

U3D8_T Linear Regression

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U3D8_T
Linear Re...

U3D8 MAP 4CI

Linear Regression

Date: _____

Linear Correlation A measure of how close a set of data is to the line of best fit, indicating the strength of the relationship between the two variables.

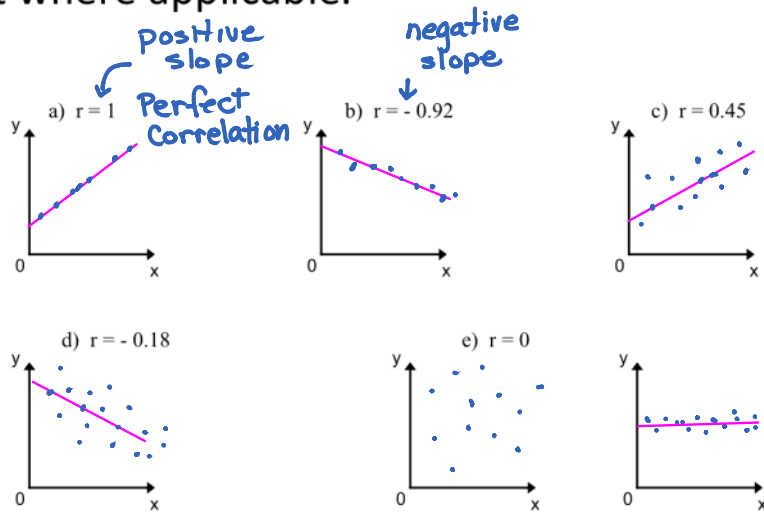
Linear Regression Calculations used (by technology) to determine the equation of a line of best fit for the data.

* Through a series of calculations, a **value r** , which is called the **correlation coefficient**, can be assigned to represent how far the points are, on average from the line of best fit.

The closer the value of r is to +1 or -1, the closer the fit. The **sign of r** relates to the slope of the line, not the fit of the line. r does not indicate whether there is a direct relationship between the variables. The following diagram illustrates how the correlation coefficient r corresponds to the strength of a linear correlation.

	Perfect	Strong	Moderate	Weak	None	Weak	Moderate	Strong	Perfect
$r =$	-1	-0.9	-0.7	-0.3	0	0.3	0.7	0.9	1

Ex. 1 Sketch the general appearance of a scatter plot associated with each value of the correlation coefficient r . Include a line of best fit where applicable.



... pg. 3 →

~~USD8 HOMEWORK: Pg. 175-176 # 1, 2, 6, 9 Use: [desmos.com/calculator](https://www.desmos.com/calculator) for Linear Regression in # 6, 9~~

Ex. 2 Regression Analysis

Once you determine that two variables have a moderate to strong linear relationship, you can determine a linear model. This will allow you to make predictions for one variable based on the value of the other variable. Linear regression software, e.g. www.Desmos.com/calculator can perform many complex calculations to determine the equation of the line of best fit between two variables.

Student	Aptitude Test Score	Final Math Mark
A	95	86
B	73	68
C	59	61
D	68	70
E	84	90
F	80	87
G	82	71
H	64	60
I	66	72
J	50	45
K	74	74
L	64	53

Last year, twelve randomly selected students took a mathematics aptitude test before they began their college mathematics course. Their results on the aptitude test and their final mark in the course are shown in the table. All scores are out of 100.

- a) Make a scatter plot of the data and use linear regression to determine the equation of the line of best fit. Give the slope and vertical-intercept.

$$m = 0.97 \quad \text{from Desmos}$$
$$b = 0.01$$
$$y = 0.97x + 0.01$$

see graph below

- b) How well does the regression equation fit the data? Explain.

$$r = 0.877$$

$$r^2 = 0.7691$$

There is a fairly strong positive correlation

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... pg 4 ↘

c) If Hannah scored 75 on the aptitude test, what would you expect her mark to be in her college math course?
 (On TI-83 plus - use 2nd Trace to calculate... enter 75 as x-value in Desmos, click on the line and slide cursor until you see an x-value of 75)

73%

d) If Pietro scored 40 on the aptitude test, what would you expect his mark to be in his college math course?

39%

Method to answer part (a): Google Desmos
www.Desmos.com/calculator
 *** Desmos Instructions

Click on + sign
 Choose table, enter data
 Zoom out to see data on graph
 Click on + sign again
 Choose Expression
 enter $y_1 \sim mx + b$
 Observe r , r^2 , m and b

Example 2
 Graph from Desmos

U3D8 HOMEWORK: Pg 175-178 # 1, 2, 6, 9 Use: desmos.com/calculator for Linear Regression in # 6, 9

