

Trend lines with Technology

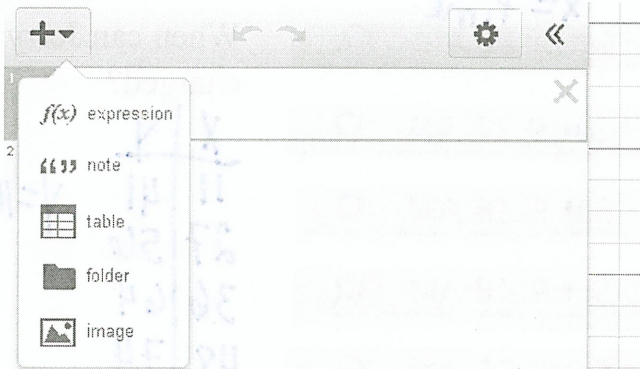
Name: _____

Day 1 Notes

Objective: I can use technology to create a trend line for a scatter plot.

Using Desmos.com to create lines of best fit:

- 1) Need to add table
- 2) Input data (x, y)
- 3) Add expression
- 4) Decide what type of function the data bests fits



Linear: $y_1 \sim mx_1 + b$

Quadratic: $y_1 \sim ax_1^2 + bx_1 + c$

Exponential: $y_1 \sim ab^{x_1}$

Ex 1) The table shows the amount of time spent studying for a final exam and the grades earned.

Study Time (hours) x	Grade Earned y
7	88
3	79
5	92
1	71
0	62
6	94
4	82
2	65

a. Use Desmos to make a scatter plot of the data.

linear $y_1 \sim mx_1 + b$

b. Find the equation of the trend line.

$m = 4.535 = 4.54$

$y = mx + b$

$b = 63.25$

$y = 4.54x + 63.25$

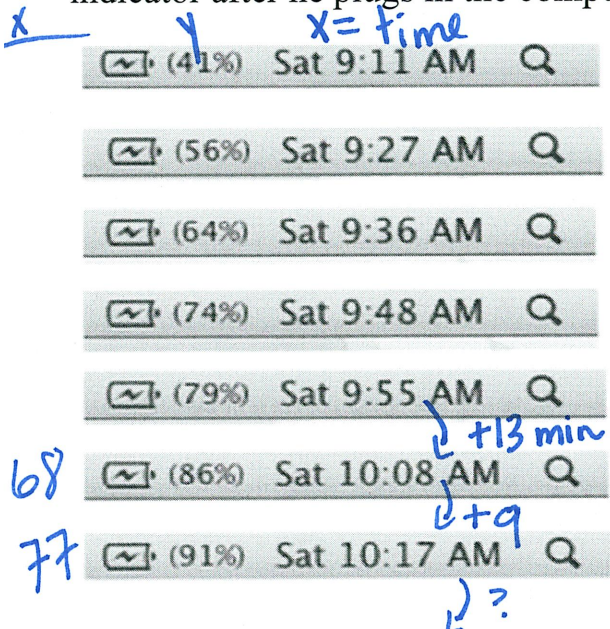
c. Use the equation to estimate the grade earned on the final exam if a student studies for 8 hours.

$x = 8$

$y = 4.54(8) + 63.25$

$y = 99.5$

Ex 2) Jerry forgot to plug in his laptop before he went to bed. He wants to take the laptop to his friend's house with a full battery. The pictures below show screenshots of the battery charge indicator after he plugs in the computer.



When can Jerry expect that his laptop battery is fully charged?

x	y
11	41
27	56
36	64
48	74
55	79
68	86
77	91

$$m = .757 \quad b = 35.34$$

$$y = .757x + 35.34$$

$$y = 100 \quad 100 = .757x + 35.34$$

$$- 35.34 \quad - 35.34$$

$$64.66 = .757x$$

$$\frac{.757}{.757} \quad \frac{.757}{.757}$$

$$85.4 = x$$

$$85.4 - 77 = x \quad + 10:17$$

$$8 \text{ min}$$

$$8.4 \text{ min} \approx 8 \text{ min}$$

10:25 fully charged

At 9:27 AM Jerry makes a quick calculation:

The battery seems to be charging at a rate of 1 percentage point per minute. So the battery should be fully charged at 10:11 AM.

our prediction 10:25

b) Explain Jerry's calculation. Is his estimate most likely an under- or over-estimate? How does it compare to your prediction?

under our prediction, we predicted it to charge longer

c) Compare the average rate of change of the battery charging function on the first given time interval and on the last given time interval. What does this tell you about how the battery is charging?

(11, 41)
(27, 56)
first

$$m_1 = \frac{56 - 41}{27 - 11} = \frac{15}{16}$$

(68, 86)
(77, 91)

$$m_2 = \frac{91 - 86}{77 - 68} = \frac{5}{9}$$

takes longer the closer it is to being fully charge

d) How long would it take for the battery to charge if it started out completely empty?

$$y = 0$$

$$0 = .757x + 35.34$$

Correlation: a measurement that indicates the relationship between two or more variables

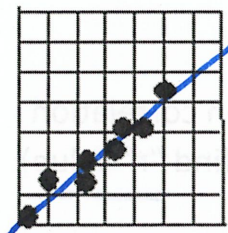
(Pearson) Correlation Coefficient: "r" : a number between -1 and 1 that tells you how close the equation of best fit models the data

Type of relationship

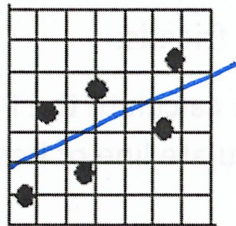
- Strong positive
- Weak positive
- None
- Weak negative
- Strong negative

Value of r

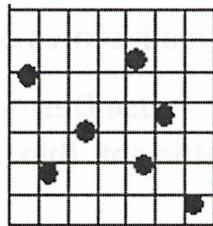
- Close to + 1 (above $\approx .7$)
- Positive (between $\approx .3$ and $\approx .7$)
- Close to 0 (between $\approx -.3$ and $\approx .3$)
- Negative (between $\approx -.3$ and $\approx -.7$)
- Close to -1 (below $\approx -.7$)



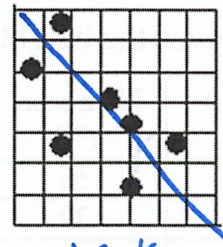
Strong Positive



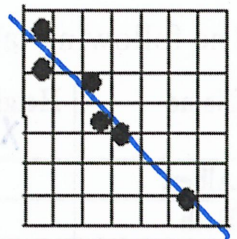
Weak positive



No Correlation



Weak negative



Strong negative

Correlation Expectations: Tell whether you would expect the correlation between the two variables in each of these sets of data to be strong positive, weak positive, strong negative, weak negative, or no correlation.

a) Weight of an animal and amount of food consumed.

X Y

both go up

Weak positive correlation

one goes down

b) Cost of an automobile and reliability of that automobile.

X Y

Weak positive

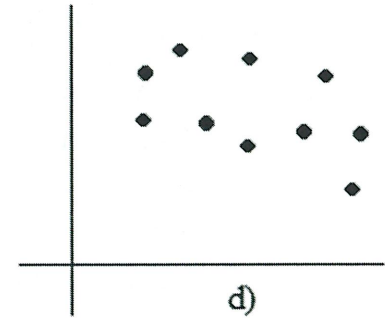
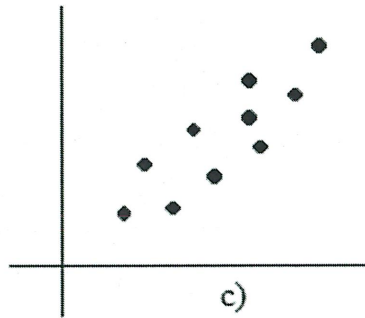
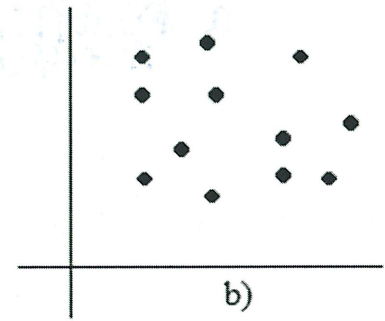
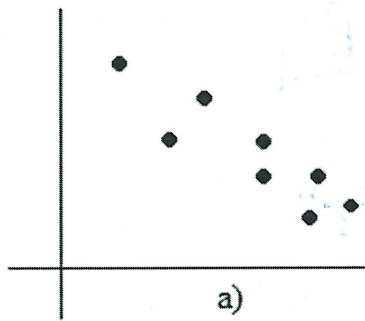
c) Speed of an airplane and travel time to a particular destination.

d) Number of rainy days and number of visitors to a resort.

e) Height of an instructor and performance of his/her students.

No correlation

1. The figures to the right show graphs of different collections of data in two variables. Identify whether the correlation is strong positive, weak positive, strong negative, weak negative, or no correlation.



The following table gives the heights and math scores of 10 friends:

Name	Height (cm) <i>x</i>	Math score (%) <i>y</i>
Albert	180	56
Beth	176	29
Cindy	144	45
David	195	93
Emily	159	67
Frank	185	38
Gary	166	85
Helen	173	77
Ida	149	56
Jeremy	168	71

a) Use Desmos to calculate the Pearson correlation coefficient. (hint calculate line of best fit, find "r" value)

$r = .205$

~~positive~~

↓
No correlation