# A question on Straight line

## Question

A line L: $2x - 3y = 1$ is given. Show that the coordinates $(x, y)$ of any point on the line L can be written as

$x = 2 + 3k$ , $y = 1 + 2k$

## Unsatisfactory solution 1

$2x - 3y = 2(2 + 3k) - 3(1 + 2k) = 1$

$\therefore$ $(2 + 3k , 1 + 2k)$ satisfies the equation $2x - 3y = 1$ .

$\therefore$ Any point $(x, y)$ of L can be written as $x = 2 + 3k$ , $y = 1 + 2k$ .

## Unsatisfactory solution 2

L: $2x - 3y = 1$

When $x = 2 + 3k$ , $2(2 + 3k) - 3y = 1$ $\therefore$ $y = 1 + 2k$

$\therefore$ Any point $(x, y)$ of L can be written as $x = 2 + 3k$ , $y = 1 + 2k$ .

## Analysis

The proofs in the above in fact show only:

"Any point of the form $x = 2 + 3k$ , $y = 1 + 2k$ lies on L: $2x - 3y = 1$."

and not:

"Any point $(x, y)$ of L can be written as $x = 2 + 3k$ , $y = 1 + 2k$ ."

## Proof

Let $(x_1, y_1)$ be any point on L .

Note that : $x_1 = 2 + 3\left(\frac{x_1 - 2}{3}\right)$. So if we take $k = \frac{x_1 - 2}{3}$, then $x_1 = 2 + 3k$ .

It leaves to show that $y_1 = 1 + 2k$ .

Since $(x_1, y_1)$ is on L, therefore $2x_1 - 3y_1 = 1$ .

Since $x_1 = 2 + 3k$, $2(2 + 3k) - 3y_1 = 1$. $\therefore$ $y_1 = 1 + 2k$

$\therefore$ Any point $(x, y)$ of L can be written as $x = 2 + 3k$ , $y = 1 + 2k$ .