

What's Going On?

Checking In

Minds on

Line of Best Fit

Action!

Finding and Using Linear Equations

Consolidation

Sketching r

Learning Goal - I will be able to recognize trends in two-variable data and determine the equation of a line of best fit with and without technology.

Minds on

Class Data Analysis

The table below shows the results of a high school math class.

Student	Grade	Absences	Lates
1	52	56	7
2	39	32	13
3	70	3	4
4	68	14	5
5	50	8	27
6	83	8	2
7	83	2	0
8	86	7	2
9	76	4	1
10	90	3	0
11	61	15	4
12	87	9	10
13	74	8	3
14	80	1	2
15	87	14	0
16	35	30	16
17	56	21	3
18	69	18	6
19	51	6	5

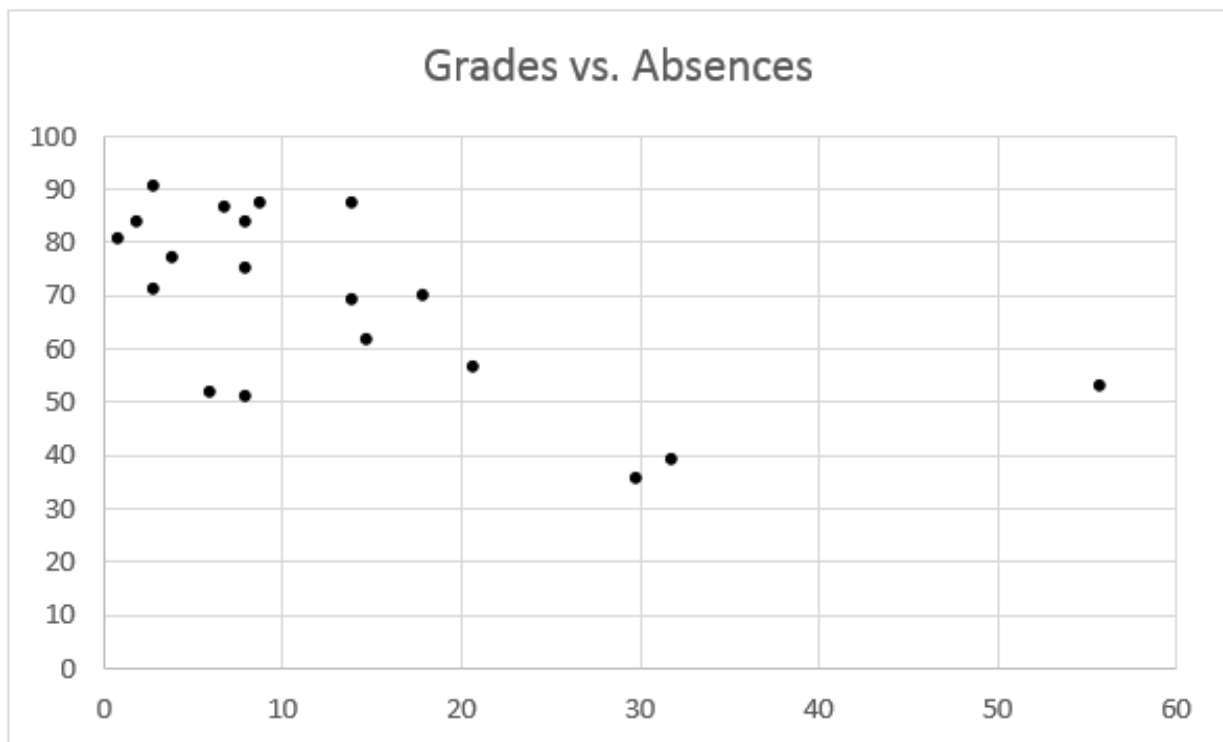
	Grades	Absences	Lates
Mean	68.26316	13.63158	5.789474
Median	70	8	4
Mode	83, 87	8	0, 2
Minimum	35	1	0
Maximum	90	56	27
Range	55	55	27

Action!

Trends in Two Variable Data Sets

Let's look back at the scatter plot we used to compare grades and absences.

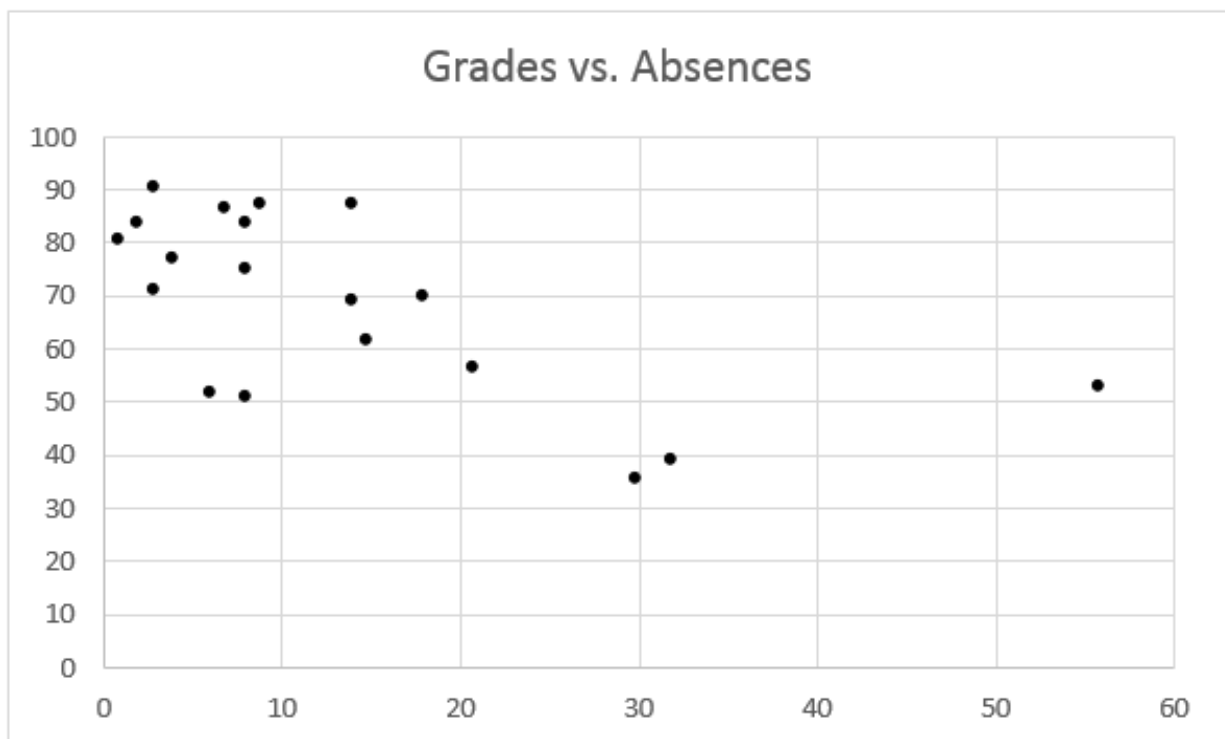
Describe any general trends that you see.



Action!

Trends in Two Variable Data Sets

Now, let's draw in a Line of Best Fit for the data.

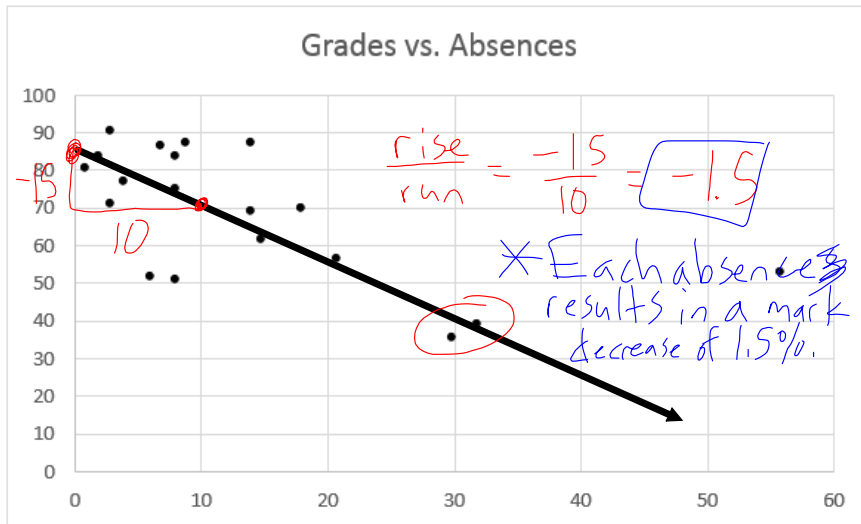


And determine the equation of the line!

Action!

Trends in Two Variable Data Sets

Determine the equation of the line!



Method 1: When we can determine the initial value by visual inspection.

$$y = mx + b$$

Grade \rightarrow y

absences \rightarrow x

initial value mark with 0 absences \leftarrow b

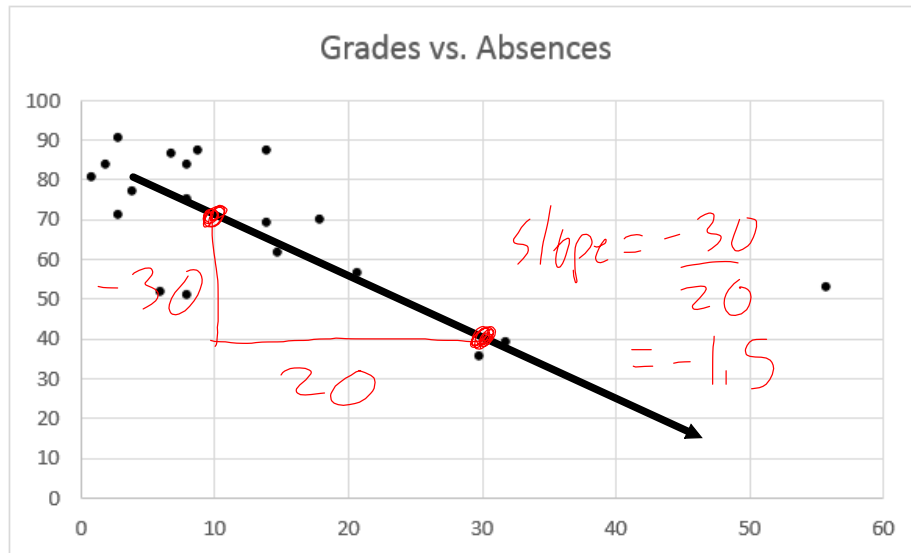
What happens to grade when absences increase by 1!

1. Determine initial value: 85
2. Determine using two points $\left(\frac{\text{rise}}{\text{run}}\right) -1.5$
3. Write equation: $G = -1.5a + 85$
 $G = 85 - 1.5a$

Action!

Trends in Two Variable Data Sets

Determine the equation of the line!



Method 2: When we **cannot** determine the initial value by visual inspection.

1. Determine slope using two points on the line of best fit.

2. Determine initial value by substituting a point and the slope into the equation and solving for b .

$$y = mx + b$$

*we used (10, 70)

$$G = ma + b$$

$$(70) = (-1.5)(10) + b$$

$$70 = -15 + b$$

$$\begin{array}{r} +15 \\ +15 \\ \hline b = 85 \end{array}$$

$$G = -1.5a + 85$$

$$G = 85 - 1.5a$$

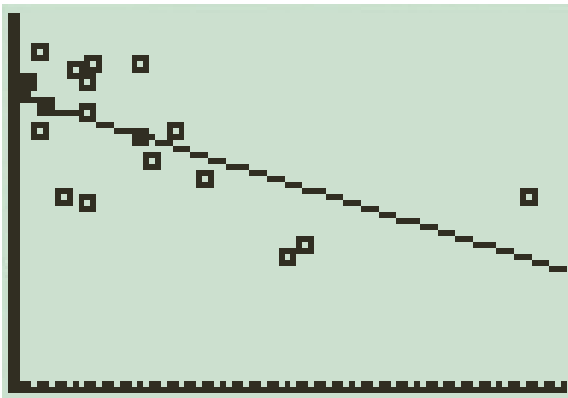
Action!

Trends in Two Variable Data Sets

Determine the equation of the line*!

Method 3: By linear regression on the graphing calculator.

*The line produced by the TI-83 may look different than our line.



```
LinReg
y=ax+b
a=-.7828985046
b=78.93530067
r2=.3884968248
r=-.6232951346
```

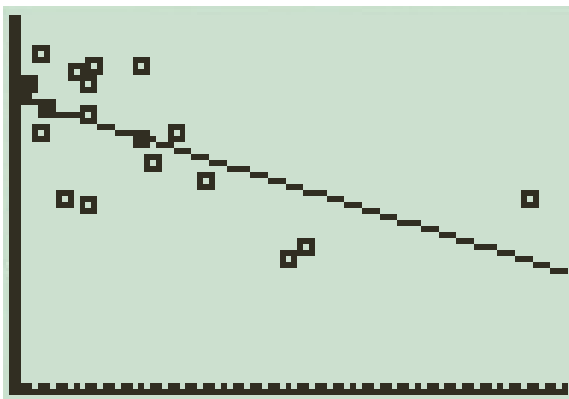
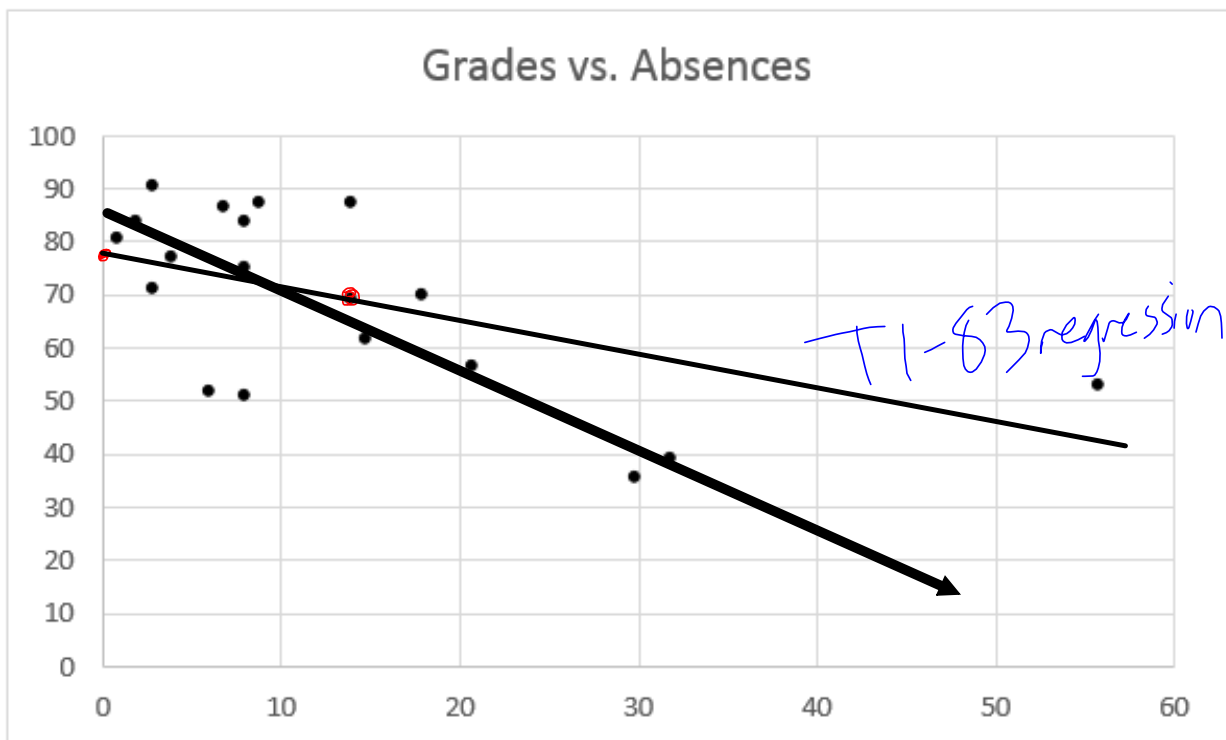
$$y = -0.783x + 78.935$$

$$G = -0.783a + 78.935$$

Action!

Trends in Two Variable Data Sets

Method 3: By linear regression on the graphing calculator.



```
LinReg
y=ax+b
a=-.7828985046
b=78.93530067
r2=.3884968248
r=-.6232951346
```


Action!

Trends in Two Variable Data Sets

Method 3: By linear regression on the graphing calculator.

*The line produced by the TI-83 may look different than our line.

How is the line produced on the TI-83 different from our line?

- Shallower slope
- Lower initial value

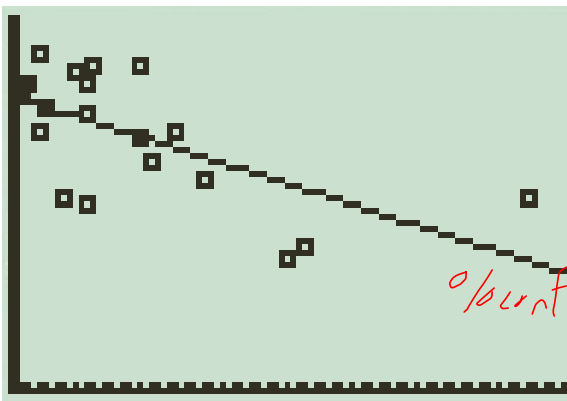
Why is the line produced on the TI-83 different from our line?

The TI-83 weighs all points equally.
We kind of ignored (56, 52) "outliers"

Which line do you think is better? Why?

Action!

Trends in Two Variable Data Sets



```
LinReg
y=ax+b
a=-.7828985046
b=78.93530067
r2=.3884968248
r=-.6232951346
```

What does the r represent? What does it tell us in this case?

negative correlation

correlation coefficient

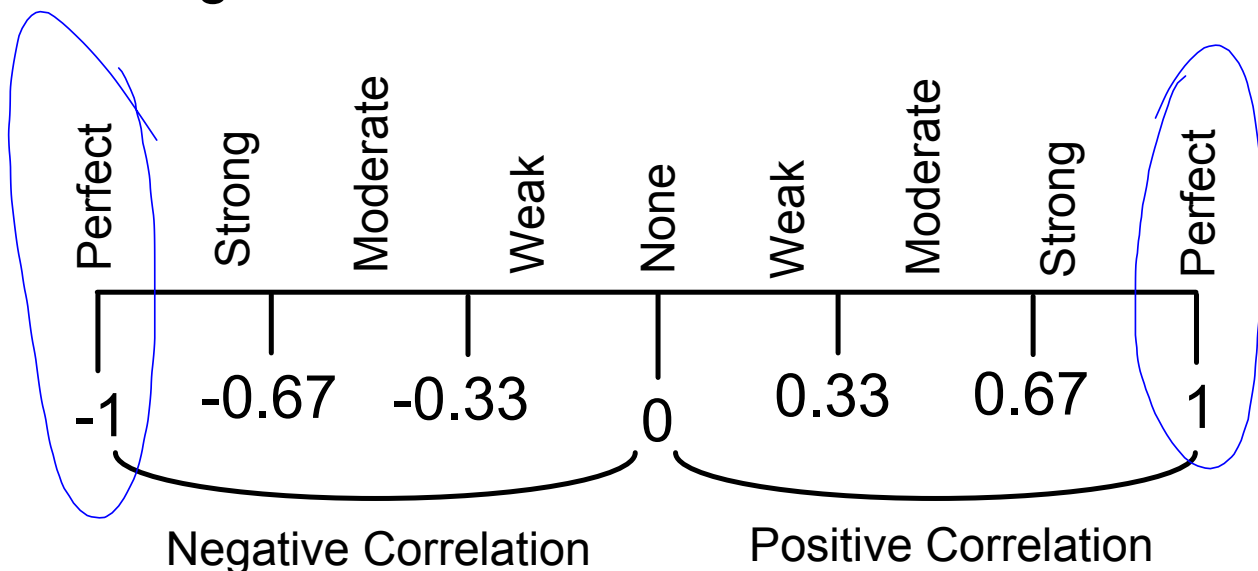
moderate to strong relationship

Action!

Trends in Two Variable Data Sets

The correlation coefficient, r , tells us how far the points are, on average, from the line of best fit.

The diagram below illustrates how the correlation coefficient corresponds to the strength of a linear correlation.



Action!

Trends in Two Variable Data Sets

Use the three equations to determine the expected grade for a student who missed 25 classes.

Method 1:

$$\begin{aligned}G &= -1.5a + 85 \\ &= -1.5(25) + 85 \\ &= -37.5 + 85\end{aligned}$$

Method 2:

$$= 47.5\%$$

Method 3:

$$\begin{aligned}G &= -0.783a + 78.935 \\ &= -0.783(25) + 78.935 \\ &= -19.575 + 78.935 \\ &= 59.36\%\end{aligned}$$

Action!

Trends in Two Variable Data Sets

A student received a grade of 30%, use the three equations to determine the expected number of times they were absent.

Method 1:

$$G = -1.5a + 85$$

$$(30) = -1.5a + 85$$

$$\begin{array}{r} -85 \\ -85 \end{array} \quad \begin{array}{r} -85 \\ -85 \end{array}$$

Method 2:

$$\frac{-55}{-1.5} = \frac{-1.5a}{-1.5}$$

$$a = 36.7 \sim 37 \text{ absences}$$

Method 3:

$$G = -0.763a + 78.935$$

$$(30) = -0.763a + 78.935$$

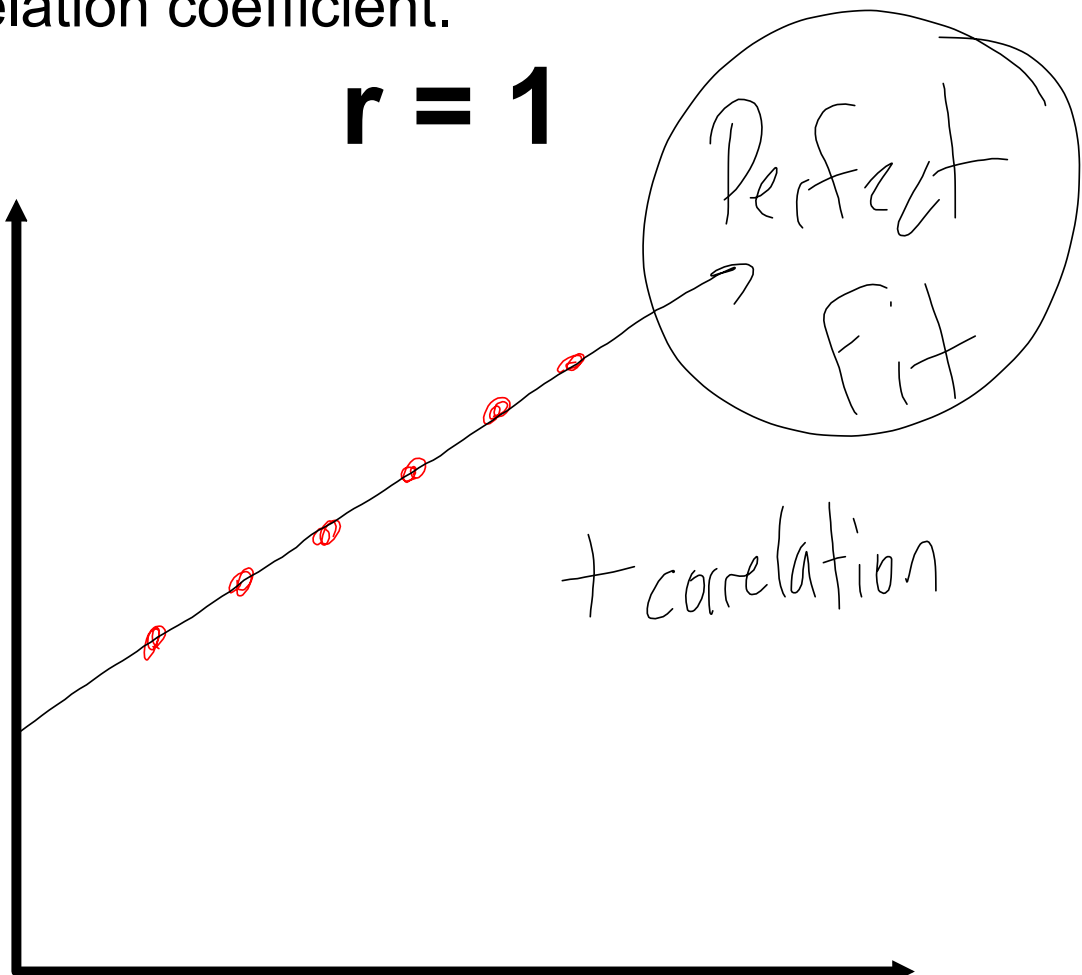
$$a = 62.9$$

Consolidation

Sketching r

Sketch the general appearance of a scatter plot associated with each value of the correlation coefficient.

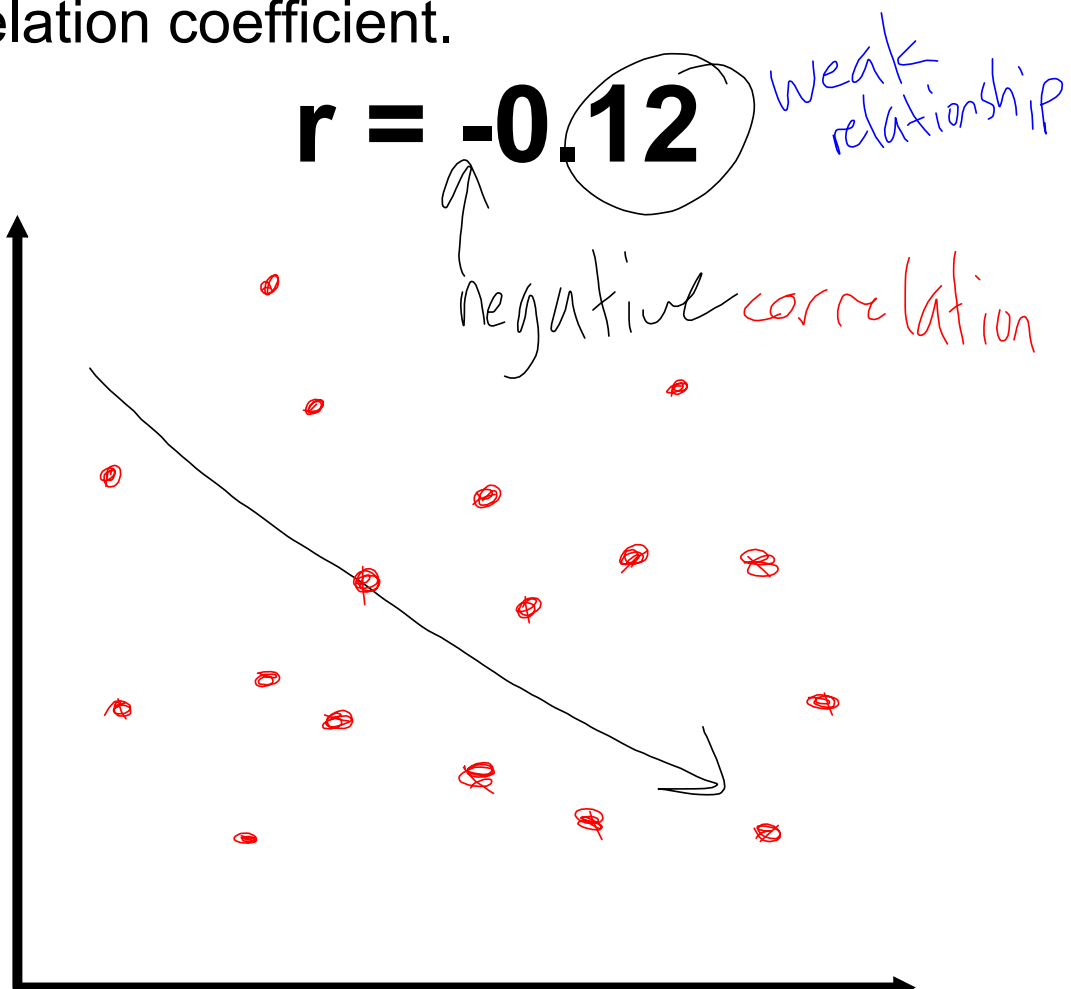
$$r = 1$$



Consolidation

Sketching r

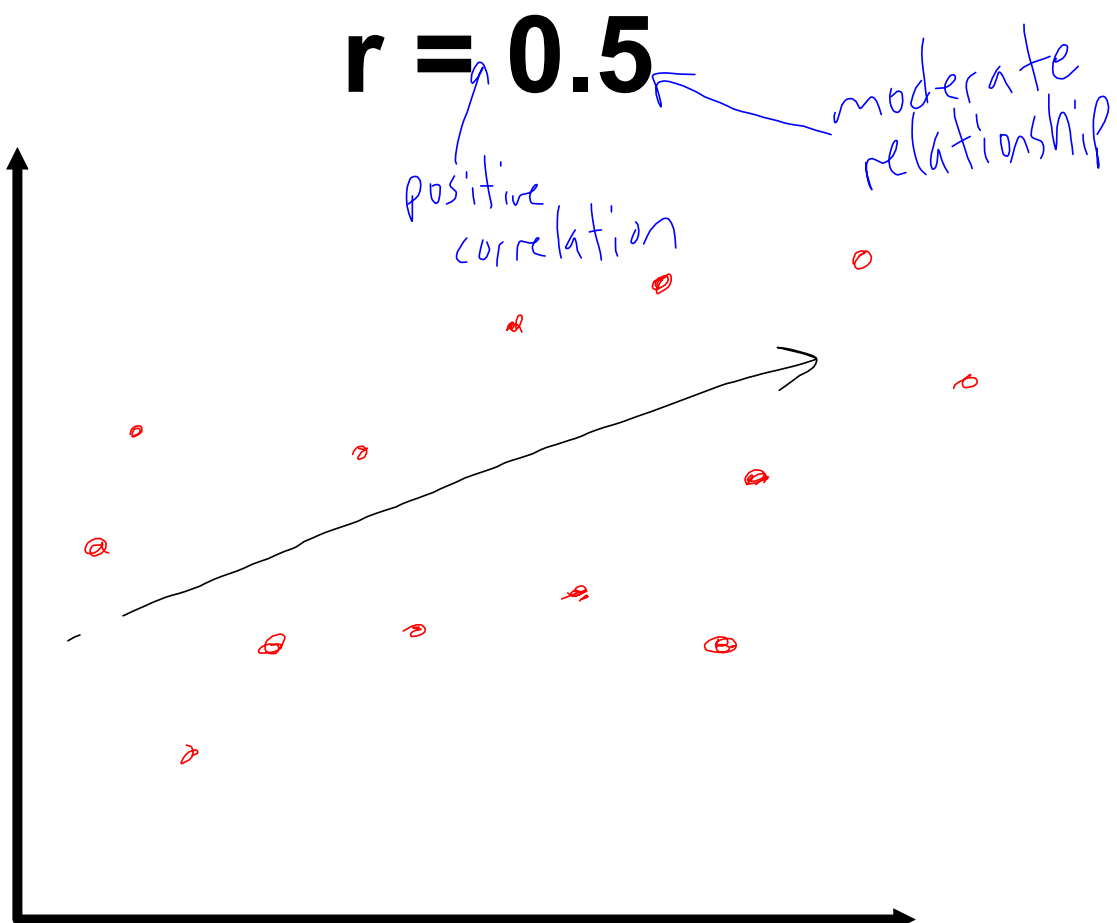
Sketch the general appearance of a scatter plot associated with each value of the correlation coefficient.



Consolidation

Sketching r

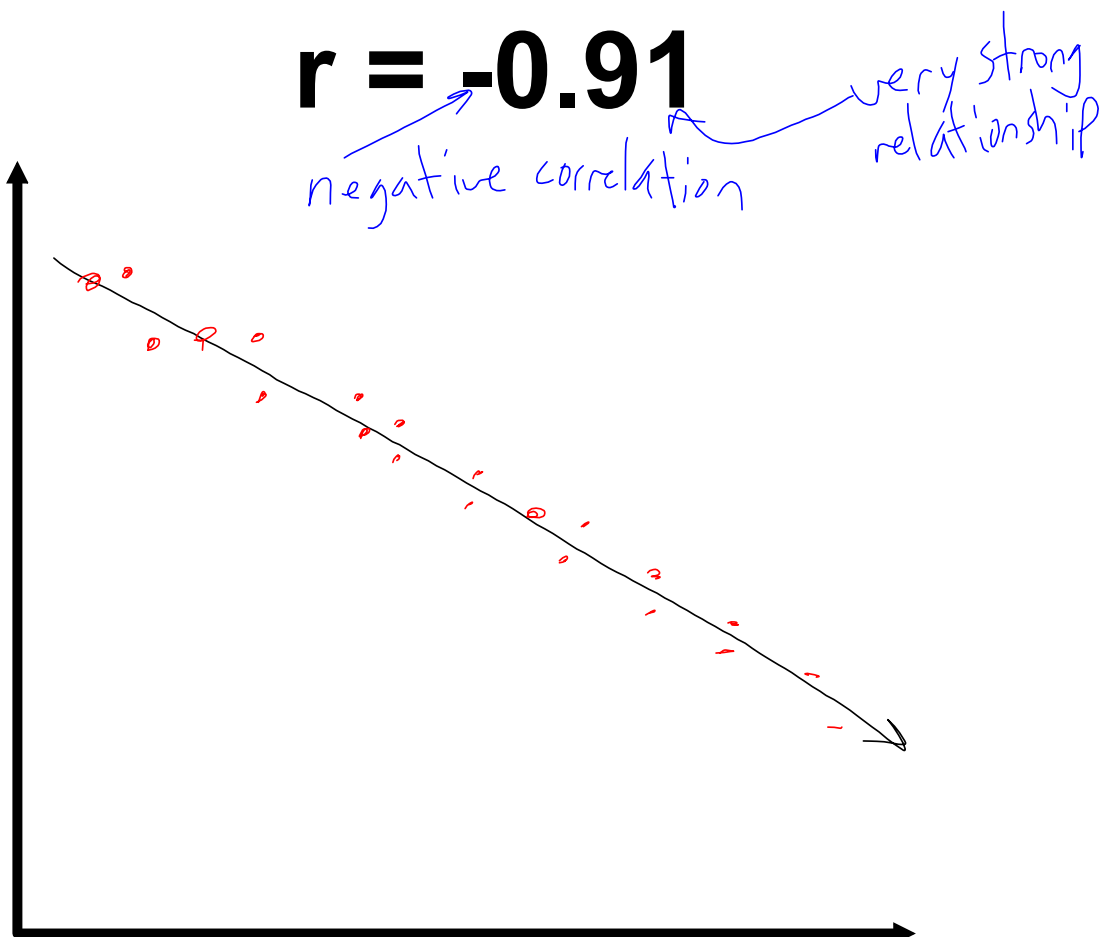
Sketch the general appearance of a scatter plot associated with each value of the correlation coefficient.



Consolidation

Sketching r

Sketch the general appearance of a scatter plot associated with each value of the correlation coefficient.



Consolidation

Homework!

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1, 2, 5, 7