

CPS–UIC Math Forum Gini Index

Integrals and Equity

http://www.rethinkingschools.org/archive/19_03/inte193.shtml

- Measuring inequality of distribution of income by the [Corrado] Gini Index
- Lorenz Curve: Graph of Cumulative Percentage vs. Cumulative Percentage
- Gini Index =¹ $100 \times (\text{Gini Coefficient})$
- Simple Example: If the population is divided into two groups – the *rich* 20% and the *poor* $100 - 20 = 80\%$ and the *rich* control 90% of the income, the Gini Index is $g = 90 - 20 = 70$. See Fig.2 in <http://www.cr1.dircon.co.uk/pdf/Lorenz.pdf>
Thus the Gini Index is the incremental advantage of the *rich* population.

Gini Coefficient

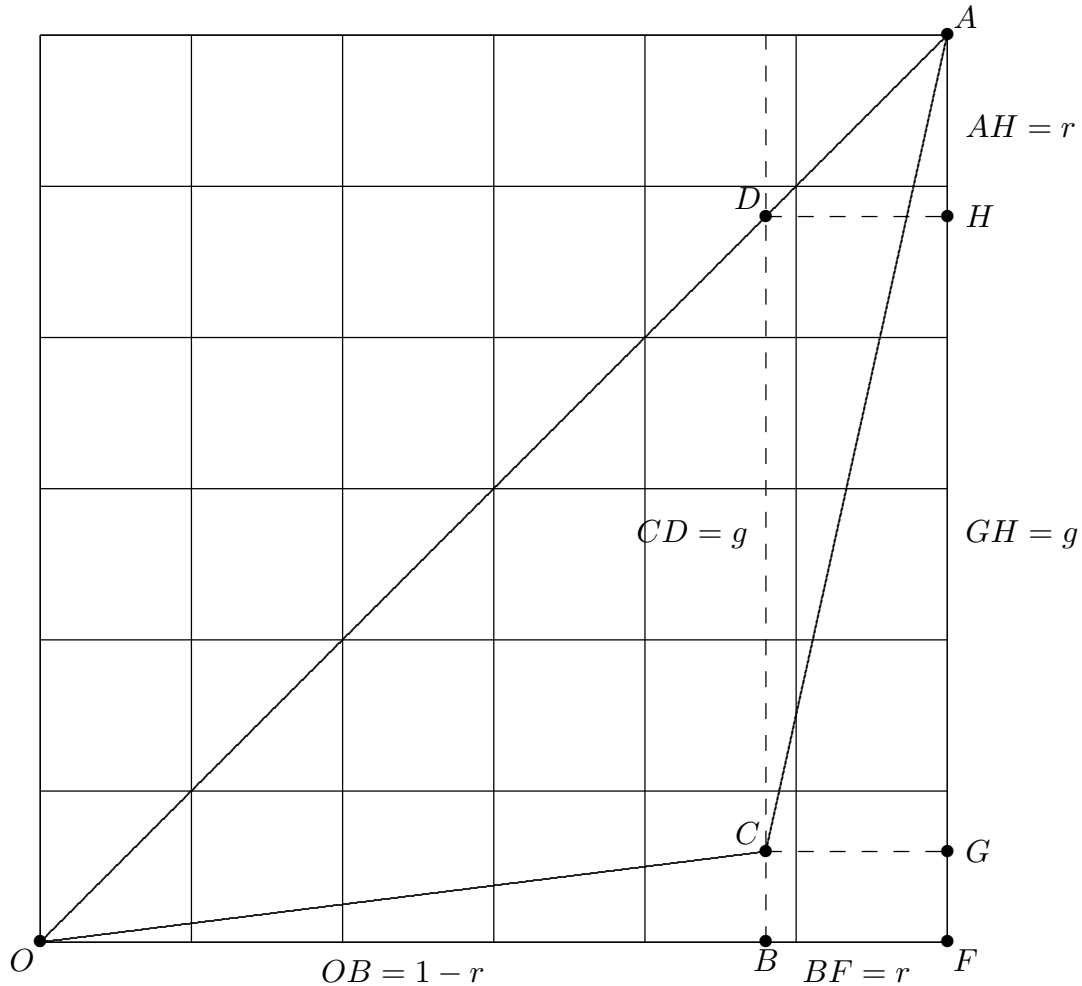
http://en.wikipedia.org/wiki/Gini_coefficient

- Calculation: The Gini coefficient is calculated as a ratio of the areas on the Lorenz curve diagram. If the area between the line of perfect equality and Lorenz curve is A , and the area underneath the Lorenz curve is B , then the Gini coefficient is $A/(A + B)$.
- Advantages and Disadvantages of the Gini coefficient as a measure of inequality
 - Advantages: Anonymity, Scale independence, Population independence
 - Disadvantages: Units of Measurement, Households vs. Individuals, Definition of Income.
- Policy Considerations: *FRBSF: Economic Letter – Inequality in the United States*
<http://www.frbsf.org/econrsrch/wklyltr/el97-03.html>

¹ N.B. In the Staples paper, the Gini *coefficient* is called the GINI *index*.

Simple Example

Simple Example: If the population is divided into two groups – the *rich* proportion r and the *poor* proportion $1 - r$ and the *rich* control an $r + g$ proportion of the the total income, the Gini Coefficient is $g = (r + g) - r$. If there was *complete equity*, the rich would control r and g represents the *incremental advantage* of the rich.



In the figure, $A = (1, 1)$, $q = GH = CD$, and

$$\begin{aligned}
 \text{Area}\triangle OCA &= \text{Area}\triangle OCD + \text{Area}\triangle DCA \\
 &= \frac{1}{2}CD \cdot OB + \frac{1}{2}BF \cdot OB \\
 &= \frac{1}{2}CD \cdot OF \\
 &= \frac{1}{2}q,
 \end{aligned}$$

or

$$\frac{\text{Area}\triangle OCA}{\text{Area}\triangle OFA} = q.$$