Warmup:

Ramiro did a survey of the number of pets owned by his classmates, with the following results:

Number of pets	Frequency
0	4
1	12
2	8
3	2
4	1
5	2
6	1

$n = 30$

$\bar{x} = \frac{0+0+0+0+1+1+1+1+\ldots+6}{30}$

$\bar{x} = \frac{0\times4 + 1\times12 + 2\times8 + 3\times2 + 4 + 5\times2 + 6}{30}$

$\bar{x} = 1.8$

What was the mean deviation of the number of pets?

$|0-1.8| = 1.8 \times 4$

$|1-1.8| = .8 \times 12$

$|2-1.8| = .2 \times 8$

$|3-1.8| = 1.2 \times 2$

$|4-1.8| = 2.2$

$|5-1.8| = 3.2 \times 2$

$|6-1.8| = 4.2$

add

$\frac{}{30}$

M.A.D = 1.12

EQ: What is a line of best fit? How can I use it to make predictions?

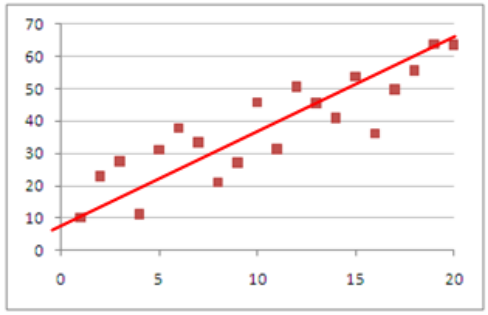
Line of Best Fit

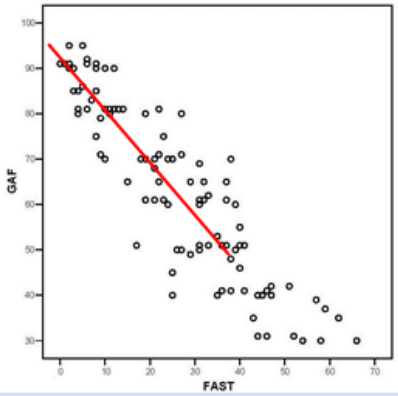
-When working with data values, the data sometimes tends to fit a pattern. This pattern in data is called **correlation.**

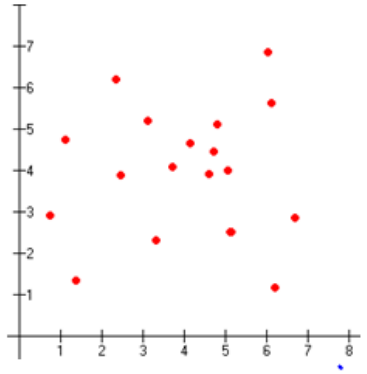
-Data can have two types of correlation:

-Data that increases over time is considered to be **positively correlated.**

-Data that decreases over time is considered to be **negatively correlated.**







One way to analyze correlation in data is to use a line of best fit. It is a way to model a set of data that has a linear trend.

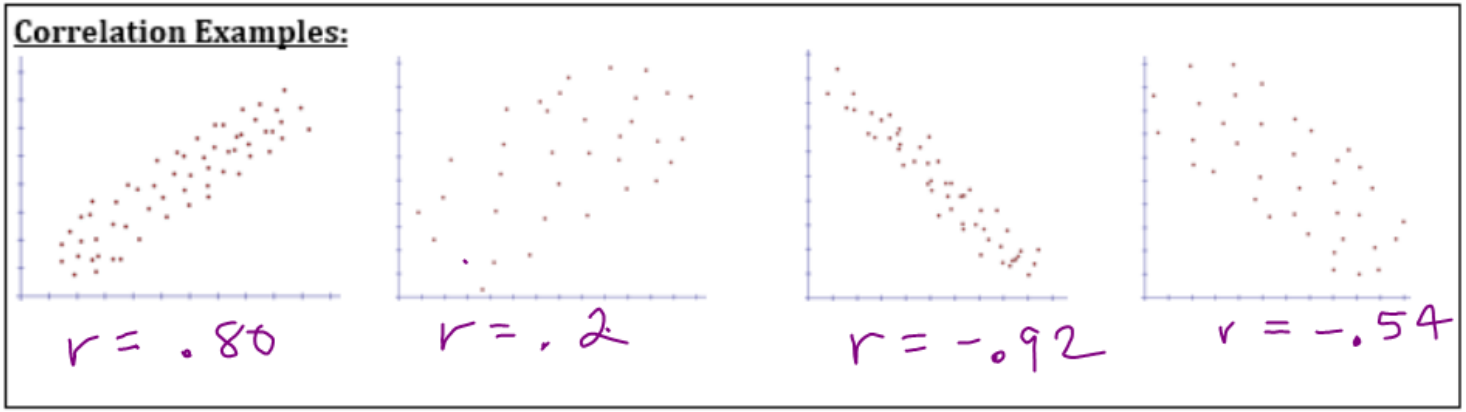
- One of the easiest ways to get the line is to estimate based on the graph of the data.
- To find the equation of the line of best fit we can use our calculators.
- Press the "data" button on your calculator.
- Enter your x values in L1
- Enter your y values in L2
- Press the "2nd" button, then the "data" button. This accesses the "stat-reg/distr" menu
- Scroll down to option 4, LinReg ax + b and hit "enter"
- Select the appropriate lists for your x and y values
- Scroll down to CALC and hit "enter"
- record the "a" and "b" values.
- Write your equation: y = ax + b substituting in the "a" and "b" values. You can round to 2 decimal places.
- Note the "r" value. This shows the correlation of your equation to your data. The closer it is to 1 or -1 the more accurate your equation is.

- r represent the **correlation coefficient** for the linear regression. The correlation coefficient indicates how closely the data points form a straight line.

  - For Positive Correlation, the correlation coefficient will be **$0 < r < 1$**, where the closer r is to 1, the **stronger the correlation.**

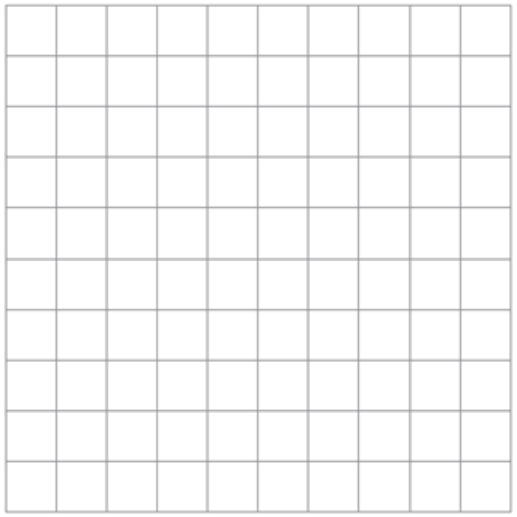
  - For Negative Correlation, the correlation coefficient will be **$-1 < r < 0$**, where the closer r is to -1, the **stronger the correlation.**

Correlation Examples:



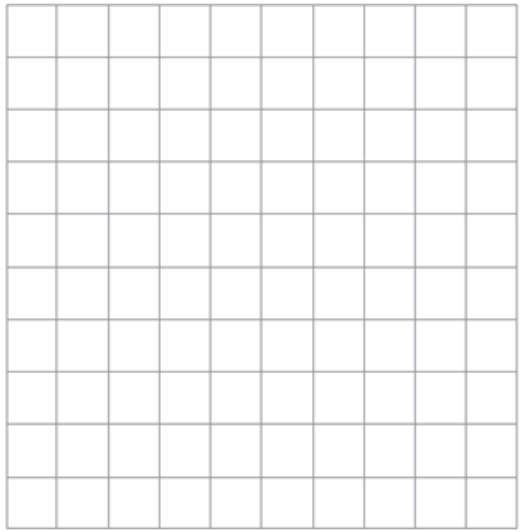
Example 1:

(0, 3), (1, 4), (6, 4), (3, 3), (2, 5), (9, 9)



Example 2:

X	Y
-7	5
-4	3
-3	2
0	-2
4	-4
6	-7

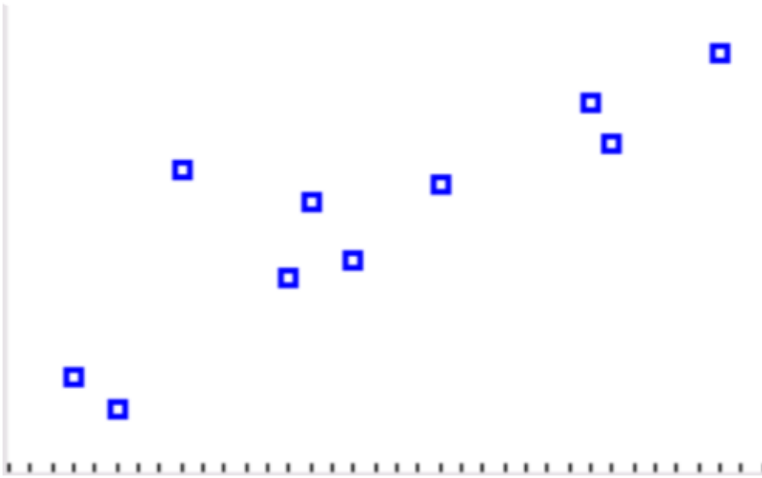


Example 3: The table below shows the age and systolic blood pressure for a group of people who recently donated blood. Draw the line of best fit for this data.

Age	36	25	49	50	35	55	30	27	42	38
Blood Pressure	129	108	141	136	120	147	133	104	131	122

$a = 1.17$
$b = 82$
$r = .864$

$y = 1.17x + 82$



a. Is the data positively, negatively, or not correlated?

b. Using the line of best fit, estimate the blood pressure of a person who is 45 years old.

$y = 1.17(45) + 82$
$y \approx 135$

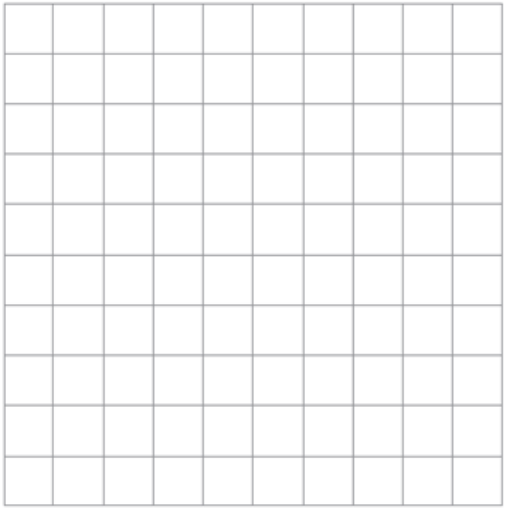
c. Using the line of best fit, estimate the age of a person who has a blood pressure of 160.

$160 = 1.17x + 82$
$-82 \quad -82$
$78 = 1.17x$
$\frac{78}{1.17} = \frac{1.17x}{1.17}$

$x = 66.\overline{6}$
≈ 67 year old

Example 4: The table shows the temperature for various elevations based on a temperature of 59°F at sea level. Draw a scatter plot of the data and describe the correlation shown.

Elevation (ft)	1000	5000	10,000	15,000	20,000	30,000
Temperature (°F)	56	41	23	5	−15	−47



a. Is the data positively, negatively, or not correlated?

b. Using the line of best fit, estimate the temperature at an elevation of 12,000 feet.

c. Using the line of best fit, estimate the elevation if the temperature is 70 degrees.

The amount of antibiotic that remains in your body over a period of time varies from one drug to the next. The table given shows the amount of Antibiotic X that remains in your body over a period of two days.

Time (hours)	0	6	12	18	24	30	36	42	48
Amount of Antibiotic X in Body (mg)	60	36	22	13	7.8	4.7	2.8	1.7	1

Enter the data in the list and generate the Linear Regression Equation.

a= -1.07 b= 42.26 r = -.883

$y = -1.07x + 42.26$ ★

Calculate the Exponential Regression Model for this data set.

a = 60.35 b= .92 r= -.999

$y = 60.35(.92)^x$ ★

Looking at the Correlation Coefficient, which model is better?

Exponential.

The Center for Disease Control collected data on the percent of children aged 12 to 19 that were considered obese between the years 1971 and 2007. The data are given in the table.

Year	Percent of Obese Children
1971	6.4
1976	5.0
1988	10.5
1999	14.8
2001	16.7
2003	17.4
2005	17.8
2007	18.1

Calculate the Linear Regression Model for the data set.

Calculate the Exponential Regression Model for the data set.

Which model best fits the data? Explain.

HW #6

Regression Equations