VARIANCE OF A FAIR DIE

Same variance, less work

The shortcut needs two averages instead of six separate deviations from the mean.

BEFORE

Definition

$$\sum (k - 3.5)^2 \cdot \frac{1}{6} = \frac{35}{12}$$

Six squared deviations: 6.25, 2.25, 0.25, 0.25, 2.25, 6.25

USE THE SHORTCUT

average the squares, subtract the squared mean

SQUARE THE MEAN

AFTER

Shortcut

$$\frac{91}{6} - 3.5^2 = \frac{35}{12}$$

Two averages: 91/6 and 3.5

WHAT CHANGED

Six squared deviations became two averages: the squared faces 1, 4, 9, 16, 25, 36 average to 91/6, and the mean is 3.5.

WHAT STAYED

The variance: 35/12 ≈ 2.92, so SD ≈ 1.71.