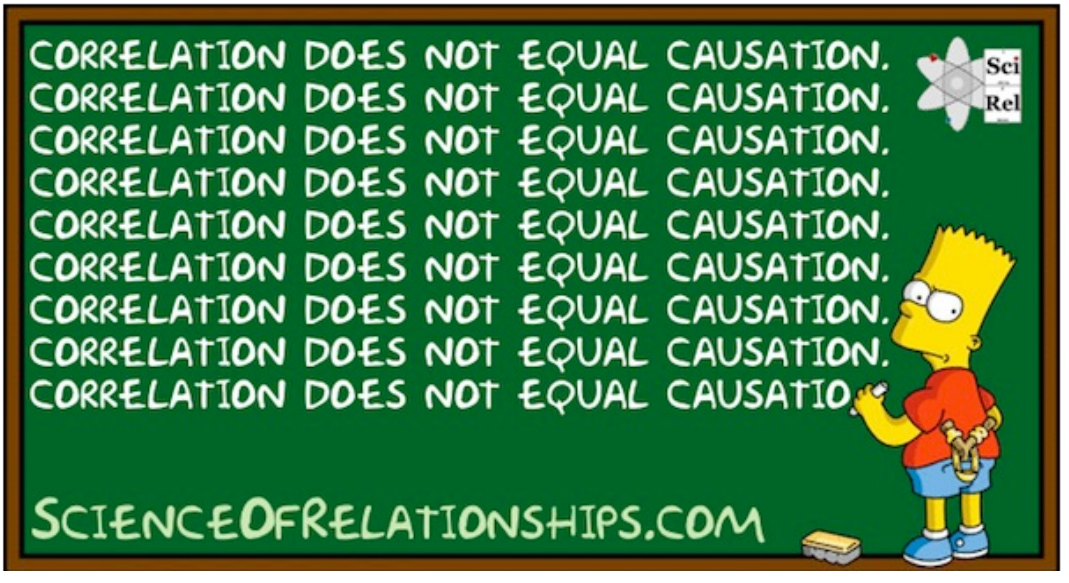
As the number of pirates increased, the Global Temperatures decreased.

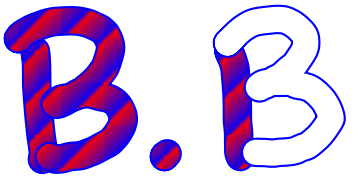
Important Note

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 confounding variable





Project ideas

Tomorrow- Turn in the four HW assignments, in order, stapled together.

<u>Assignment:</u>
a handout