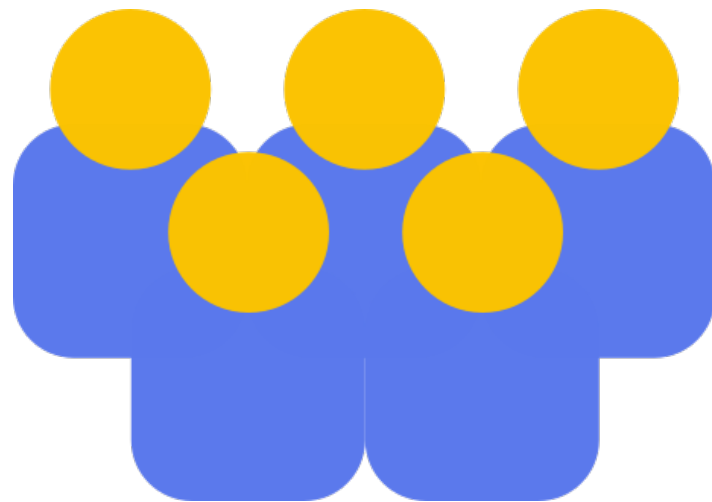
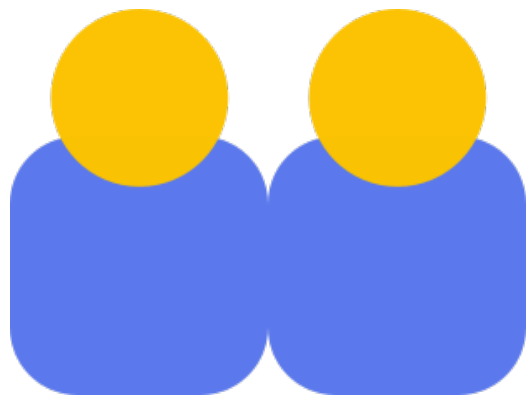




Mathematics and Problem Solving

Lecture 12.1

Samples and Populations

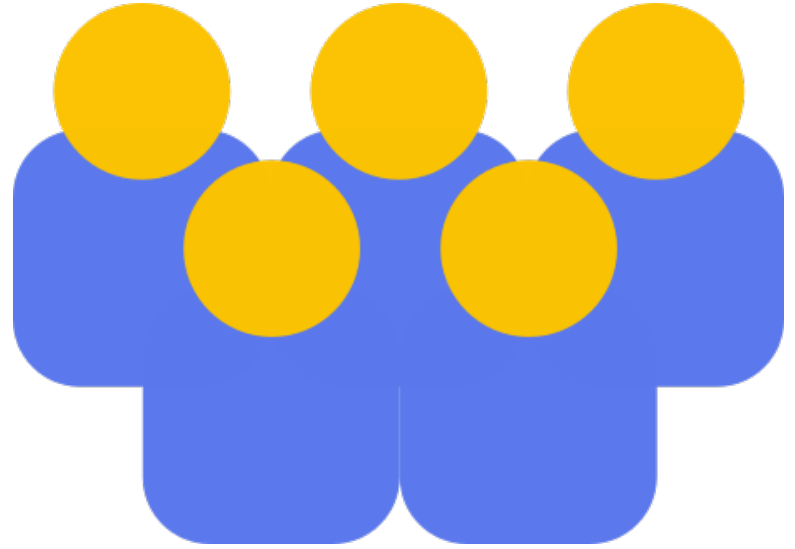


Inference

- A **claim** that the evidence supports a particular conclusion
- Inferential statistics help justify this claim
 - **Not** because numbers are impressive
 - They show **how likely the conclusions are** (given certain assumptions)

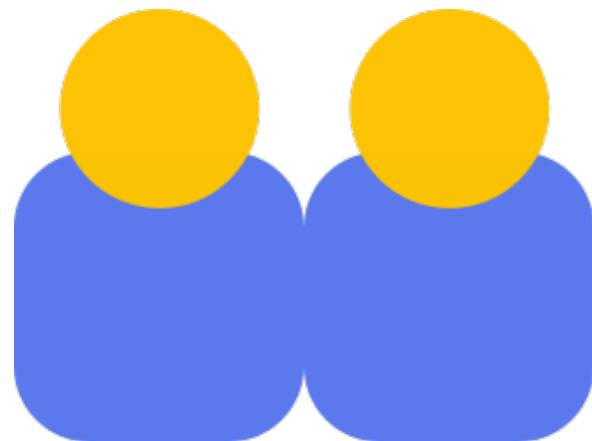
Population

- The group of people (or things) we are interested in



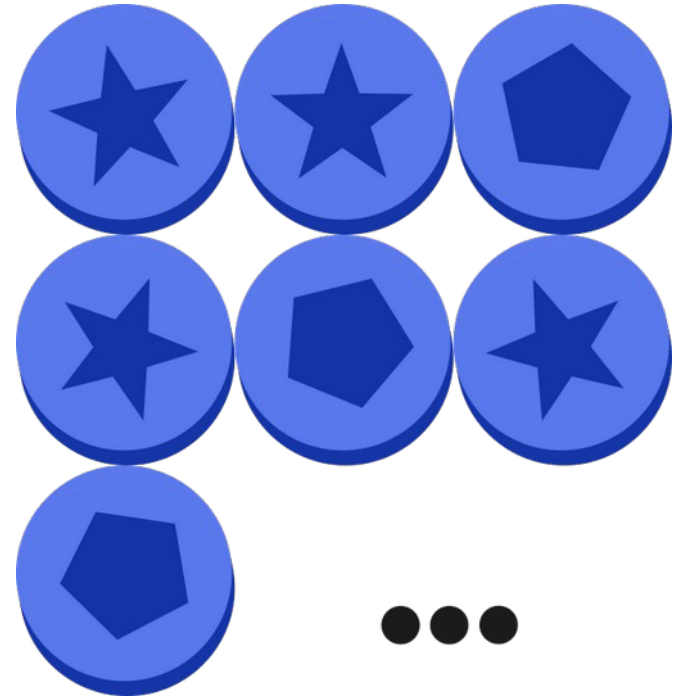
Sample

- The subset we collect data from is called our **sample**.



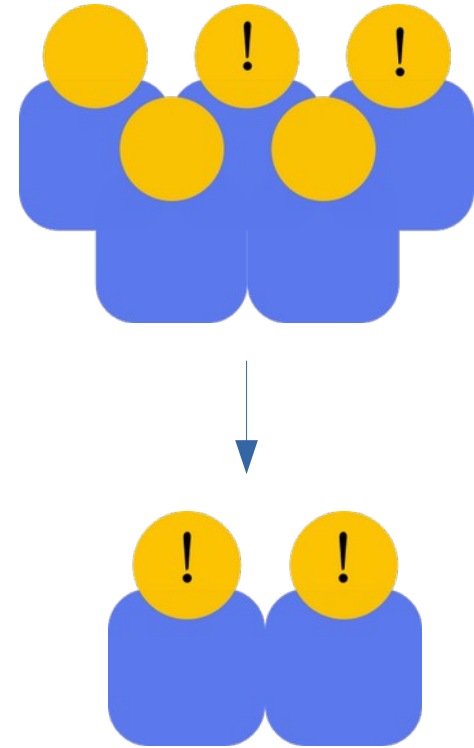
Coin flips

- Is a coin biased?
 - **Population:** All coin flips with that coin (past, present, future)
 - **Sample:** We flip the coin lots of times and record the results



Sampling Problems

- We can easily collect a **biased** sample
 - We usually don't sample our population randomly
 - There might be things our sample has in common just due to the way we collected it
- This is a **threat to validity** – something that means our inferences might not be correct

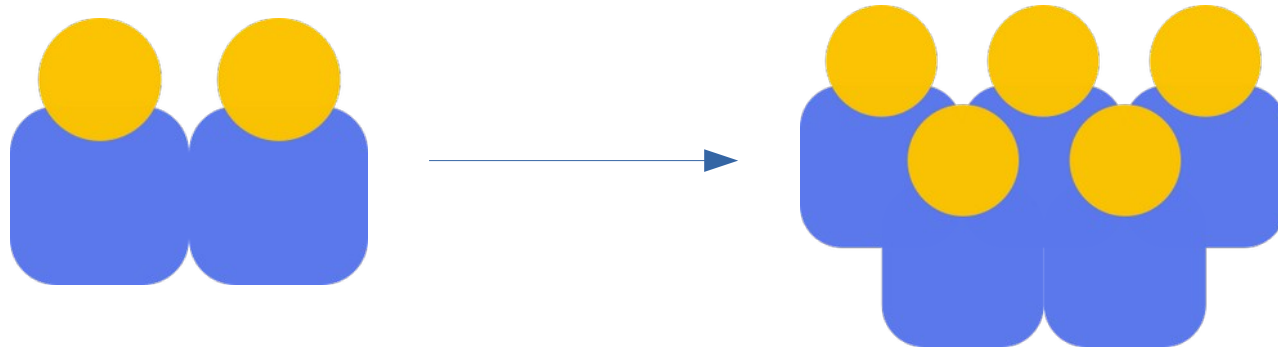


Construct Validity

- **Validity** is an argument that you make in support of your conclusions
 - Has your experiment actually measured what you think it has?
- Biased sample → less convincing

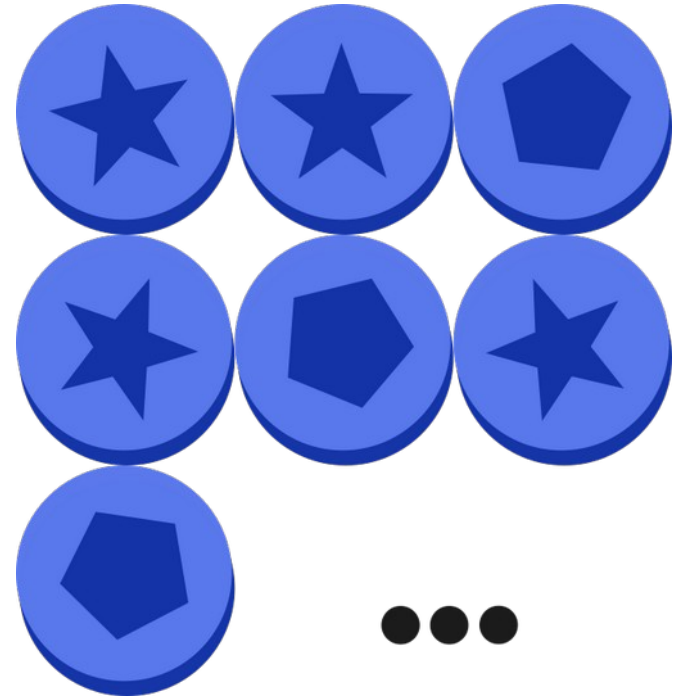
External Validity

- Can we generalise our findings beyond our sample?



Coin Flips

- Does the fairness of the coin change over time?
 - We don't expect that to be the case
 - Unlikely to make someone reject our argument

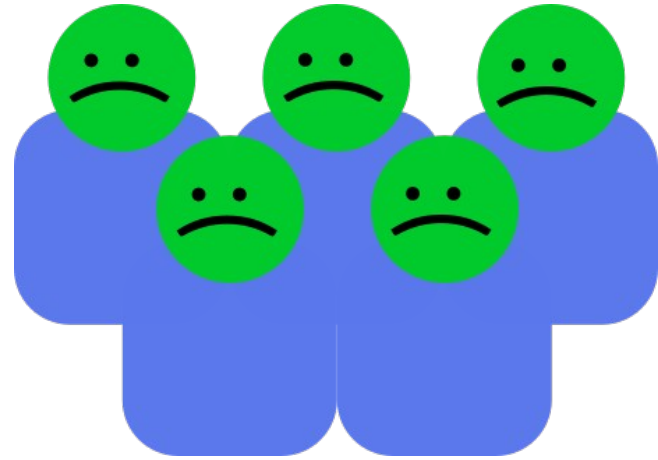
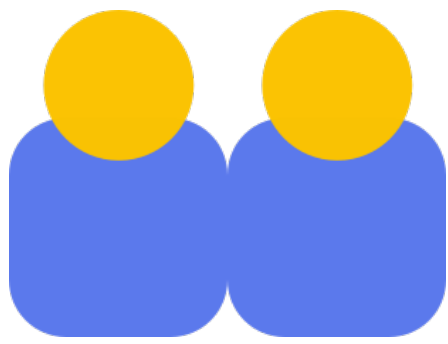


A common criticism...

- Social science studies
 - **Population:** all humans
 - **Sample:** undergraduates
- A big problem?
 - Are undergraduates a biased sample *for this variable?*

Drug studies

- We run a study **to check a drug is safe**
 - We recruit **1000 healthy people** to our study
 - Our results show **the drug is safe**
- Is the drug safe?



Summary

- **Population**
 - Set we want to say something about
- **Sample**
 - Subset we collect data from
- **Inference**
 - Claim data supports a conclusion
- **External Validity**
 - Do our findings generalise from sample to population?