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$$m(X) = \frac{1}{N}\sum_{i=1}^{N} x$$

$$m(a+bX) = \frac{1}{N}\sum_{i=1}^{N} a+bx$$

$$= \frac{1}{n}\sum_{i=1}^{n} a + \sum_{i=1}^{n} bx$$

$$= \frac{1}{n} n \cdot a + b\sum_{i=1}^{n} x$$

$$= a + b \cdot m(x)$$

2 $$cov(x, a+by) = \frac{1}{n}\sum_{i=1}^{n} (x_i - m(X))((a+by) - m(a+by))$$

$$= \frac{1}{n}\sum_{i=1}^{n} (x_i - m(X))(b(y_i - m(Y))$$

$$= \frac{b}{n}\sum_{i=1}^{n} (x - m(X))(y - m(Y))$$

$$= b \cdot cov(X, Y)$$

3. $$Ca(a+bX, a+bX) = \frac{1}{n}\sum((a+bx) - m(a+bX))((a+bx) - m(a+bX))$$

$$= \frac{1}{n}\sum_{i=1}^{n} ((a+bx_i) - a + b\,m(X))(a+bx - a+bm(X))$$

$$= \frac{1}{n} \sum_{i=1}^{n} (b(x_i - m(X)))^2$$

$$= \frac{b^2}{n} \sum_{i=1}^{n} (x_i - m(X))^2$$

$$= b^2 \, cov(X,X)$$

4. The transformation of the median is the median of the transformed variable, when a linear calculation is performed, but will be different if an exponential calculation is used (log, for example). This rule also applies for the other facets within a data set.

5. This equation is true for linear equations, but other transformations provide different results. For example, $\sin(\cos(1))$ is different to $\cos(\sin(1))$