Modeling with Linear Functions

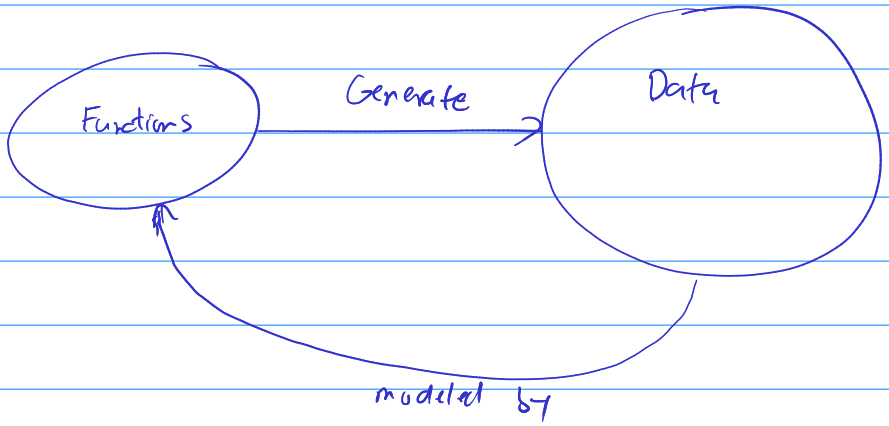
Employee Turnover The percentage of employees who cease their employment during a year is referred to as employee turnover, and it is a serious issue for businesses. The following table shows the cost, in millions of dollars, to Walmart for a given employee turnover percentage in a year.[13]

E = employee turnover	10	20	30	40	(%)
C = cost	250	400	550	700	(mil USD)

How much does it cost if the employee turn over is 50% or 60%? or 71% and so on.

we will use "mathematical modeling" to answer the question.

we will "model" this data using a function. This means that we will find a function that generats the data or generate a data set that is very close to the data.



E = employee turnover	10	20	30	40	(%)
C = cost	250	400	550	700	(mil USD)

+10% +10% +10%

+150 +150 +150

we will use a linear function to model this dataset.

Input: Employee turnover (E)

output: Cost (C)

we want to write C as a linear function of E.

we observe that for any 10% increased in E, there is 150 (mil) increased in C. So a linear function is a "good" function to model the dataset.

we also have the rate of change is

$$\text{rate of change} = \frac{\text{change in output}}{\text{change in input}} = \frac{150}{10} = 15$$

The linear function is

$$C = (\text{rate of change}) * E + \underbrace{(\text{some number})}_{m}$$

$$\Rightarrow \boxed{C = 15E + m}$$

we need to find m. To find m, we plug in any pair of values for E and C.

$E = 10, \quad C = 250$

$\Rightarrow \quad 250 = 15 \cdot 10 + m$

$\Rightarrow \quad 250 = 150 + m \quad \Rightarrow \quad \boxed{m = 100}$

So the liner function to model the dataset is

$$\boxed{C = 15E + 100}$$

If $E = 50\% \Rightarrow C = 15 * 50 + 100$

$$\boxed{C = 850}$$

If $E = 71\% \Rightarrow C = 15 * 71 + 100$

$$= 1165$$

Assignment 3: (Submit photos of the answer to Canvas)

Tuition at American Private Universities The following table shows the average yearly tuition and required fees, in dollars, charged by four-year American private nonprofit universities in the school year ending in the given year.

Date	Average tuition
2012	$27,870
2013	$29,004
2014	$30,138
2015	$31,272
2016	$32,406

← Data

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A

(a) calculate the rate of changes in Average tuition

(b) write a linear function to model the data

(c) Use the linear model to estimate / calculate the tuition of 2024