

Step-1

Given points are $(0, y_1), (1, y_2), (2, y_3)$, we have to find that under what conditions on y_1, y_2, y_3 do the given points lie on a straight line.

Three points are said to lie on the same line if the area of the triangle formed with these three points is zero.

Step-2

The area of the triangle from the analytical geometry gives,

$$\frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)| = 0$$

$$\Rightarrow \frac{1}{2} |0(y_2 - y_3) + 1(y_3 - y_1) + 2(y_1 - y_2)| = 0$$

$$\Rightarrow |0 + y_3 - y_1 + 2y_1 - 2y_2| = 0$$

$$\Rightarrow y_3 + y_1 - 2y_2 = 0$$

$$\Rightarrow 2y_2 = y_1 + y_3$$

So the relation between y_1, y_2, y_3 is $\boxed{2y_2 = y_1 + y_3}$