

Section 1.8 Mathematical Modeling

Objective: In this lesson you learned how to write mathematical models for direct, inverse, and joint variation and how to use the least squares regression feature of a graphing utility to find mathematical models of actual data.

Course Number

Instructor

Date

Important Vocabulary

Define each term or concept.

Directly proportional

Least squares regression line

I. Introduction (Page 181)

Describe what is meant by “fitting a line to data.”

What you should learn

How to use mathematical models to approximate sets of data points

II. Direct Variation (Page 182)

When a variable y is directly proportional to a variable x , the

constant of variation is . . . _____

_____. Another

name for the constant of variation is the _____

_____.

What you should learn

How to write mathematical models for direct variation

Example 1: If y varies directly as x , and y is 6 when x is 4, find the value of y when x is 20.

III. Direct Variation as n th Power (Page 183)

If $y = kx^n$ for some nonzero constant k , then describe the relationship between y and x in two different ways.

What you should learn

How to write mathematical models for direct variation as an n th power

Example 2: If y is directly proportional to the third power of x , and y is 750 when x is 10, find the value of y when x is 8.

IV. Inverse Variation (Page 184)

If x and y are related by an equation of the form _____, then y varies inversely as x .

If y varies inversely as x , then y is _____ to x .

If x and y are related by an equation of the form $y = k/x^n$, then y _____ or y _____.

Example 3: If y varies inversely as x , and y is 4 when x is 16, find the value of y when x is 10.

What you should learn
How to write mathematical models for inverse variation

V. Joint Variation (Page 185)

If z is **jointly proportional** to x and y , then $z =$ _____.

Another way to say that z is jointly proportional to x and y is . . .

Example 4: If z varies jointly as x and y , and if $z = 10$ when $x = 4$ when $y = 15$, find the value of z when $x = 12$ and $y = 7$.

What you should learn
How to write mathematical models for joint variation

VI. Least Squares Regression (Page 186)

To find the least squares regression line for a set of data, . . .

What you should learn

How to use the least squares regression feature of a graphing utility to find mathematical models

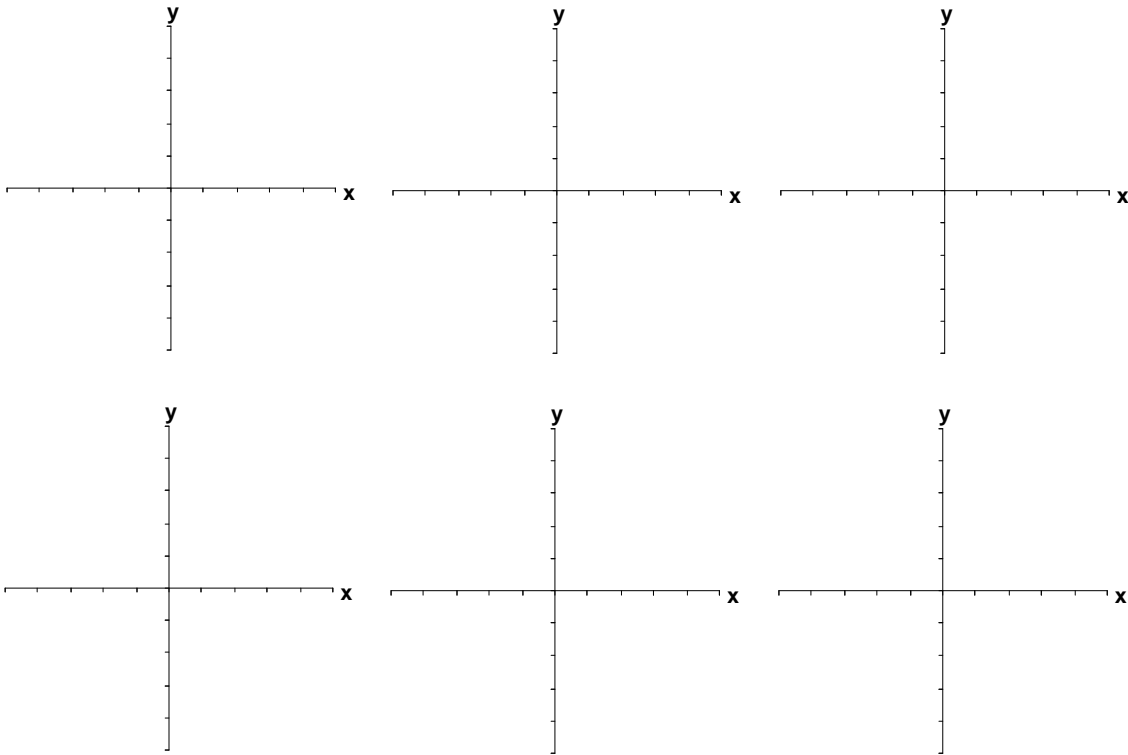
The correlation coefficient r of a set of data gives a measure of _____ . The closer $|r|$ is to 1, the better . . .

Example 5: The numbers of U.S. Air Force personnel p on active duty for the years 1995 through 1999 are shown in the table. Use the regression capabilities of a graphing utility to find a linear model for the data. Let t represent the year with $t = 5$ corresponding to 1995.

Year	1995	1996	1997	1998	1999
p	400	389	379	363	358

(Source: U.S. Department of Defense)

Additional notes

Additional notes**Homework Assignment**

Page(s)

Exercises