Measures of Spread - Standard Deviation & z-scores

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Deviation is the distance from the mean to a specific data point.

Variance is a measure of spread based on the squares of all deviations from a sample or population of data.

Standard Deviation is the square root of variance.

$$\sigma = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$$

S.D. for sample

$$\sigma = \sqrt{\frac{\sum(x_i - \mu)^2}{N}}$$

S.D. for population

σ 0

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The z-score describes the deviation from the mean for a single data point as a multiple of standard deviations.

$$z = \frac{x_i - \bar{x}}{\sigma}$$

sample

$$z = \frac{x_i - \mu}{\sigma}$$

population

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Steps for calculating standard deviation:

(1) list data
(2) count data
(3) sum data
(4) calculate mean
(5) calculate deviations
(6) square deviations
(7) sum squared deviations
(8) divide by N or (n-1) to get variance
(9) square root of variance
(10) z-scores

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Ex. Calculate the standard deviation and z-scores for this sample data.

(1) x_i	(5) $x_i - \bar{x}$	(6) $(x_i - \bar{x})^2$	(10) $z = \frac{x_i - \bar{x}}{\sigma}$
9	9−13.6=−4.6	21.16	−0.474
14	0.4	0.16	0.041
30	16.4	268.96	1.689
5	-8.6	73.96	−0.88
10	−3.6	12.96	-0.370

(2) $n = 5$ (4) $\bar{x} = 13.6$ (8) $\sigma^2 = \frac{377.2}{4} = 94.3$

(3) $\sum x_i = 68$ $\sum (x_i - \bar{x})^2 = 377.2$ (7) (9) $\sigma = 9.71$

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Assigned Work:

p.286 # 1 - 3, 4a, 6, 8, 9, 15

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