The slope of a line

Suppose for $n > 2$, $(x_1, y_1), \ldots, (x_n, y_n)$ are distinct points on the line $y = mx + c$. The slope can be expressed in terms of the x's and y's in many ways, including

$$m = \frac{y_j - y_i}{x_j - x_i}, \qquad 1 \leq i \neq j \leq n$$

Define the means

$$\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i, \qquad \bar{y} = \frac{1}{n} \sum_{i=1}^{n} y_i$$

It can be checked that $(\bar{x}, \bar{y})$ is on the line. Hence for any i with $x_i \neq \bar{x}$,

$$m = \frac{y_i - \bar{y}}{x_i - \bar{x}}$$

Notice that the means are invariant to any reordering of the points. For instance, if we swap (x_1, y_1) with (x_n, y_n), the formulae for $\bar{x}$ and $\bar{y}$ remain the same, but the above formulae for m do not.

Question: Is there an invariant formula for m?

If for every i, $x_i \neq \bar{x}$, it seems feasible to try

$$m = \frac{\sum_{i=1}^{n} (y_i - \bar{y})}{\sum_{i=1}^{n} (x_i - \bar{x})}$$

Can you see why this does not work?