

Lecture 2

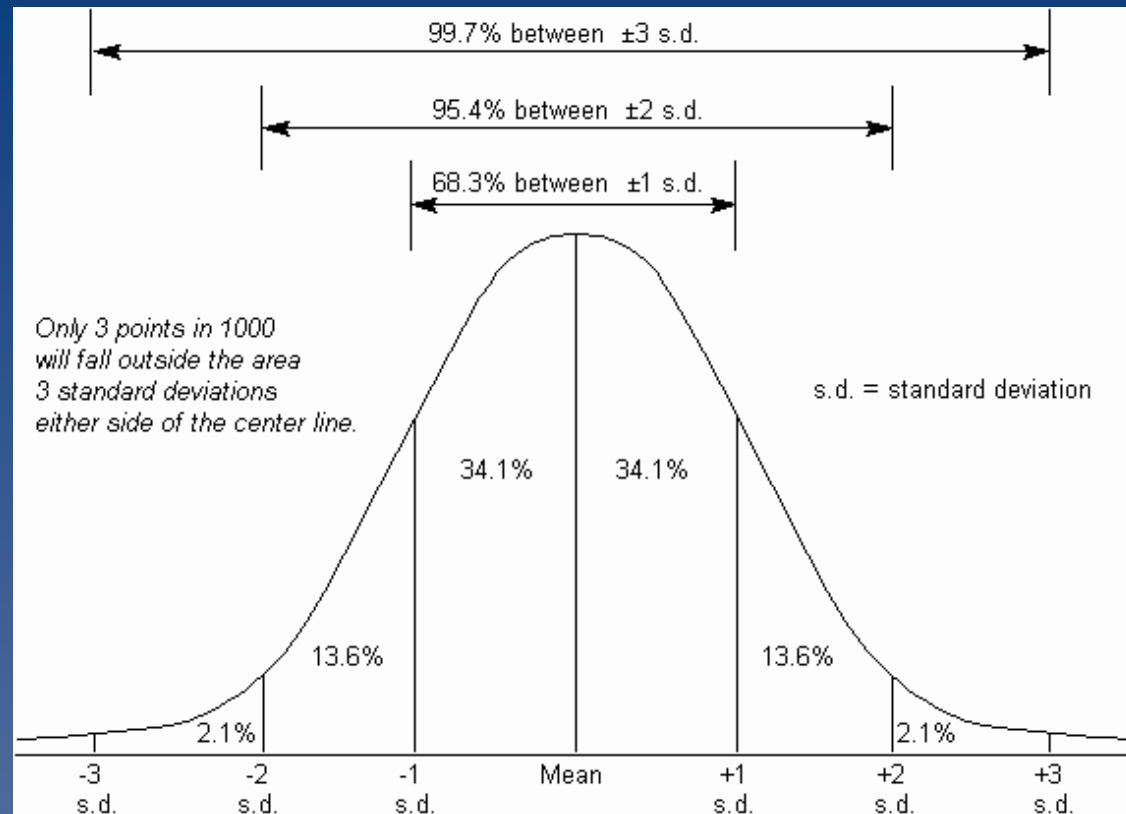
Segment 3

Tools for inferential statistics

Tools for inferential stats

- Important concepts
 - The normal distribution
 - Z-scores
 - Percentile rank
 - Probability
 - Inferential statistics

The normal distribution



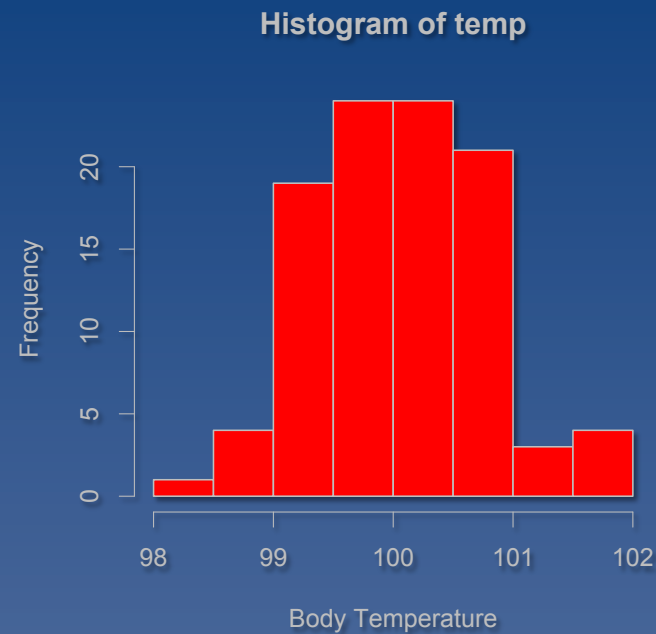
An example

- Body temperature
 - What is “normal” body temperature?
 - Oral
37.0 Celsius = 98.6 Fahrenheit
 - Internal
37.5 Celsius = 99.5 Fahrenheit
 - “Wand”?

The wand: Infrared meter



Wand measurement



Wand measurement

- $M = 100.06$
- $SD = .71$

Z-scores

- A standardized unit of measurement
 - Convert “raw” scores to z-scores

$$Z = (X - M) / SD$$

Example

- If Andy's body temperature = 100.06

$$Z = (X - M) / SD$$

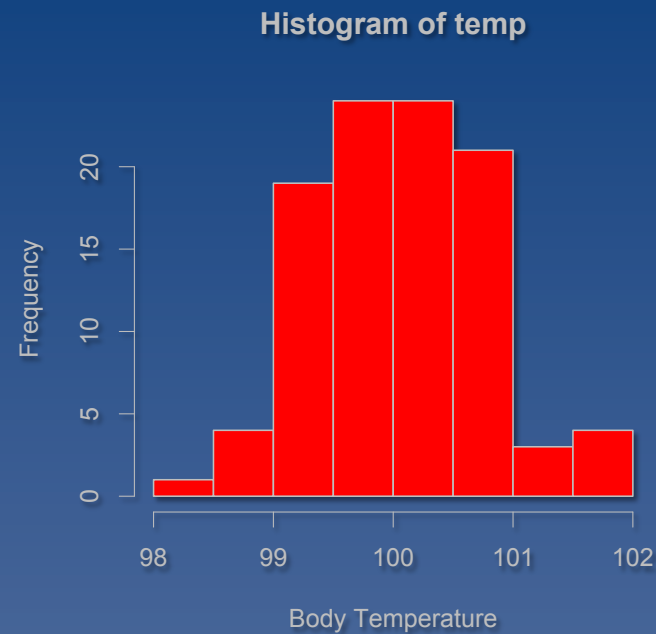
$$Z = (100.06 - 100.06) / .71 = 0$$

$$Z = 0 \text{ (the mean)}$$

Percentile rank

- Percentile rank = the percentage of scores that fall at or below a given score

Wand measurement



Percentile rank

- If Andy's body temperature = 100.06
 - Half the distribution is below 100.06
 - Percentile rank = 50th or 50%

Another example

- If Andy's body temperature = 100.77

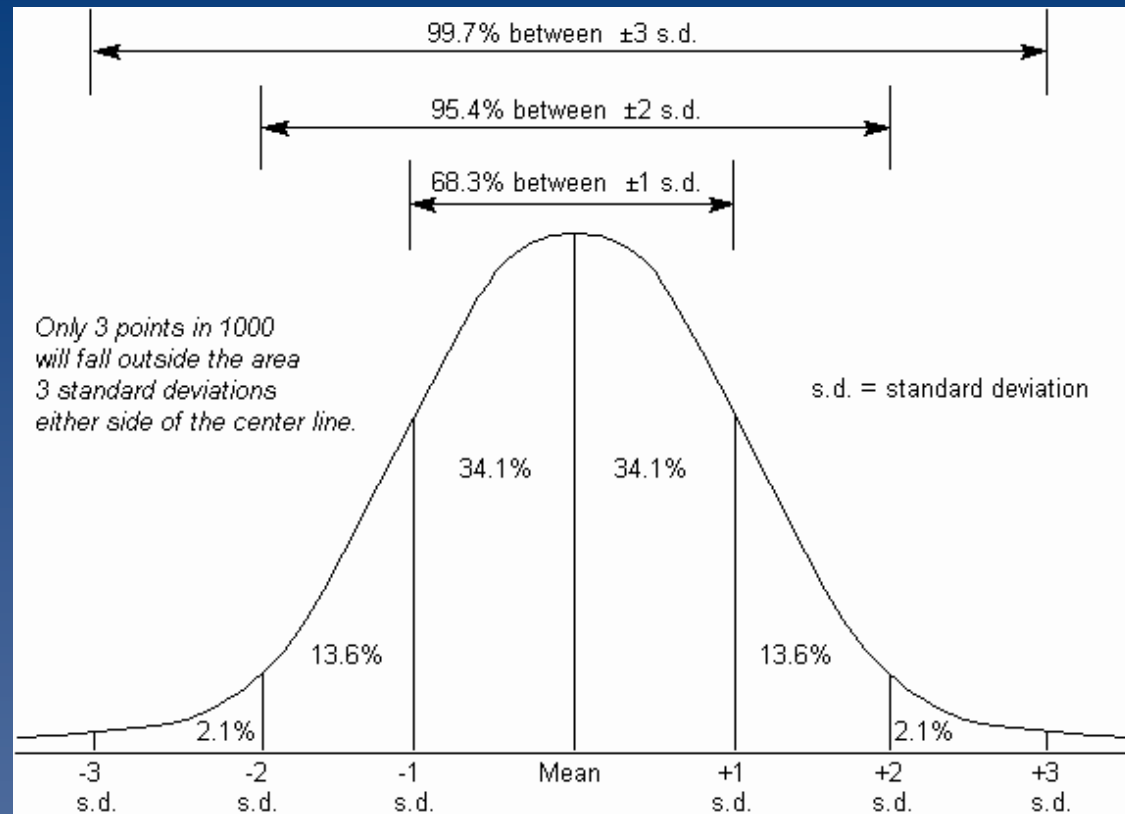
$$Z = (X - M) / SD$$

$$Z = (100.77 - 100.06) / .71 = +1$$

Percentile rank

- What percentage of the distribution is lower than +1?

The normal distribution



Percentile rank

- Area under the curve
 - Basic calculus
 - Z-table
 - $Z = +1 \sim \text{Percentile rank} = 84.1\%$

Know how to convert

- Raw score
- Z-score
- Percentile rank

Probability

- The probability of an event (E)
 - $P(E) = (\text{\# of ways E can be attained}) /$
(total \# of possible outcomes)

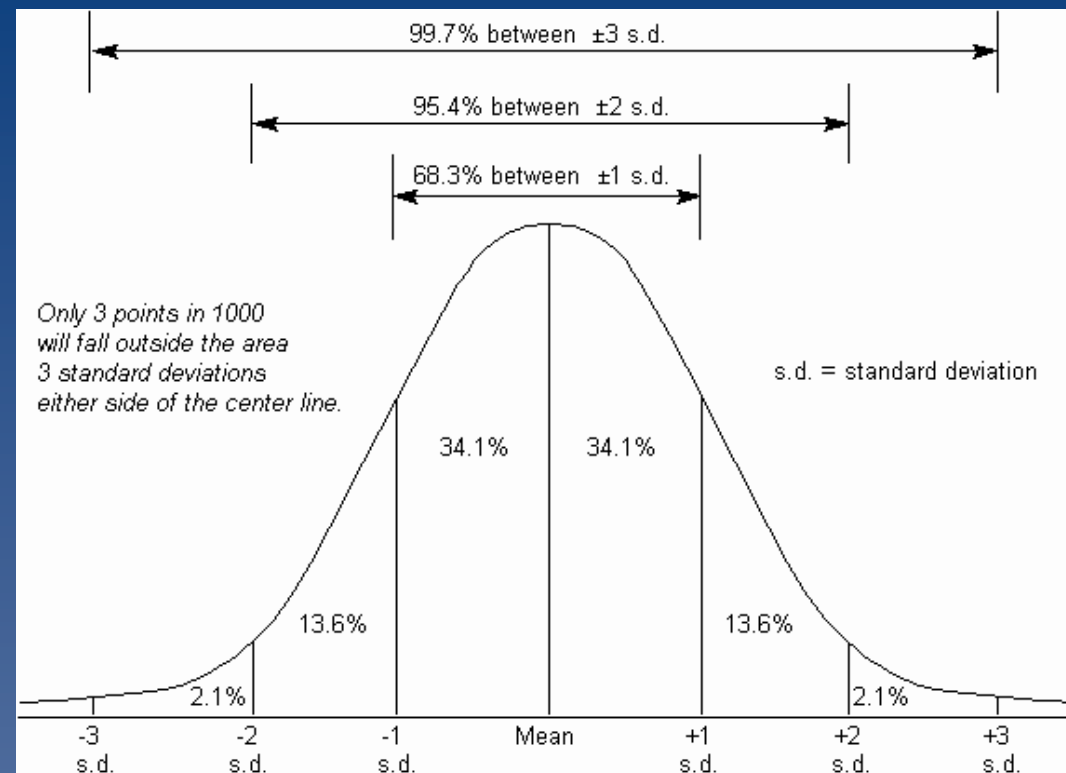
Roll the dice!



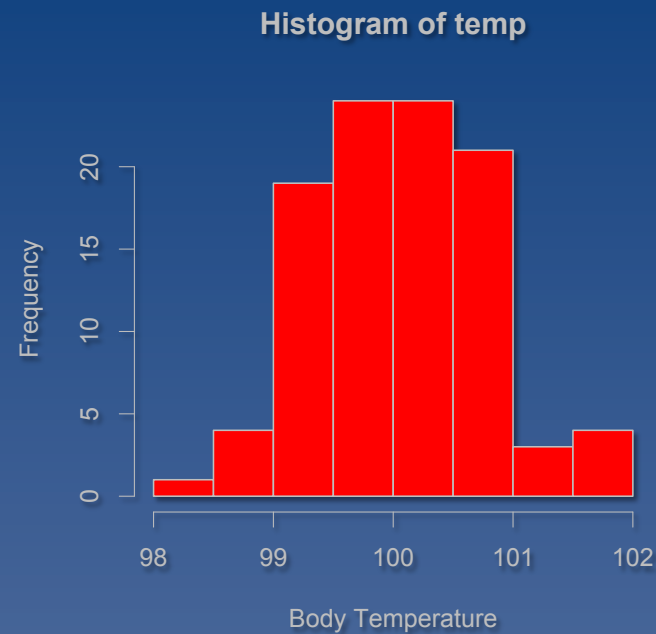
Probability

- The probability of a 6
 - $P(6) = 1/6$

Probability & the normal distribution



Wand measurement



Probability & the normal distribution

- If I choose a student at random from the distribution, what is the probability that his or her body temperature will be greater than 100.06?
 - $P(X > 100.06) = .50$

Probability and the normal distribution

- If I choose a student at random from the distribution, what is the probability that his or her body temperature will be greater than 100.77?
 - $P(X > 100.77) = .159$

Probability and the normal distribution

- If I choose a student at random from the distribution, what is the probability that his or her body temperature will be greater than 103?
 - $P(X > 103) < .01$

Inferential statistics

- Assume a normal distribution
 - Assume certain values, such as the mean
 - Conduct an experiment
 - Do the assumptions hold?
 - Either way, an inference can be made

Inferential statistics

- Safe to assume a normal distribution???
 - What are you trying to measure?
 - What is the construct?
 - How do you operationalize the construct?
 - See lecture on Measurement!

Tools: Review

- Important concepts
 - The normal distribution
 - Z-scores
 - Percentile ranks
 - Probability
 - Inferential statistics

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