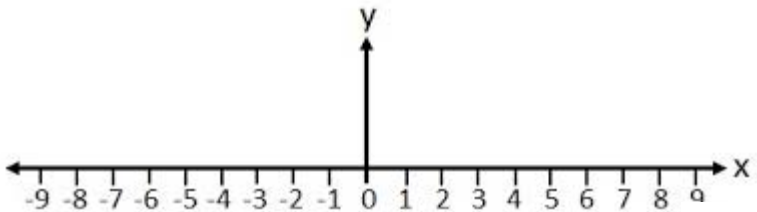
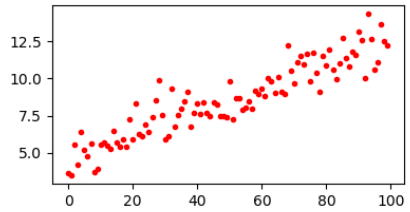
Statistics

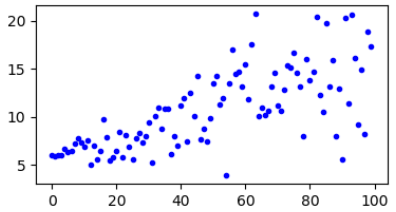
Summary statistics

- A dataset is made of variables & observations
- We may want to summarise the distribution of variables for each of the value
- When we explore data we are interested in

Position

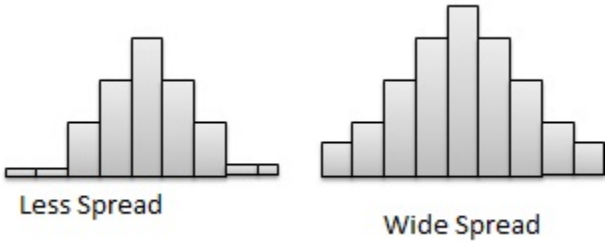






Shape

Spread



Summary statistics

Mean / Average

Given sequence:
13, 18, 13, 14, 13, 16, 14, 21, 13
The mean is the usual average, so:
(13+18+13+14+13+16+14+21+13) / 9= 15

Mode

The mode is the number that is repeated more often than any other, so 13 is the mode.

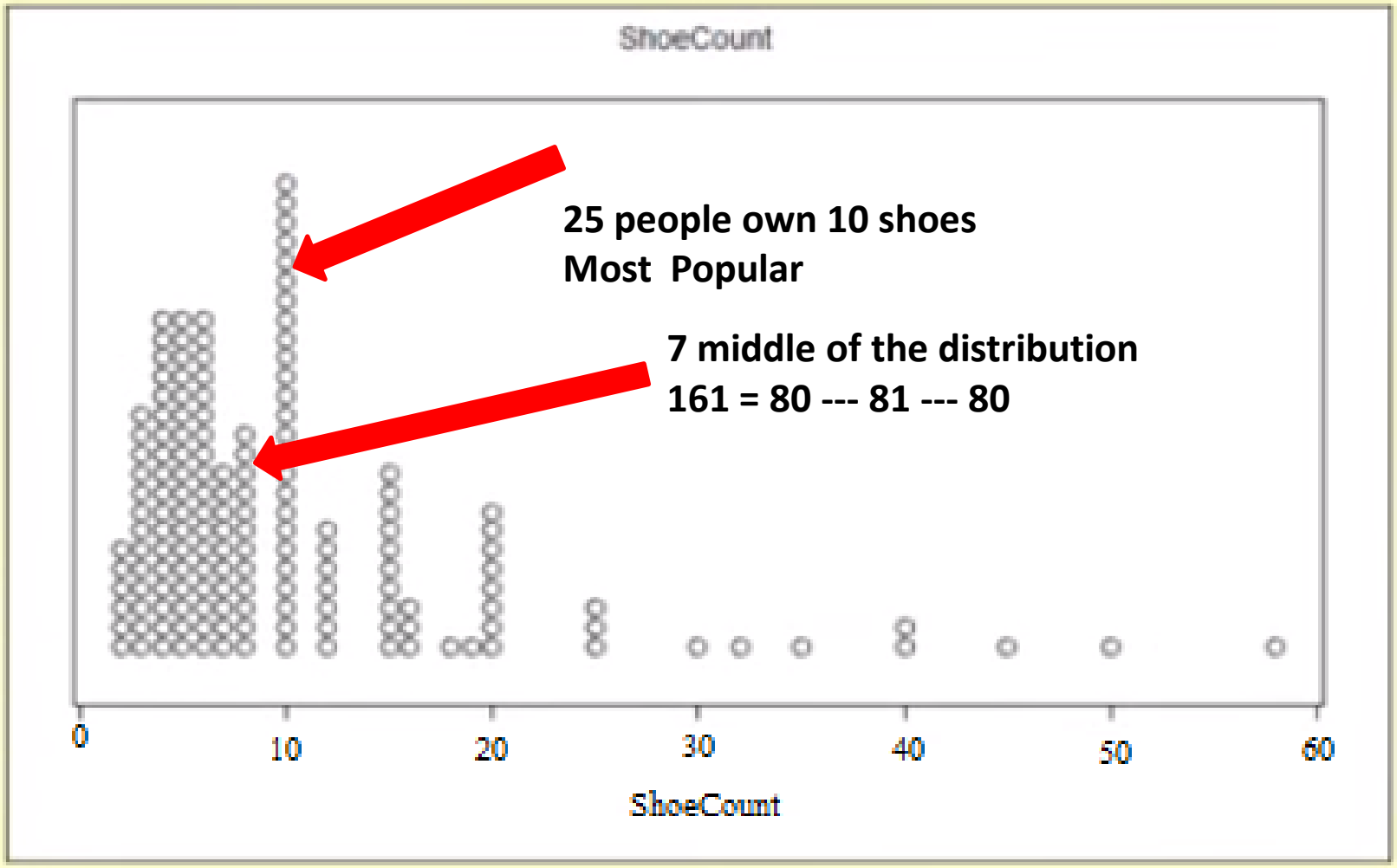
Median

Order the list : 13, 13, 13, 13, 14, 14, 16, 18, 21

There are **nine numbers** in the list, so the middle one will be **(9+1)/2=10/2 = 5**

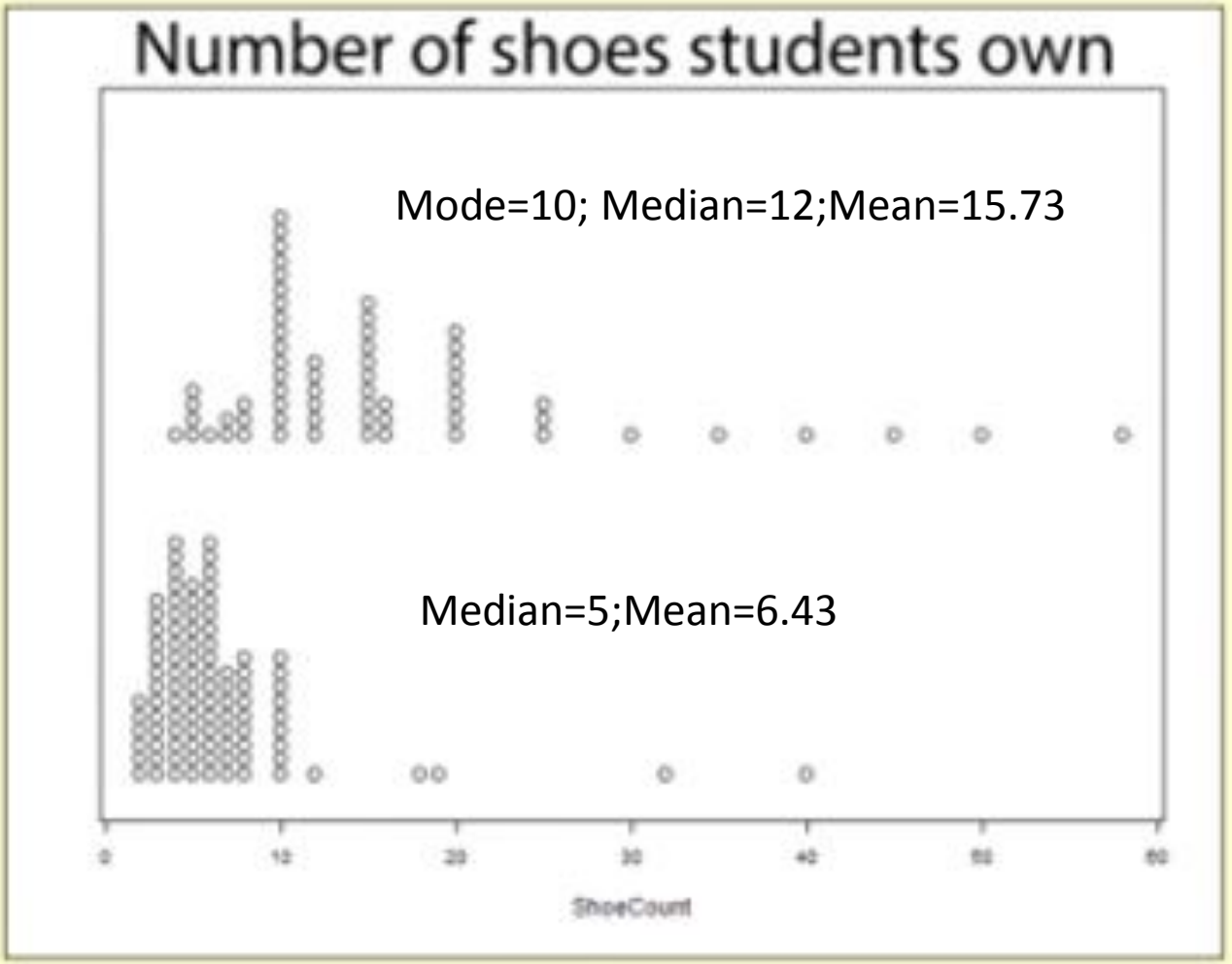
= 5th number, So the median is 14.

Mode=10;Median=7;Mean=10.07



Female

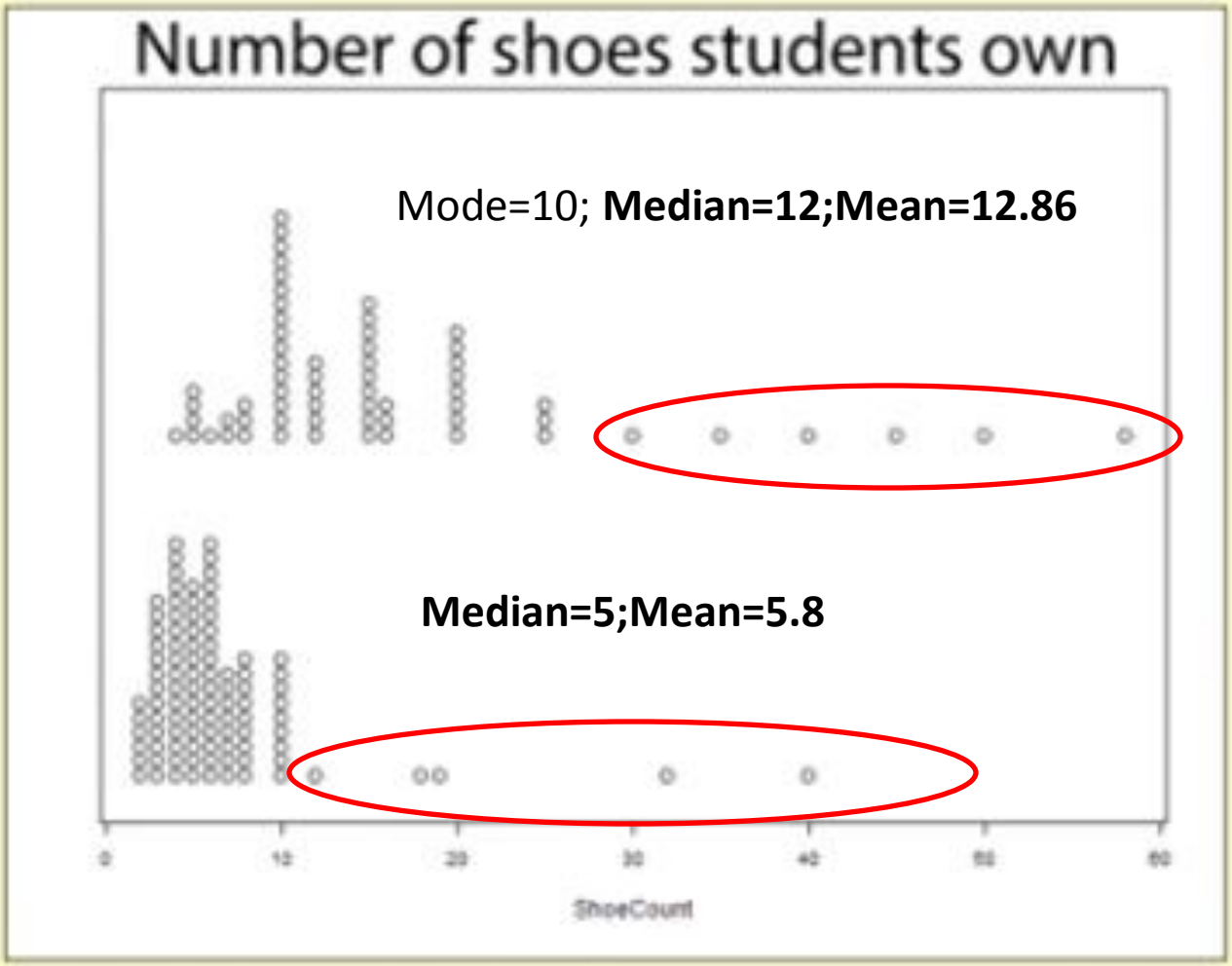
Male


Number of shoes students own
Mode=10; Median=12;Mean=15.73
Median=5;Mean=6.43
0
10
20
30
40
50
60
ShoeCount

Both cases median remains unchanged. For this example MEDIAN is better indicative

Female

Male



Statistical Analysis

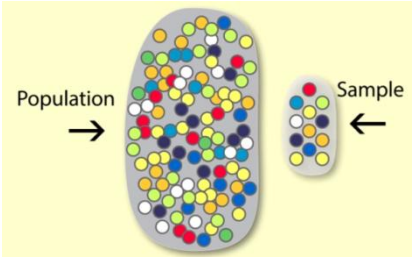
Inferential statistics

The process of **drawing conclusions** about **population** parameters based on a **sample** taken from the **population**

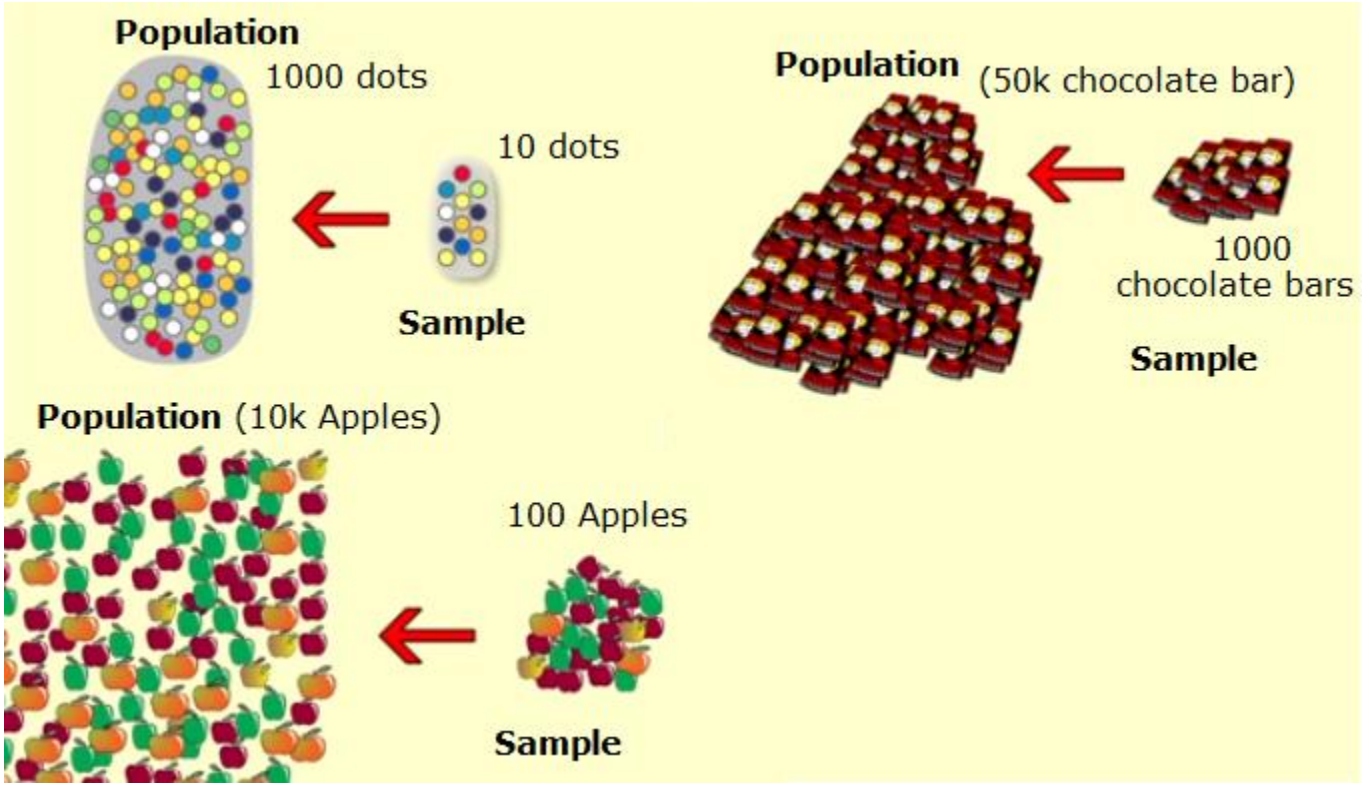
Allows us to make conclusion beyond the data we have to the population to what it was drawn

Samples

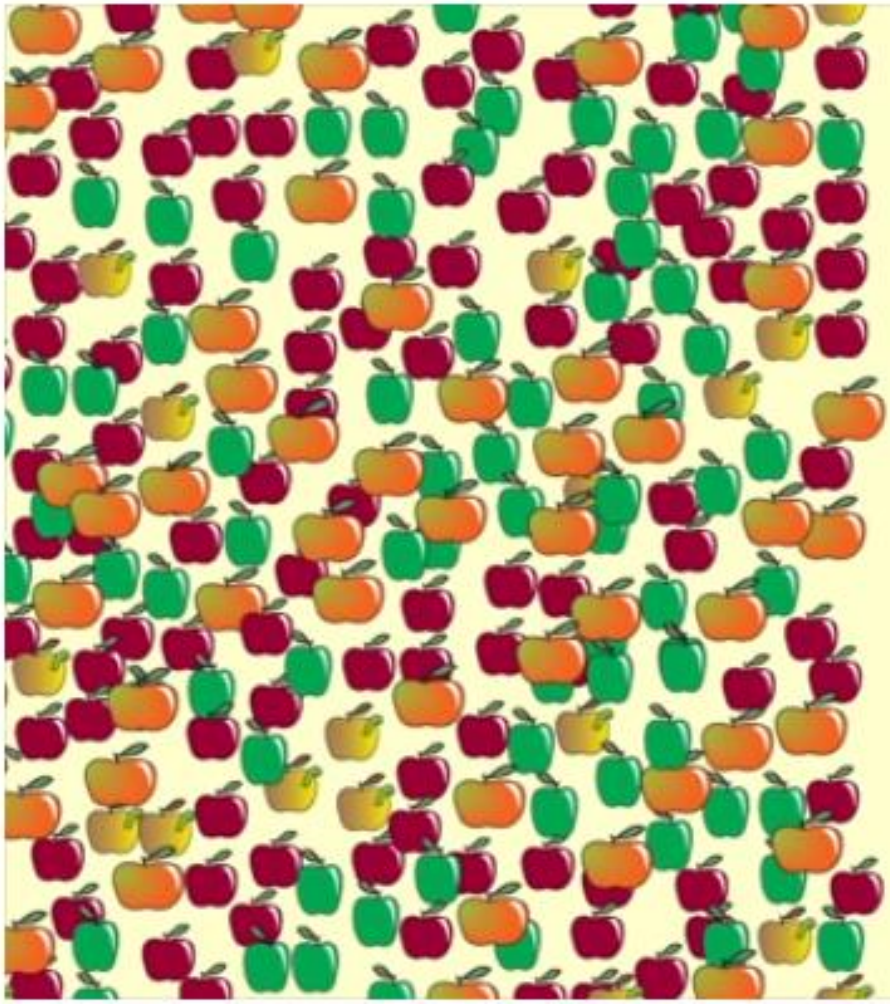
Sample is the data that we collect from the population



Samples help us draw some conclusions about the objects in the population



Samples

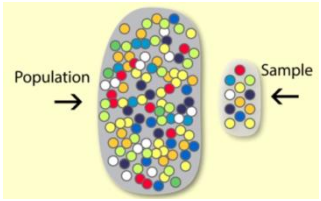


Sample mean = 149 g

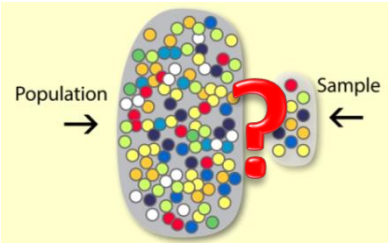
Population mean
is about 149 g

Ideas underling Inference

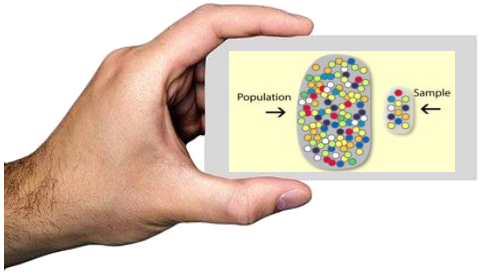
1. A sample is likely to be good representation of the population



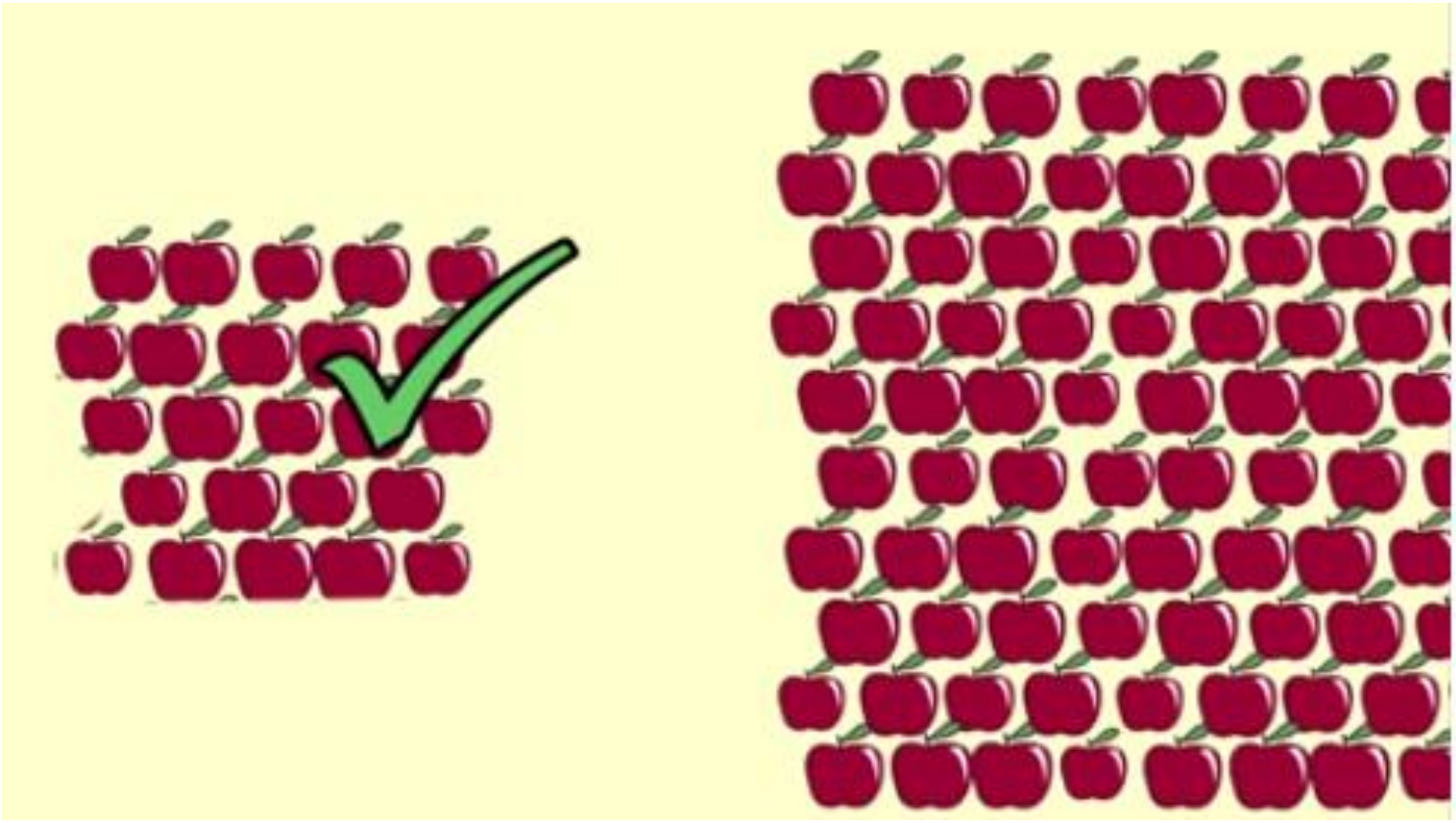
2. There is a element of uncertainty as to how well the sample represents the population



3. The way the sample is taken matters



1. A sample is likely to be good representation of the population



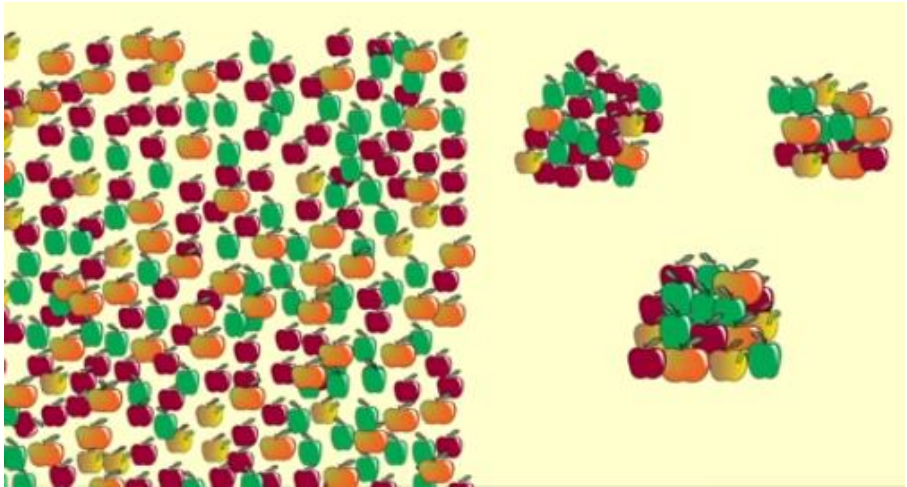
2. There is a element of uncertainty as to how well the sample represents the population

Population

Sample

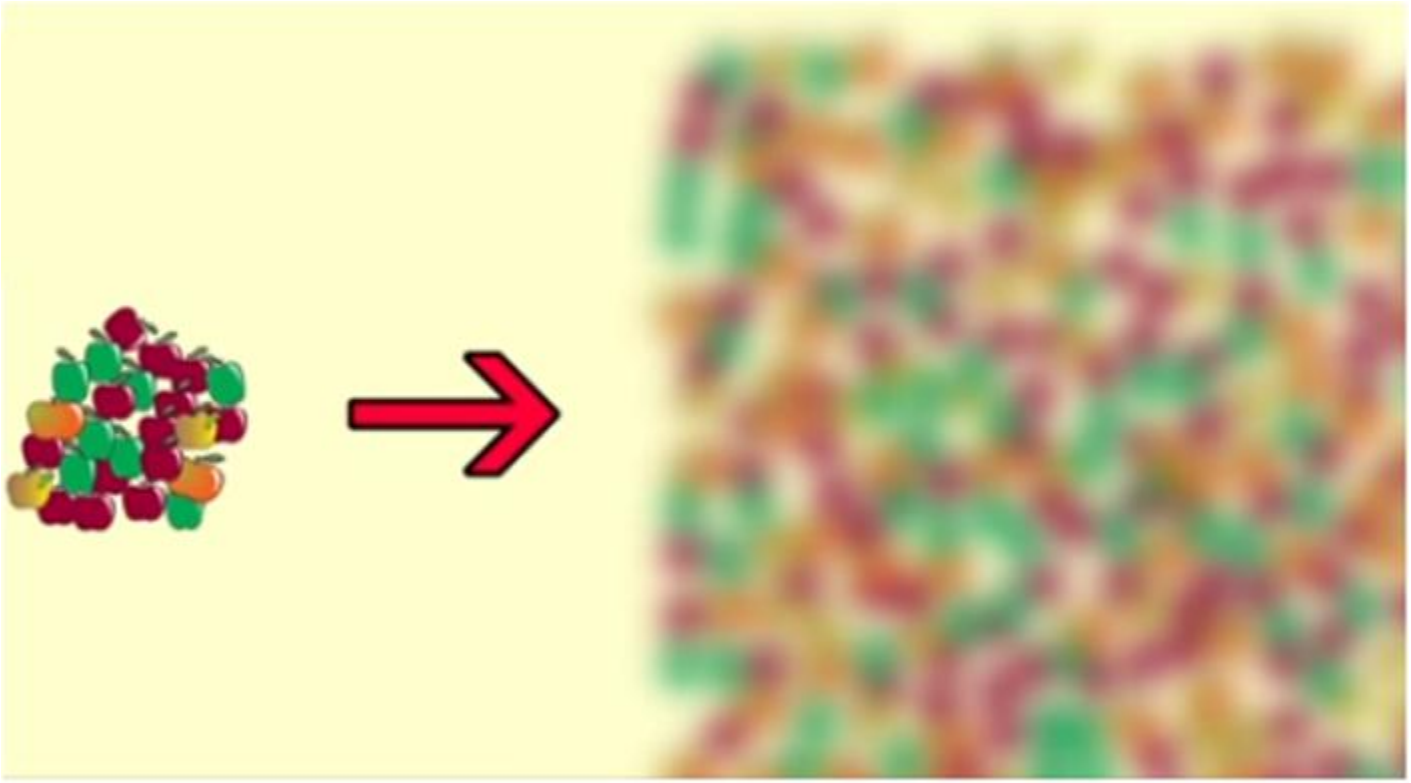
Sample may not always be a perfect representation of what it was drawn from.

Sampling Error



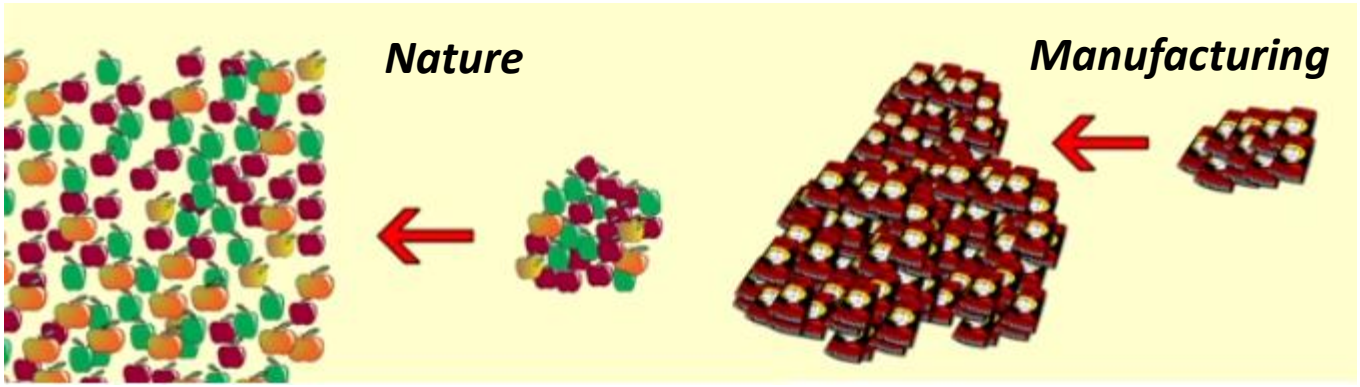
All the samples drawn from the same population may not be the same

From Simulation and probability theory we can get an idea of what the population is likely to be like from the information the sample gives us



3.The way the sample is taken matters

The sample must be representative of the population, this happens when each person in the population has a equal chance of being selected in the sample



Easy to Sample

Difficult to Sample

Confidence Interval

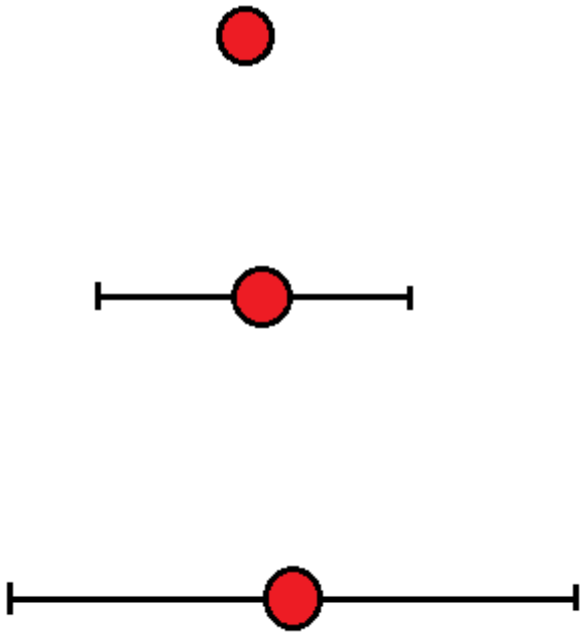
Confidence Interval indicates how accurate our estimate lies to be

It will cost 10000$

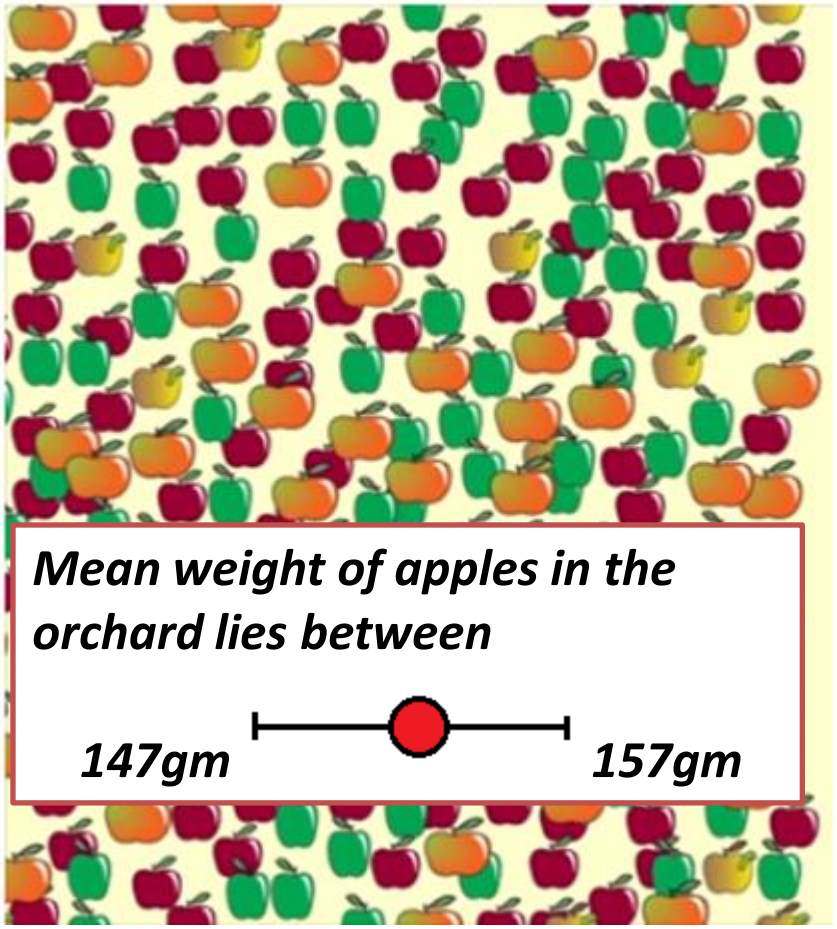
It will cost between $9900 to 10,100

It will cost between $7000 to 15000

Confidence Interval



What is the mean weight of Apples in the Orchard?



Take Sample and Calculate mean

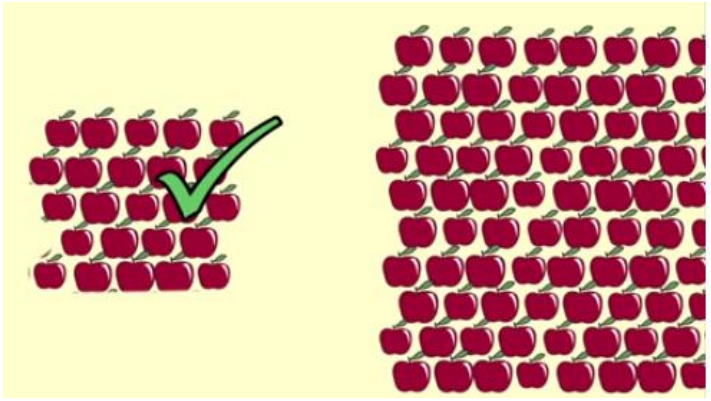
Sample mean = 149 g

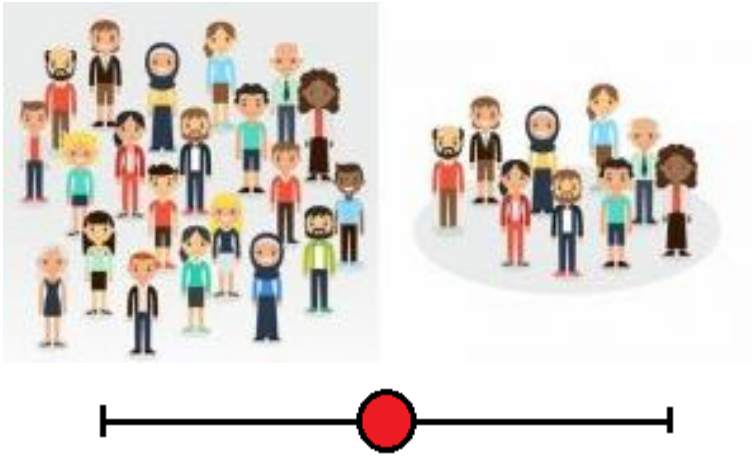
↓

Population mean is about 149 g

What affects the width of the CI

1.Variation within the population of interest





2.Size of the sample

139gm **182gm**

280gm **310gm**

Types Of Sampling

Random Sampling

- ***When there is a very large population and it is difficult to identify every member of the population.***

- ***The entire process of sampling is done in a single step with each piece of data selected independently of the other members of the population.***

- ***Using this technique, each member of the population has an equal chance of being selected .***

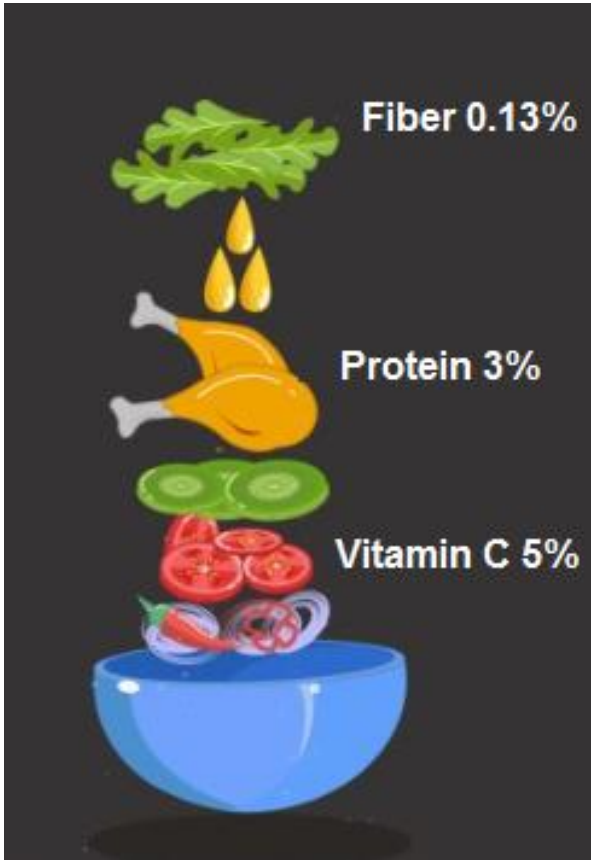
...

Systematic Sampling

- *When your given population is logically homogenous*
- *In a systematic sample, after we decide the sample size, we arrange the elements of the population in some order and select terms at regular intervals from the list.*
- *A clustered selection of data items is avoided through systematic sampling.*

...

Stratified Sampling



- *When we can divide the population into characteristics of importance we use Stratified Sampling.*

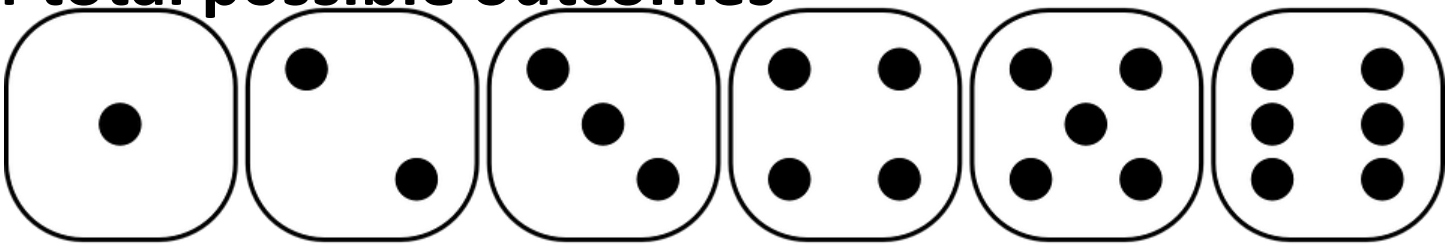
- *Before sampling, the population is divided into characteristics of importance for the research — for example, by gender, education level, age group, etc. Then the population is randomly sampled within each category.*

- *This ensures that every category of the population is represented in the sample.*

Probability

# of outcomes you looking for

# of total possible outcomes



Probability of rolling a dice

1 outcome / 6 total possible outcome

= 1/6

Probability of rolling even number

3 outcome / 6 total possible outcome

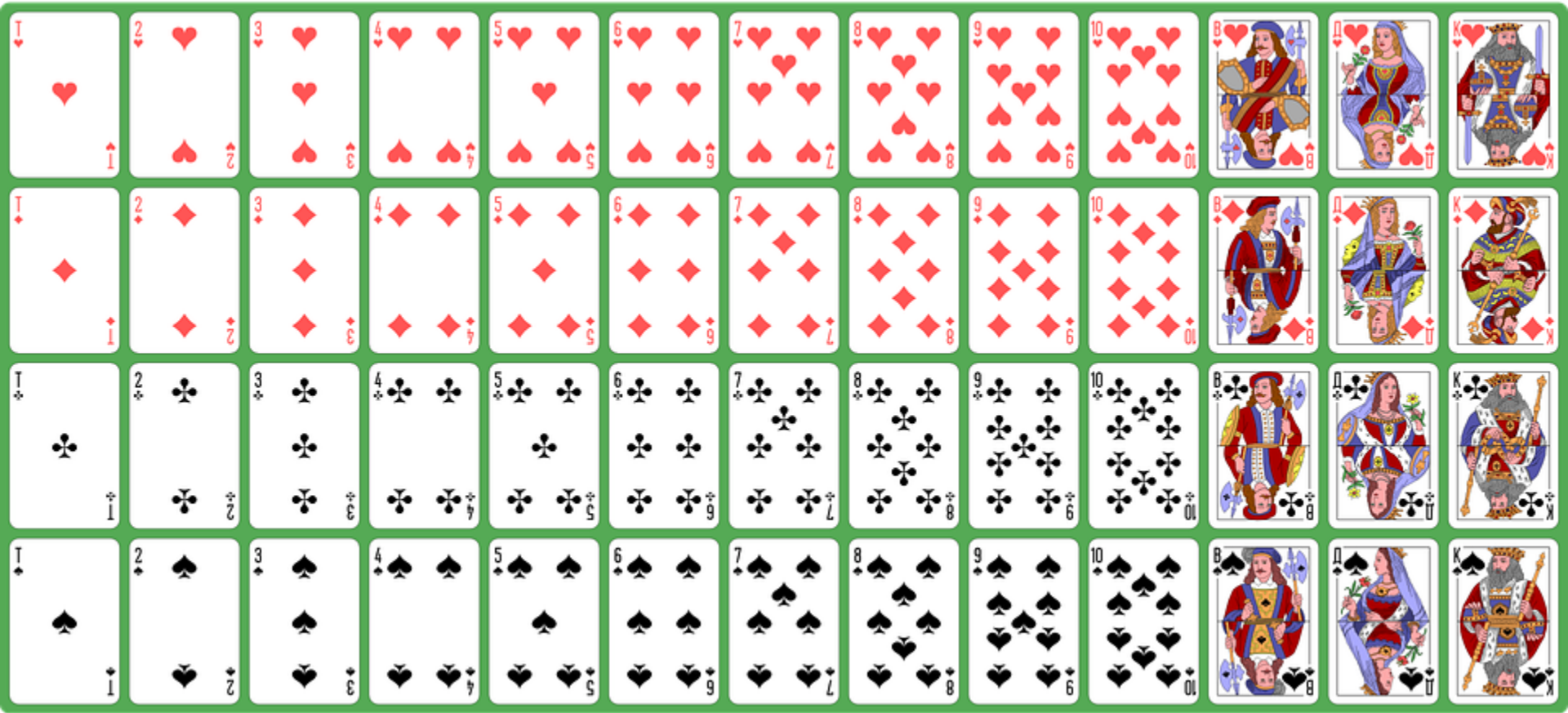
= 3/6 = 1/2

Probability of randomly drawing a heart
= 13/52 = 1/4

*Probability of drawing queen = **4/52***

*Probability of drawing queen of hearts = **1/52***

*Probability of drawing face card = **12/52***



Conditional Probability

Events

***A**: Draw a Heart*

***B**: Draw a face card*

P(A) = 13/52

P(B) = 12/52

Draw a Face card that's a Heart

P(B|A) = 3/13

Probability of B given A