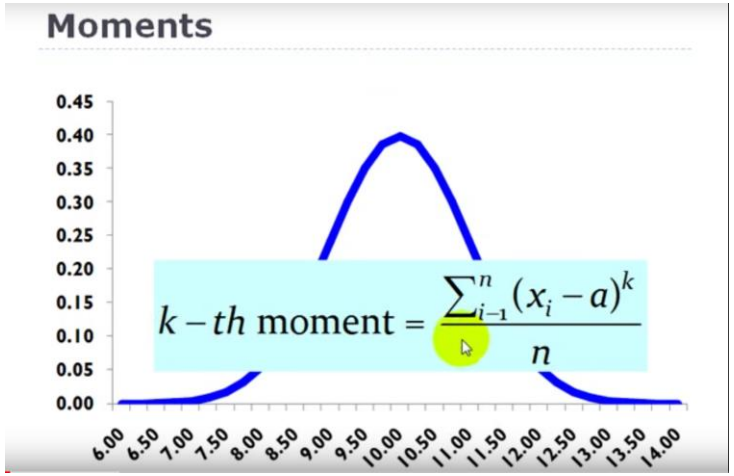
Reflections on the Math behind the MWD curve

Moments of a function

$$\int f(x)\,dx$$

$$\int x\,f(x)\,dx$$

$$\int x^2\,f(x)\,dx$$



https://www.youtube.com/watch?v=SZ3T1cSXP7w

Moments: Mean and Variance

The expectation (mean or the first moment) of a discrete random variable *X* is defined to be:

$$E(X) = \sum_x xf(x)$$

Variance

The variance of a discrete random variable, denoted by *V* (*X*), is defined to be

$$V(X) = E((X - E(X))^2)$$
$$= \sum_x (x - E(X))^2 f(x)$$

https://online.stat.psu.edu/stat504/node/24/

Averages of the Molecular Weight Distribution

(in general)

The weight average molecular weight is

$$M = \frac{\Sigma N_i M^{n+1}}{\Sigma N_i M_i^n}$$

If n=0 is Mn

If n=1 is Mw

If n=2 is Mz

Mn
(Number average molecular weight)

It is the statistical average molecular weight of all the polymer chains in the sample:

$$Mn = \frac{\Sigma N_i M_i}{\Sigma N_i}$$

Mi is the molecular weight of a chain and Ni is the number of chains of that molecular weight.

Mw
(Average molecular weight)

The weight average molecular weight is

$$Mw = \frac{\Sigma N_i M_i^2}{\Sigma N_i M_i}$$

Mw takes into account the molecular weight of each chain in determining contributions to the molecular weight average.