The Standard Deviation
Section 2.7
Lecture 7

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Outline

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An Example

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- For which date should you choose to predict the high temperature?
- On which date is the high temperature less variable?
- Naturally, you should choose the date with less variability.
- Which one is that?

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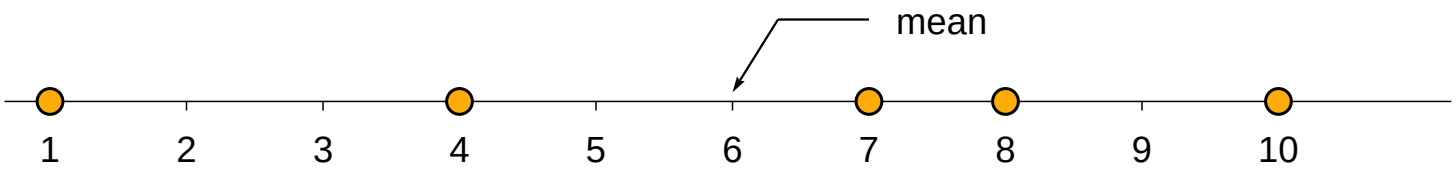
Deviations from the Mean

Definition (Deviation)

The deviation of an observation x_i is the difference between x_i and the mean $\overline{x}$.

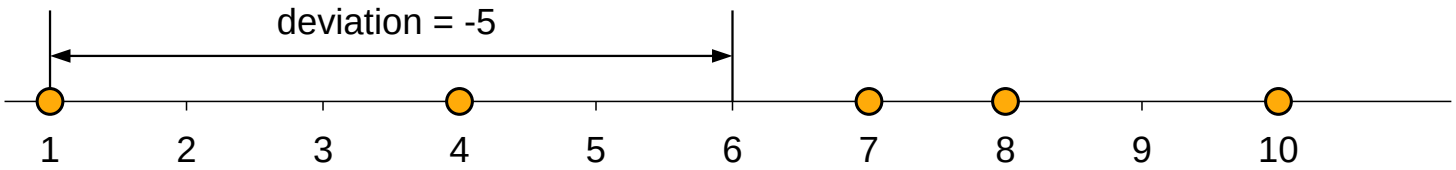
$$\text{deviation of } x_i = x_i - \overline{x}.$$

Deviations from the Mean



Deviations from the mean

Deviations from the Mean



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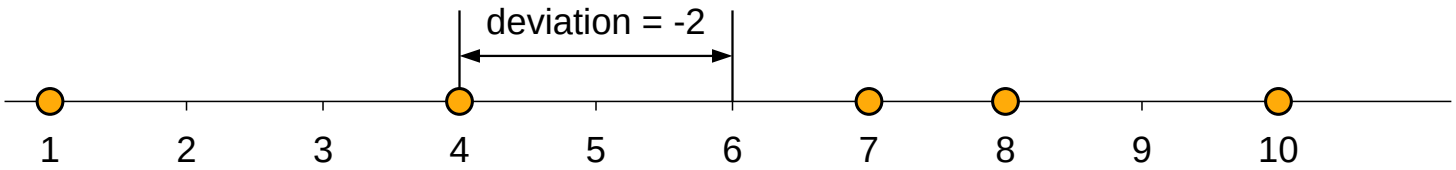

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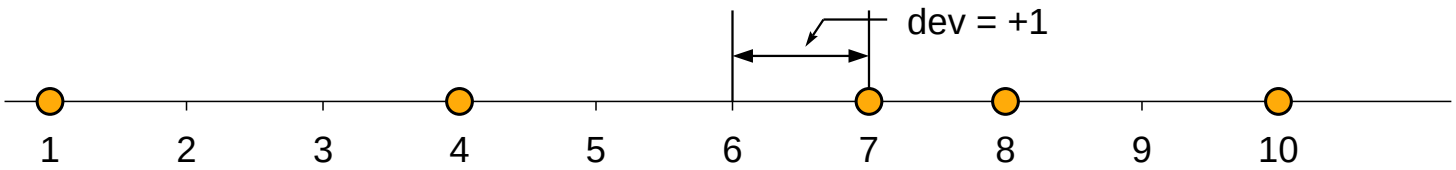

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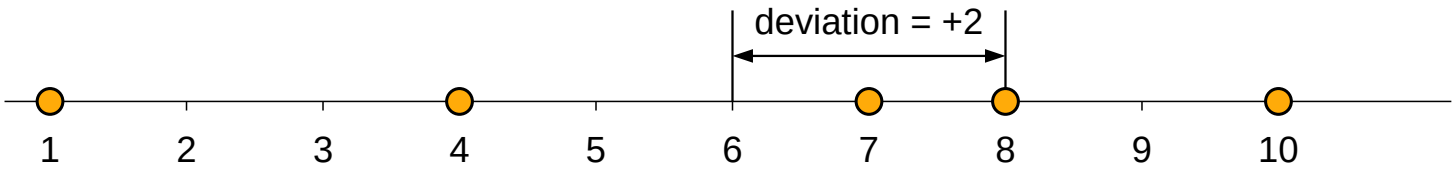

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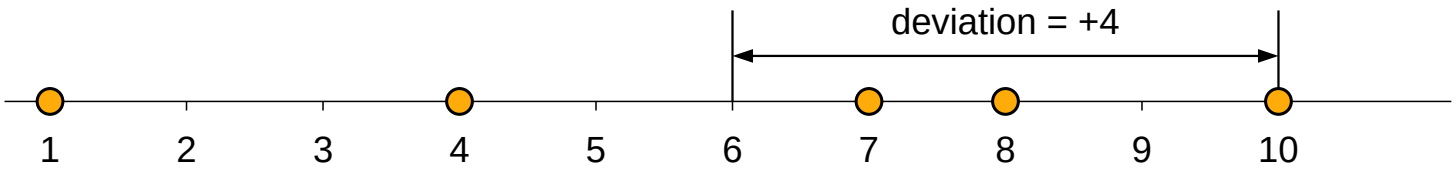

Deviations from the mean

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Deviations from the Mean

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- Why will the average not work in this case?

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- Instead of averaging the deviations, we will average their *squares*. That way, there will be no canceling.

The Standard Deviation

Definition (The Variance)

The variance, denoted s^2, is the average (sort of) of the squared deviations of the values in the data set.

$$s^2 = \frac{\sum (x_i - \overline{x})^2}{n-1}.$$

Definition (The Standard Deviation)

The standard deviation, denoted s, is the square root of the variance.

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- We may think of the standard deviation as being a "typical" deviation from the mean.

Example

Example (Standard Deviation)

- Find the standard deviation of the following data.

1 4 7 8 10

Example

Example (Median Rainfall)

- Rainfall data for August in Richmond, VA (1986 - 2015).

6.74	1.24	4.04	4.90	5.72	2.88
6.91	5.58	2.52	8.42	4.44	1.41
1.84	2.00	2.79	2.30	3.15	3.59
16.02	2.56	5.99	6.81	5.73	4.04
3.92	7.10	3.50	7.64	3.61	2.77

- Find the variance and the standard deviation.

Example

Example (Median Rainfall)

- Rainfall data for April in Richmond, VA (1986 - 2015).

0.80	1.08	1.59	1.93	2.03	2.05
2.14	2.18	2.33	2.40	2.56	2.57
2.63	2.70	2.73	2.79	2.88	3.42
3.62	3.94	4.05	4.12	4.13	4.17
4.37	4.85	5.33	6.67	8.32	11.12

- Use the standard deviation to compare the variability of rainfall in August to the variability of rainfall in April.

Outline

Assignment

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- Read Section 2.7.
- Apply Your Knowledge: 2.10 (by hand), 2.11 (on calculator).
- Check Your Skills: 2.22, 2.23, 2.24.
- Exercises: 46, 48, 50, 51.