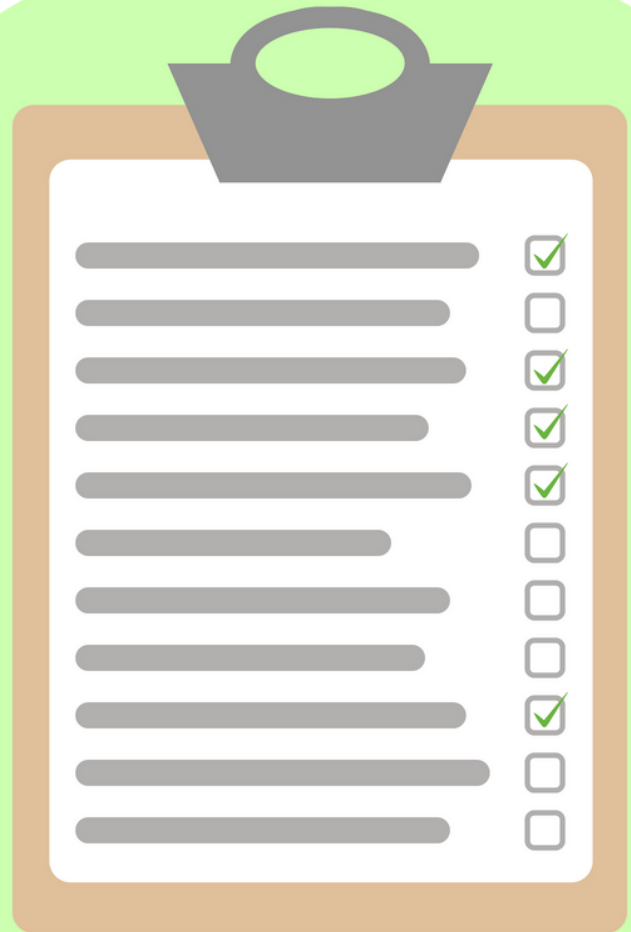


A large blue circle serves as a background. Inside the circle, a white normal distribution curve is centered. Below the curve, a histogram is shown with several vertical bars of varying heights. The bars are colored in shades of blue and grey. The text "UNDERSTANDING THE NORMAL DISTRIBUTION" is overlaid in the center of the circle in a bold, red, sans-serif font.

UNDERSTANDING THE NORMAL DISTRIBUTION



LEARNING OBJECTIVES



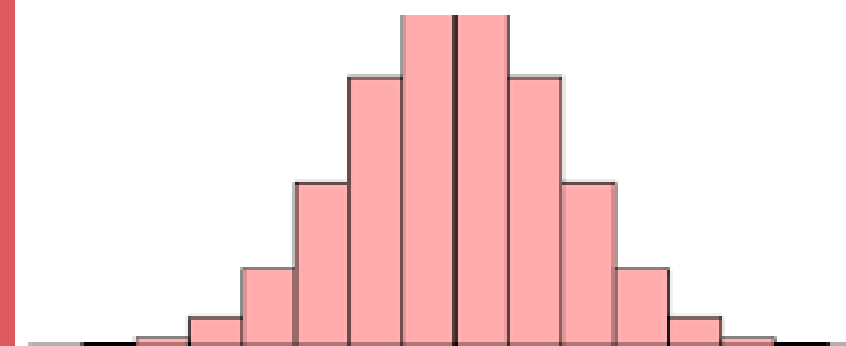
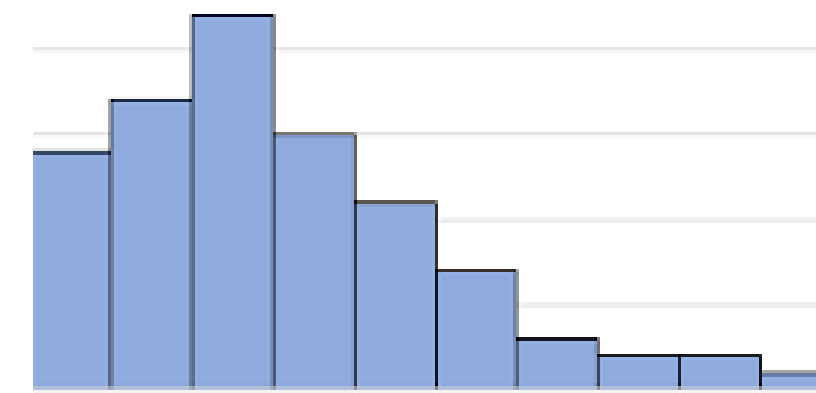
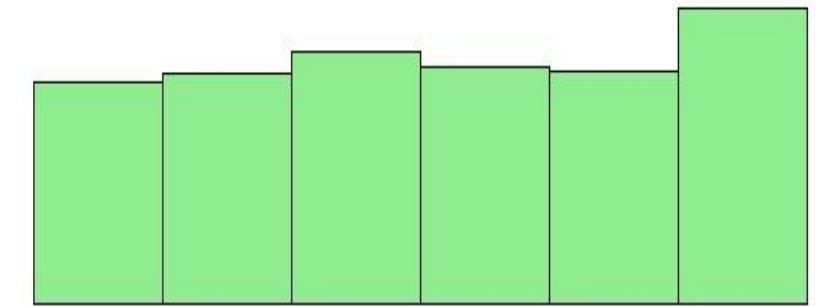
- Describe the key characteristics of a normal distribution
- Explain the meaning of standard deviation in the context of this lesson
- Apply the 68-95-99.7 rule to interpret data
- Recognize real-life examples of normally distributed variables
- Identify when data is not normally distributed



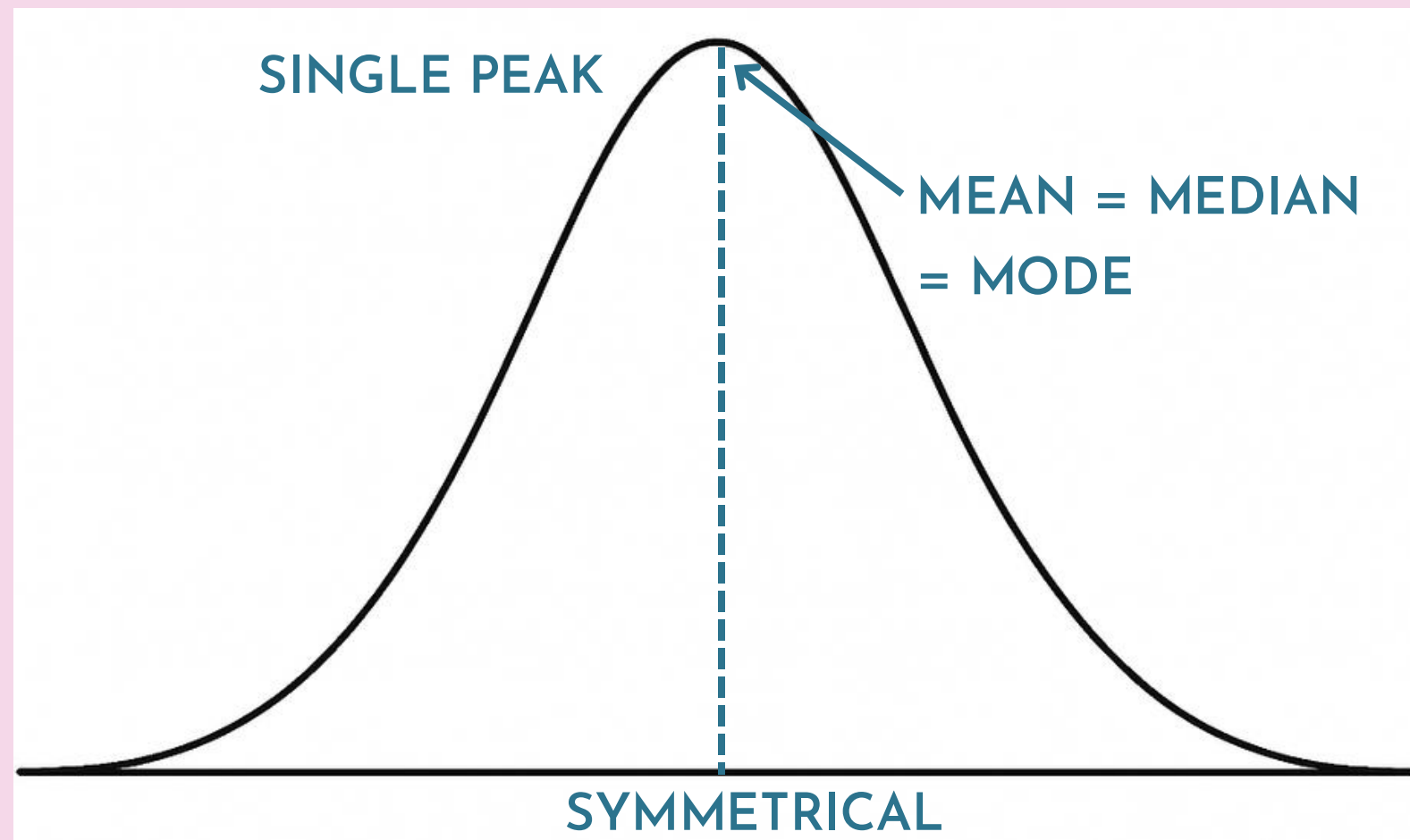
WHAT IS A DISTRIBUTION?

A distribution shows how data is spread across values.

Note: Some distributions are uniform, some are skewed, and some—like the normal distribution—are symmetrical.



MEET THE BELL CURVE



REFRESHER ON TERMS

Mean - The average of all values

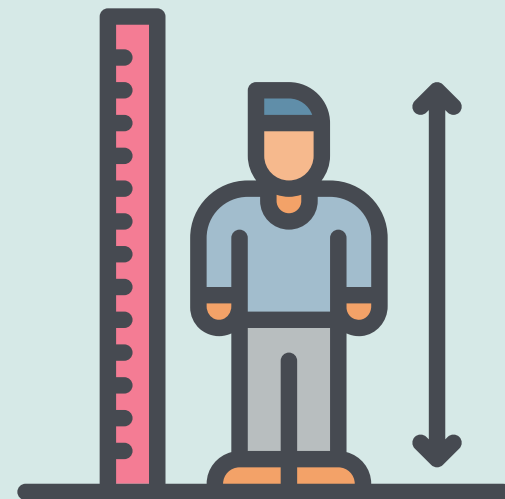
Median - The middle number when values are ordered

Mode - The most frequent value

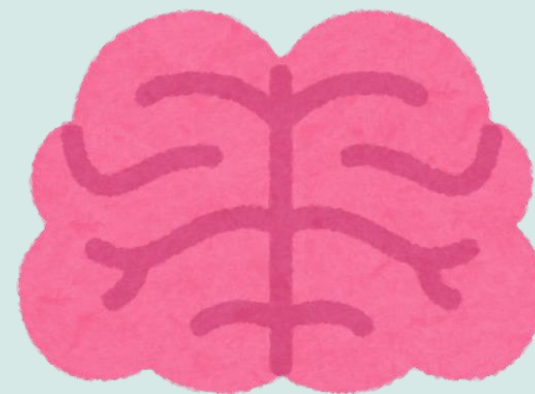


REAL-LIFE EXAMPLES

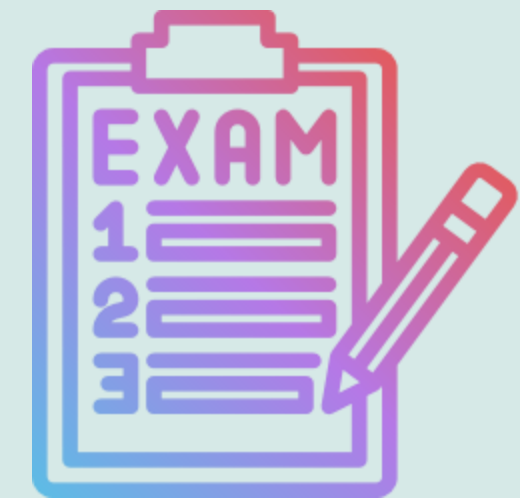
Human Height



IQ Scores



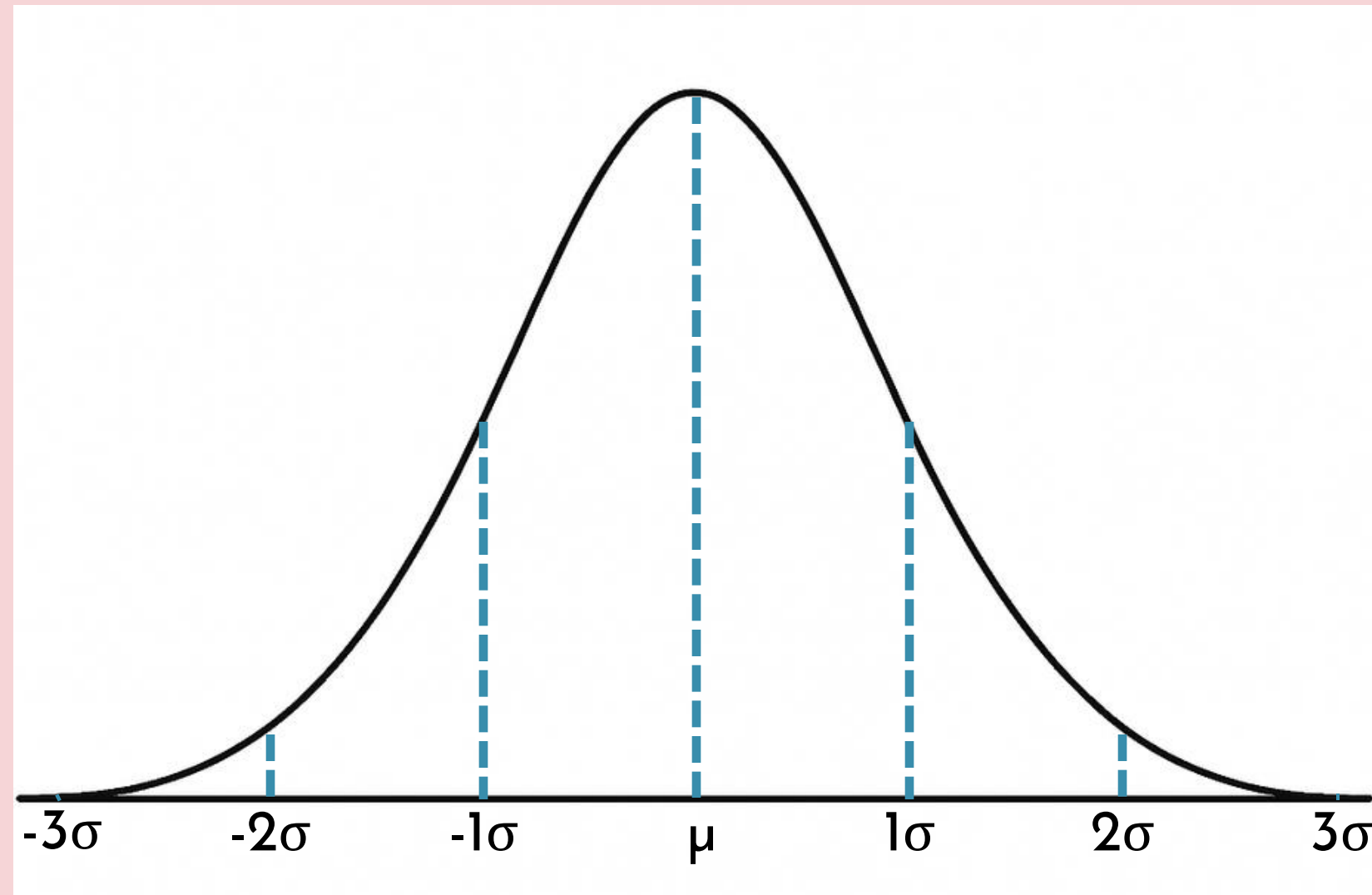
SAT Scores



MOST PEOPLE ARE NEAR THE AVERAGE. FEW ARE AT THE EXTREMES.



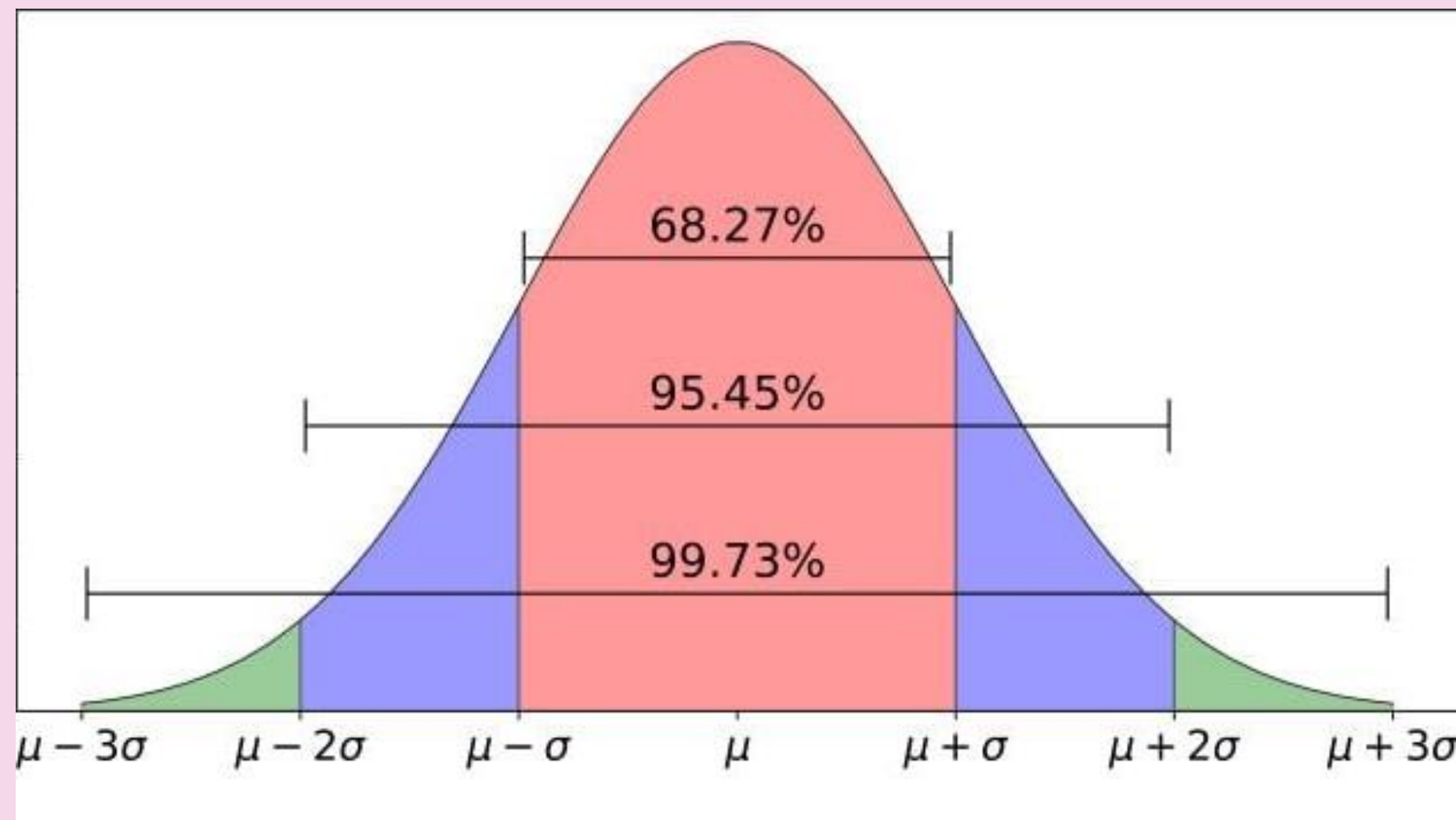
STANDARD DEVIATION



In a normal distribution, μ is the mean and σ shows the spread around it.



68-95-99.7 RULE



68% of data is within 1 standard deviation

95% within 2 standard deviations

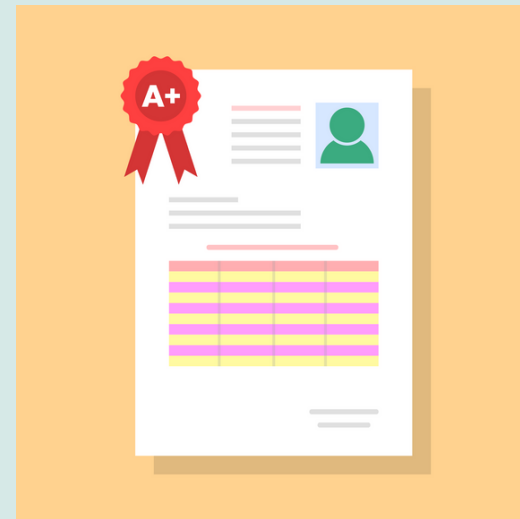
99.7% within 3 standard deviations



WHY IT MATTERS



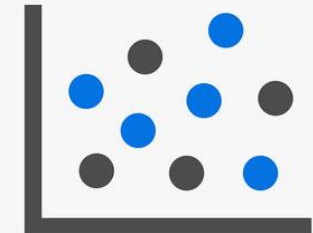
Hypothesis testing



Interpreting
standardized scores



Healthcare



Detecting outliers



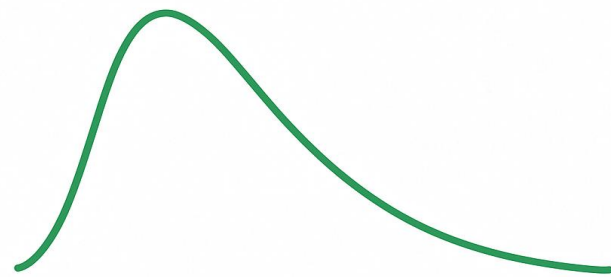
BEFORE YOU ASSUME IT'S NORMAL...

- Not all bell-shaped curves are truly normal
- Real-world data is often skewed, categorical, etc.
- The 68-95-99.7 rule only applies to normal distributions
- T-distributions and others may look similar but behave differently

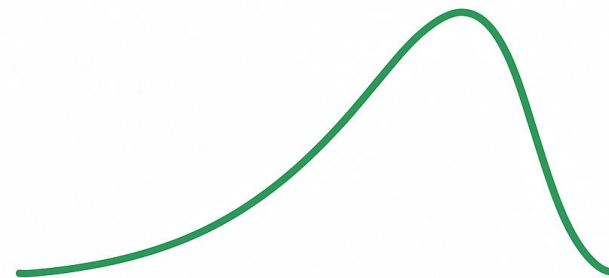


WHEN THE DATA ISN'T NORMAL

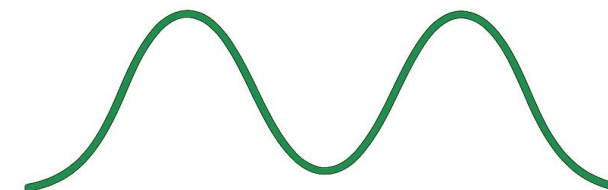
Right-skewed



Left-skewed



Bimodal



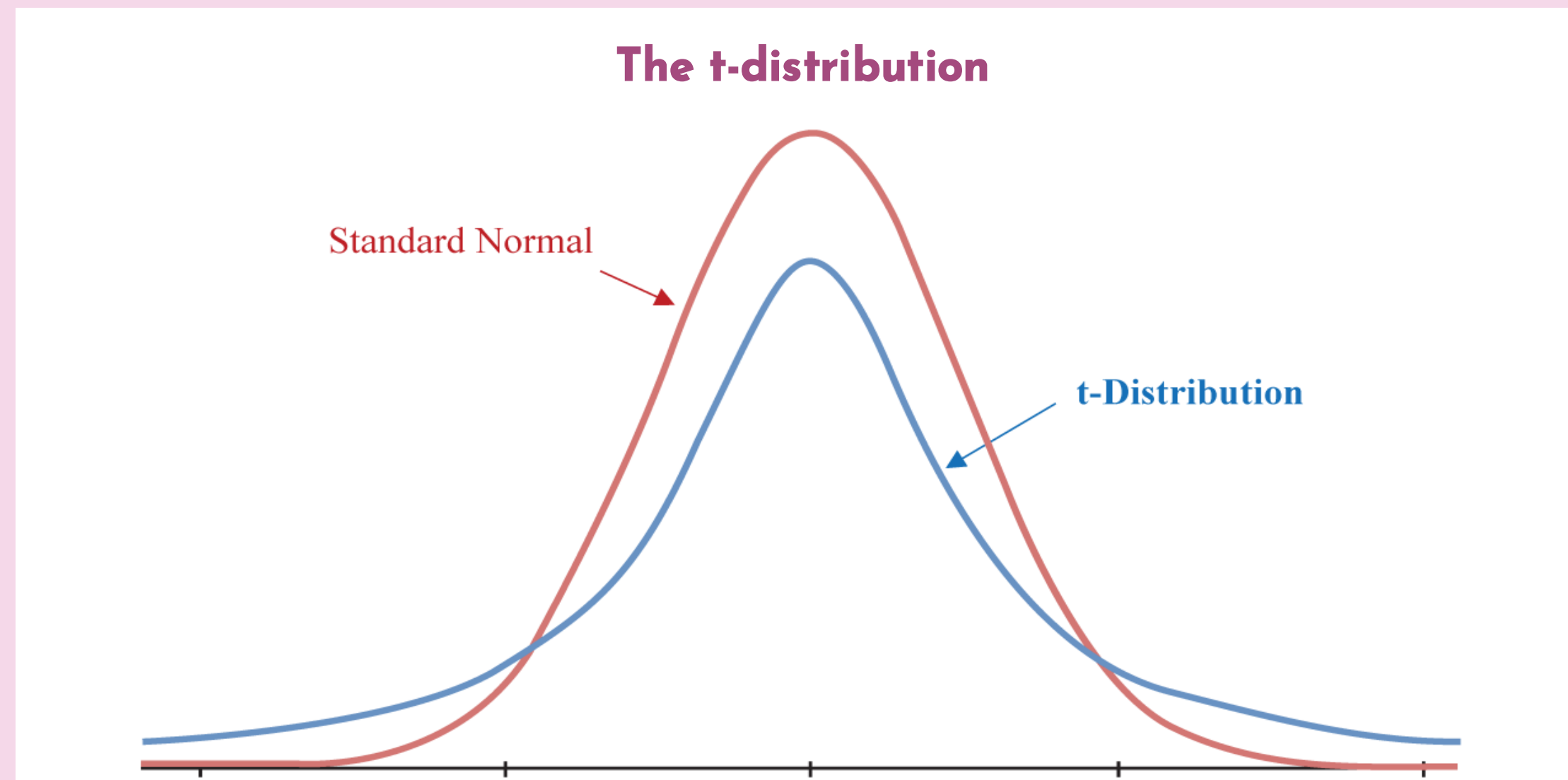
Uniform



Some options: non-parametric tests, data transformations, visual analysis tools



WHEN THE DATA IS APPROXIMATELY NORMAL

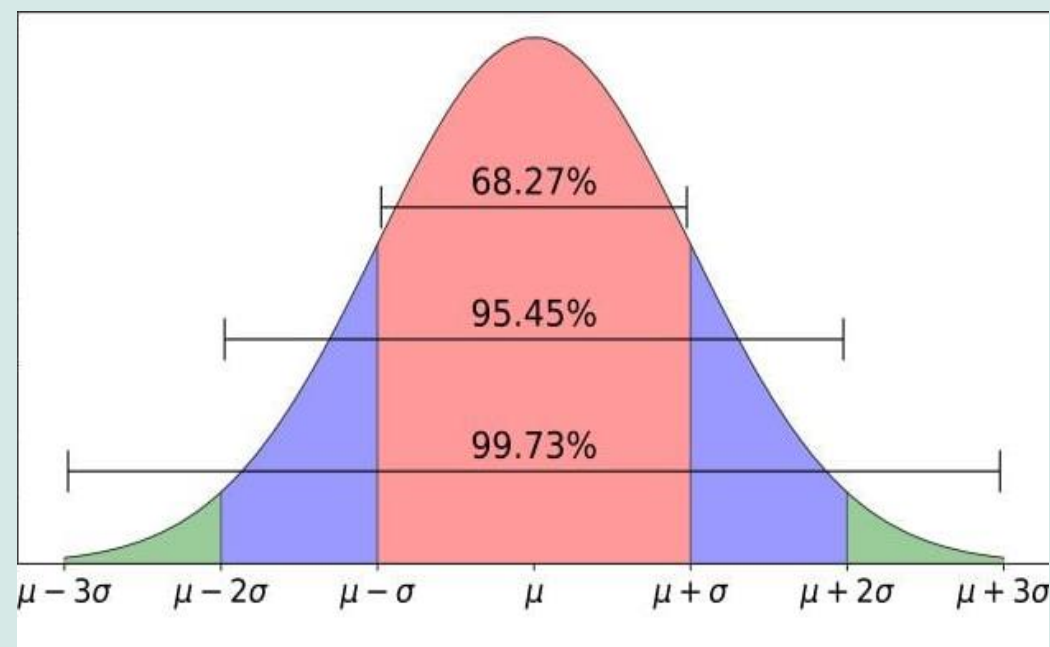


- **Use the t-distribution for small samples**
- **Similar to the normal curve, but with thicker tails**
- **Becomes more normal as sample size grows**



PRACTICAL EXAMPLE USING THE NORMAL DISTRIBUTION

68-95-99.7 RULE



$\mu = 30$ minutes

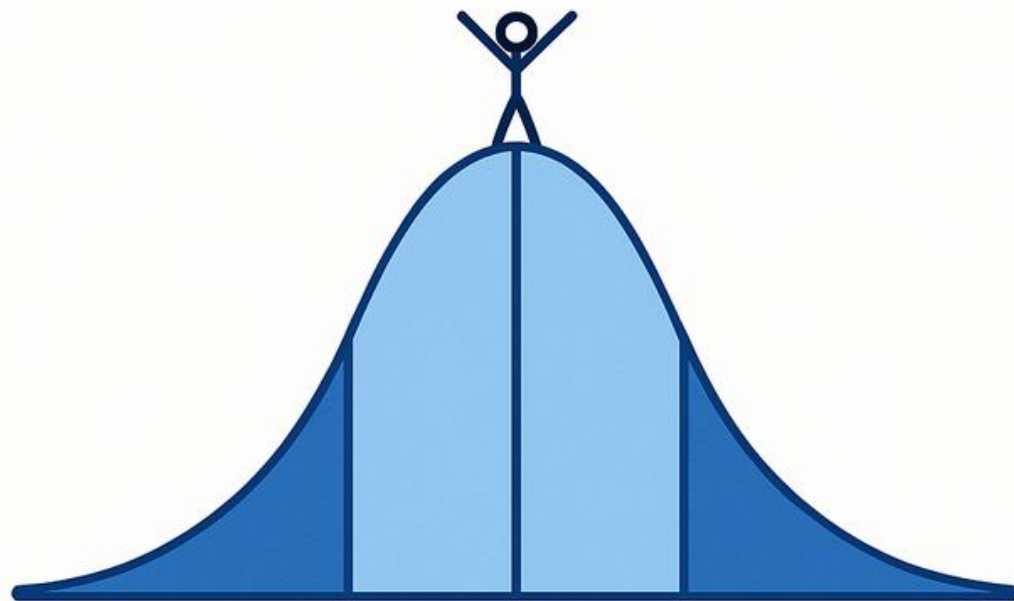
$\sigma = 10$ minutes

Q: What range covers about 95% of commute times?

A: Between 10 and 50 minutes



Hooray!
I've Reached



MEDIOCRITY

FINAL RECAP

- ✓ Symmetrical, bell-shaped curve
- ✓ Mean = median = mode
- ✓ Standard deviation controls spread
- ✓ The 68-95-99.7 Rule helps with probability
- ✓ The normal distribution helps us make sense of data in education, health, research, business, etc.
- ✓ Powerful, but not universal





THANKS FOR WATCHING!

