

Newsroom Math Cheat Sheet

By Prof. Steve Doig
Arizona State University

To convert a fraction into a decimal:

- Divide the top number by the bottom number
- Examples: $5/8 = 0,625$ $17/64 = 0,265\dots$

To convert a decimal into a percentage:

- Multiply by 100 (or simply move the decimal two places to the RIGHT)
- Examples: $0,658 = 65,8\%$ $1,255 = 125,5\%$

To turn a percentage into a decimal:

- Divide by 100 (or simply move the decimal two places to the LEFT)
- Examples: $43,7\% = 0,437$ $148,2\% = 1,482$

To get X% of Y:

- Turn X% into a decimal, then *multiply* it by Y
- Example: 20% of $90 = 0,20 * 90 = 18$ $130,5\%$ of $45 = 1,305 * 45 = 58,7\dots$

To compare X and Y using percentages (X is what percent of Y?):

- X is $(X/Y * 100)$ percent of Y
- Example: 5 and 8: $5/8 = 0,625 = 62,5\%$, so 5 is 62,5% of 8
- Example: 8 and 5: $8/5 = 1,6 = 160\%$, so 8 is 160% of 5

To compare X and Y using percentage differences:

- X is $(X/Y - 1) * 100$ MORE/LESS than Y
- Use MORE THAN if the answer is positive, and LESS THAN if it's negative
- Example: 5 and 8: $5/8 - 1 = 0,625 - 1 = -0,375 = -37,5\%$, so 5 is 37,5% less than 8
- Example: 8 and 5: $8/5 - 1 = 1,6 - 1 = 0,6 = 60\%$, so 8 is 60% more than 5

To compare a NEW number with an OLD number using percentage change:

- NEW has increased/decreased $((NEW/OLD - 1) * 100)$ percent since OLD
- Note: this is the same as $(NEW-OLD)/OLD$
- Use INCREASED if the answer is positive, and DECREASED if it's negative
- Example: This year's €8 million budget is a 60% increase over last year's €5 million budget.
- Example: This year's €5 million budget is a 37.5% decrease from last year's €8 million budget.

To calculate rates (the number of events per some standard unit):

- Do this to account for different size populations
- $RATE = (EVENTS / POPULATION) * ("PER" \text{ Unit})$
- Example Problem: If there were 320 murders in a population of 1.937.086, what is the murder rate per 100.000?
 - First, divide the 320 murders by 1937086 = 0,0001652...
 - Now multiply 0,0001652... by 100.000 = 16,5 murders per 100.000 population

To calculate the effect of inflation using the Consumer Price Index (CPI):

$$\frac{\text{Price Now}}{\text{Price Then}} = \frac{\text{CPI Now}}{\text{CPI Then}}$$

- With this formula, all you need is any three of the numbers to calculate the fourth.
- Example: Is UK petrol more expensive in real cost today than it was in 2007?
CPI in 2013 is 123,0; CPI in 2007 was 104,7; price of gas in 2007 was € 0.967 per liter.
 $X / 0,967 = 123,0 / 104,7$
 $X = (123,0 / 104,7) * 0,967 = 1,17 * 0,967 = 1,13$
Therefore, gas in 2007 cost the equivalent of € 1,13 per liter in 2013 prices, so the actual price of € 1,55 is much more expensive

Newsroom statistics:

- Mean (average): Add the numbers, then divide by how many numbers there are
- Median: Sort the numbers in order, then find the middle value
- Sampling error margin: $1/\sqrt{N}$ (example: sample of 625: $1/\sqrt{625} = 1/25 = 0.04 = +/- 4$ points)

Crowd estimating:

- Calculate crowd area in square meters (length X width)
- For a loose crowd (people are at arm's length), there will be about one person per square meter
- Multiply square meters by 1.3 for a tight crowd (people are more shoulder to shoulder)