

NOTES: VARIATION

DAY 8

Textbook Chapter 8.1

OBJECTIVE: Today you will learn about the 3 types of variation and how to use each type to model various situations!

Variation Language: _____ varies _____ as _____

- The score on my midterm exam varies as the number of hours I study.
A. $z = kxy$ i. Inverse Variation

- The area of a triangle varies as the base and the height.
B. $y = kx$ ii. Joint Variation

- The number of textbooks in your backpack varies as the size of each book.
C. $y = \frac{k}{x}$ iii. Direct Variation

- Circle the following equations that represent direct variation:
 $y = 2x$ $y = \frac{3}{4}x + 3$ $y = \frac{3}{4}x$ $5y = -4x$ $3y - 2 = x$ $4 = \frac{x}{y}$
- If you study for 10 hours for your midterm exam and you earn a score of 90, find the constant of variation.
- If a triangle has a base of 10, height of 7 and area of 35, what is the constant of variation?

What Type of Variation?

Decide whether each situation is direct, inverse, or joint variation.

1	The number of oranges in a box varies as the size of each orange.	Direct	Inverse	Joint
2	The distance I run varies as my speed and the amount of time that I run.	Direct	Inverse	Joint
3	The number hours that the painters spend painting your house varies as the number of painters.	Direct	Inverse	Joint
4	The amount of my paycheck varies as the number of hours I work.	Direct	Inverse	Joint
5	The height of a child under the age of 10 varies as the age of the child.	Direct	Inverse	Joint
6	The volume of a cylinder varies as the radius and the height of the cylinder.	Direct	Inverse	Joint

Example 1: The number of students sitting varies _____ as the number of people standing. Why?

Example 2: Your house can be painted by 12 painters in 20 hours. Find the variation equation then use it to find out how long it would take 10 painters to paint your house.

Example 3: The number of songs you are able to store onto an iPod varies inversely with the average size of the song. My iPod can store 2500 songs with an average song length of 4 MB.

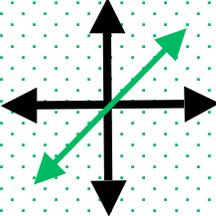
a) Write a general formula for the number of songs, n , that will fit on iPod

b) How many songs will fit if the average length is 3 MB? 5MB? What do you notice about the number of songs as the size increases?

Variation Notes

DAY 9

Direct Variation → $y = kx$
"y varies directly with x, where a is the constant of variation"



Circle the following equations that represent direct variation:

$y = 2x$	$y = \frac{3}{4}x + 3$	$y = \frac{3}{4}x$	$5y = -4x$	$3y - 2 = x$	$4 = xy$
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EXAMPLE ONE → FIND THE CONSTANT OF VARIATION

y varies directly as x. Find the constant of variation given the following (x, y)

a) (2, 6)

b) (1, 2)

c) (9, 6)

$$\text{Inverse Variation} \rightarrow y = \frac{k}{x}$$

“y varies inversely with x, where a is the constant of variation”

EXAMPLE TWO → WRITE AN INVERSE VARIATION EQUATION.

The variables x and y vary inversely. Write an equation to relate the variables then find y when x = -2.

a) (4, 7)

b) (-3, 5)

EXAMPLE THREE → INVERSE VARIATION MODELS

The number of songs you are able to store onto an iPod varies inversely with the average size of the song. My iPod can store 2500 songs with an average song length of 4 MB.

c) Write a general formula for the number of songs, n, that will fit on iPod

d) How many songs will fit if the average length is 2 MB? 3MB? 5MB? What do you notice about the number of songs as the size increases?

Joint Variation → $z = kxy$

“z varies jointly with x and y with constant of variation a”

EXAMPLE FOUR → WRITE A JOINT VARIATION EQUATION

z varies directly with x and y. Write the equation that relates the variables if $z = -75$, $x = 3$, and $y = -5$. Then find z when $x = 2$ and $y = 6$

EXAMPLE FIVE → WRITE A JOINT VARIATION EQUATION

The number of hours h that it takes m men to assemble x machines varies directly as the number of machines and inversely as the number of men. If four men can assemble 12 machines in four hours, how many men are needed to assemble 36 machines in eight hours?

TABLE

Check for direct variation – does the data have the same constant (k)?
Check the ratio of each ordered pair.

X	1	2	3	4
Y	15	30	45	60

VARIATION:y varies directly/inversely/jointly as xy is directly/inversely/jointly proportional to x.**DAY 9**

	Instructions	Example
Direct Variation	<ol style="list-style-type: none"> y varies DIRECTLY as x. Equation: $y = kx$ Given x and y, plug them into the equation. Solve for k. Write the formula with k filled in. Use the formula to answer any questions! 	The score on my test varies directly as the number of hours I study. If I study for 2 hours, I will earn a 90% on the test. What will I earn if I study for 3 hours?
Inverse Variation	<ol style="list-style-type: none"> y varies INVERSELY as x. Equation: $y = \frac{k}{x}$ Given x and y, plug them into the equation. Solve for k. Write the formula with k filled in. Use the formula to answer any questions! 	The number of books in my backpack varies inversely as the size of each book. If each book is 150 in ³ , I can fit 4 books into my backpack. How many books can I carry if each book is 100 in ³ ?
Joint Variation	<ol style="list-style-type: none"> z varies JOINTLY as x and z. Equation: $z = kxy$ Given x, y, and z plug into the equation. Solve for k. Write the formula with k filled in. Use the formula to answer any questions! 	The area of a triangle varies jointly as the base and the height. A triangle with base 32 in and height of 4 inches has an area of 64 in. What is the area of a triangle with base of 11 inches and height of 2 inches?