TRENDS AND CORRELATION COEFFICIENTS (MODEL NOTES)

Directions

Use the tables to find a pattern of how the y-values increase or decrease. Write a general rule next to each table (ex. + 4, · 2, etc.).

Tickets	Cost
1	$15.00
2	$30.00
3	$45.00
4	$60.00
5	$75.00

+15

Hours	Bacteria
1	2
2	6
3	18
4	54
5	162

·3

Weeks	Pounds
2	100
4	95
6	90
8	85
10	80

−5

Minutes	Temp.
0	200
1	150
2	112.5
3	84.375
4	63.28125

$\cdot \frac{3}{4}$ or $\div 1.\overline{3}$

Field Goals	Points
5	10
8	16
11	22
14	28
17	34

+6

Time (min.)	Tylenol (mg)
30	250.445
60	209.076
90	174.540
120	145.710
150	121.641

·0.8348

Observations

The data in the tables on the left is linear. Why do you think we use that word for it?

It probably makes a line. It looks a lot like how I find the slope of a line.

The data on the right is nonlinear—more specifically, it is exponential.

Using the table, how can you determine if a data set is linear? is exponential?

- It is linear if… *you add or subtract the same thing from y each time.*

- It is exponential if… *you multiply each y by the same number each time.*

Linear or Exponential (Formalize Your Findings)

- If a scatter plot **<u>can</u>** be represented with a straight line, then we say that the trend is

  __linear__.

- If a scatter plot **<u>cannot</u>** be represented with a straight line, then we say that the trend is

  __nonlinear__.

- When a data set is ***linear***, the y-values change by *__adding the same number__*.

- When a data set is ***exponential***, the y-values change by *__multiplying by the same*

  number__.

Linear Regression

Your calculator uses ***linear regression*** to find a line of best fit, which is also known as a ***linear regression model***.

- ***a*** represents the *__slope__* of the line.

- ***b*** represents the *__y-intercept__* of the line.

- ***r*** is the ***correlation coefficient***. This r-value shows *__how well the linear regression model*

  fits the data__.

- The closer the r-value is to *__–1__* or *__1__*, the better the line fits the data.

Week	Account Balance
1	$4.00
2	$8.00
3	$12.00
4	$16.00
5	$20.00

Example

You are saving money to buy a video game. The table shows your account balance at the end of each week. Is the data linear or not linear? How can you tell from the table?

The data is linear because $4 is added to the account balance every week.

Find the linear regression model for your account balance and write it in the form $y = mx + b$.

$y = 4x + 0$ or $y = 4x$

Give the correlation coefficient and explain its meaning.

$r = 1$. This means that the linear regression model perfectly fits the given data.

Predict the amount of money in your account after 10 weeks.

$y = 4(10) + 0 = 40 + 0 = 40$ *After 10 weeks, I should have $40.*