

Equation of a straight line (Two point form)

Currently used formula for the equation of the straight line passing through two given points,

$$(x_1, y_1) \text{ and } (x_2, y_2) \text{ is } \frac{(y - y_1)}{(x - x_1)} = \frac{(y_2 - y_1)}{(x_2 - x_1)} .$$

This formula can be further simplified as below.

$$\begin{aligned}(x_2 - x_1)(y - y_1) &= (x - x_1)(y_2 - y_1) \\ x_2 y - x_2 y_1 - x_1 y + x_1 y_1 &= x y_2 - x y_1 - x_1 y_2 + x_1 y_1 \\ x y_1 - x y_2 + x_2 y - x_1 y &= x_2 y_1 - x_1 y_2 \\ (y_1 - y_2)x + (x_2 - x_1)y &= x_2 y_1 - x_1 y_2 \\ (y_1 - y_2)x - (x_1 - x_2)y &= x_2 y_1 - x_1 y_2\end{aligned}$$

This solution was provided by Jagadguru Swāmī Śrī Bhāratī Kṛṣṇa Tīrtajī Mahārāja in his work 'Vedic Mathematics.'

The above equation can be written as $(x_1 - x_2)y = (y_1 - y_2)x + (x_1 y_2 - x_2 y_1)$ in the form

$$by = ax + c \text{ where } b = (x_1 - x_2), a = (y_1 - y_2) \text{ and } c = \begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix} = (x_1 y_2 - y_1 x_2) .$$

Ref:

- 1) Vedic Mathematics - by Jagadguru Swāmī Śrī Bhāratī Kṛṣṇa Tīrtajī Mahārāja.
- 2) Triples - Applications of Pythagorean Triples – by Kenneth Williams.