

Direct, Inverse, Joint and Combined Variation

k is a constant of variation

Type of Variation	Phrase	Simple Equation example	Practical Example	More Complicated Equations
Direct	“is directly proportional to” “varies directly with”	$y = kx$ y varies directly with x	The radius of the circle lit by a car’s light decreases (y) as the distance away from the garage decreases (x).	$y = kx^2$ y varies directly with x^2
Inverse	“varies inversely with”	$y = k/x$ y varies inversely with x	The brightness of a car’s lights increases (y) as the distance from the garage decreases (x).	$y = k/x^3$ y varies inversely with x^3
Joint	“varies jointly (directly) with” “depends upon both...”	$y = kxz$ y varies jointly with x and z	The heat loss through a glass window (y) varies jointly with the area of the window (x) and the temperature difference (z) between inside and outside.	$y = kx^3z^2$ y varies jointly with x^3 and z^2
Combined	“varies directly with x and inversely with z	$y = kx/z$ y varies directly with x and inversely with z	The radius of the circle lit by a car’s light decreases (y) as the distance away from the garage decreases (x), but the nervousness of the new driver increases (z) (he’s afraid he’s going to hit the door!!!!).	$y = \frac{k\sqrt{x}}{z^4}$ y varies directly with the square root of x and inversely with z^4

To solve the problems, you will follow these steps.

Step 1 Write the equation in general terms as in the 3rd column above...don’t forget the “k”

Step 2 Use the data given to sub in and solve for k

Step 3 Use the equation in step 1 to fill in the k from step 2.

Step 4 Fill step 3’s equation in the second set of data, solve for the only variable remaining.