Linear Equation in simple terms

Overview
In mathematics, a linear equation is an equation that may be put in the form

$$a_1x_1 + \cdots + a_nx_n + b = 0,$$

where x1 , … , xn are the variables (or unknowns), and b,a1 , … , an are the coefficients, which are often real numbers. The coefficients may be considered as parameters of the equation, and may be arbitrary expressions, provided they do not contain any of the variables. To yield a meaningful equation, the coefficients a1 , … , an are required to not all be zero.

Linear Equation in 3 variables
R3 is the space of 3 dimensions There is *x, y* and *z* coordinate. Each coordinate can be any real number.

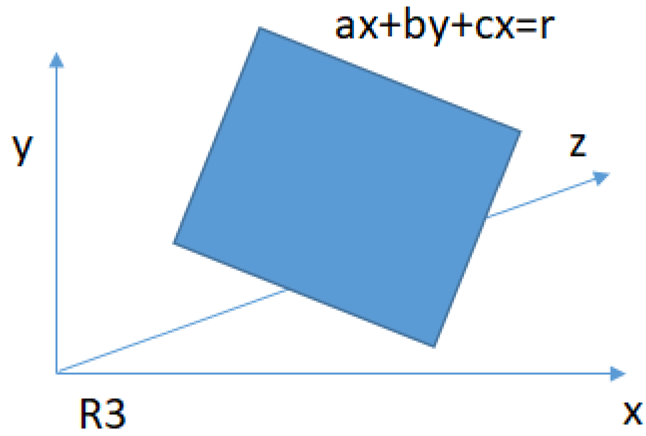
if a,b,c and r are real numbers (and if a,b and c are not all equal to 0) then
ax+by +cz = r is called a linear equation in three variables.
The numbers a, b, and c are called the coefficients of the equation. The number r is called the constant of the equation.

Example

x + 2y - 3z = -3	Equation 1
2x - 5y + 4z = 13	Equation 2
5x + 4y - z = 5	Equation 3

Solution to Equations
A solution of a linear equation in three variables ax + by + cz = r is a specific point in R3 such that when the x-coordinate of the point is multiplied by a, the y-coordinate of the point is multiplied by b, the z-coordinate of the point is multiplied by c, and then those three products are added together, the answer equals r.

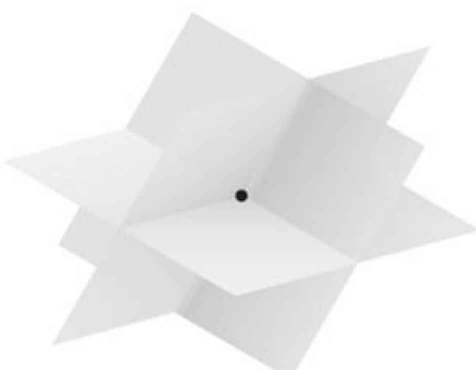
Linear Equation and Planes
The set of solutions in R3 of a linear equation in three variables is a 2- dimensional plane

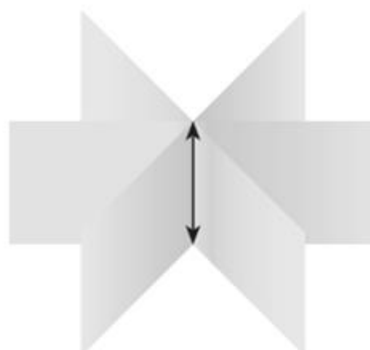


Geometry of Solutions
Suppose we have a system of three linear equations in three variables. Each of the three equations has a set of solutions that's a plane in R3. A solution to the system of equations is a point that lies on all three of those planes. If there is only one point that lies on all three planes, then that solution is unique.
If you randomly write down three three different linear equations in three variables, the odds are the three corresponding planes will intersect in on and only one point. That means that for most systems of these linear equations in three variables there will be unique solution.

If the planes intersect in a single point, the system has one solution.

If the planes intersect in a line, as infinitely many solutions.





If the planes have no point of intersection, the system has no solution. In the example on the left, the planes intersect pairwise, but all three have no points in common. In the example on the right, the planes are parallel.