

## Inequality calculations – Example

We will use the following income distribution:

$$(y_1, y_2, y_3); (n_1, n_2, n_3)$$

$$(5, 10, 40); (6, 3, 1)$$

The first set of numbers represents the various incomes, whereas the second set represents the number of people earning each of these incomes.

$$\text{Hence, } y_1 = 5 \quad y_2 = 10 \quad y_3 = 40 \quad n_1 = 6 \quad n_2 = 3 \quad n_3 = 1$$

$$n = n_1 + n_2 + n_3 = 6 + 3 + 1 = 10$$

**Mean income:**

$$\mu = \frac{1}{n} \sum_{j=1}^m n_j y_j$$

$$\mu = \frac{1}{10} (6 * 5 + 3 * 10 + 1 * 40) = 10$$

**The range:**

$$R = \frac{1}{\mu} (y_m - y_1)$$

$$R = \frac{1}{10} (40 - 5) = 3.5$$

**The mean absolute deviation:**

$$M = \frac{1}{\mu n} \sum_{j=1}^m n_j |y_j - \mu|$$

$$M = \frac{1}{10 * 10} (6 * |5 - 10| + 3 * |10 - 10| + 1 * |40 - 10|) = \frac{60}{100} = 0.6$$

**The coefficient of variation:**

$$C = \frac{1}{\mu} \sqrt{\sum_{j=1}^m \frac{n_j}{n} (y_j - \mu)^2}$$

$$C = \frac{1}{10} \sqrt{\frac{6}{10} (5 - 10)^2 + \frac{3}{10} (10 - 10)^2 + \frac{1}{10} (40 - 10)^2}$$

$$C = \frac{1}{10} \sqrt{\frac{1050}{10}} = 1.025$$

**The Gini coefficient:**

$$G = \frac{1}{2\mu n^2} \sum_{j=1}^m \sum_{k=1}^m n_j n_k |y_j - y_k|$$

$$G = \frac{1}{2 * 10 * 10^2} \left\{ \begin{array}{l} (6 * 6)|5 - 5| + (6 * 3)|5 - 10| + (6 * 1)|5 - 40| + \\ (3 * 6)|10 - 5| + (3 * 3)|10 - 10| + (3 * 1)|10 - 40| + \\ (1 * 6)|40 - 5| + (1 * 3)|40 - 10| + (1 * 1)|40 - 40| \end{array} \right\}$$

$$G = \frac{0 + 90 + 210 + 90 + 0 + 90 + 210 + 90 + 0}{2000} = \frac{780}{2000} = 0.39$$