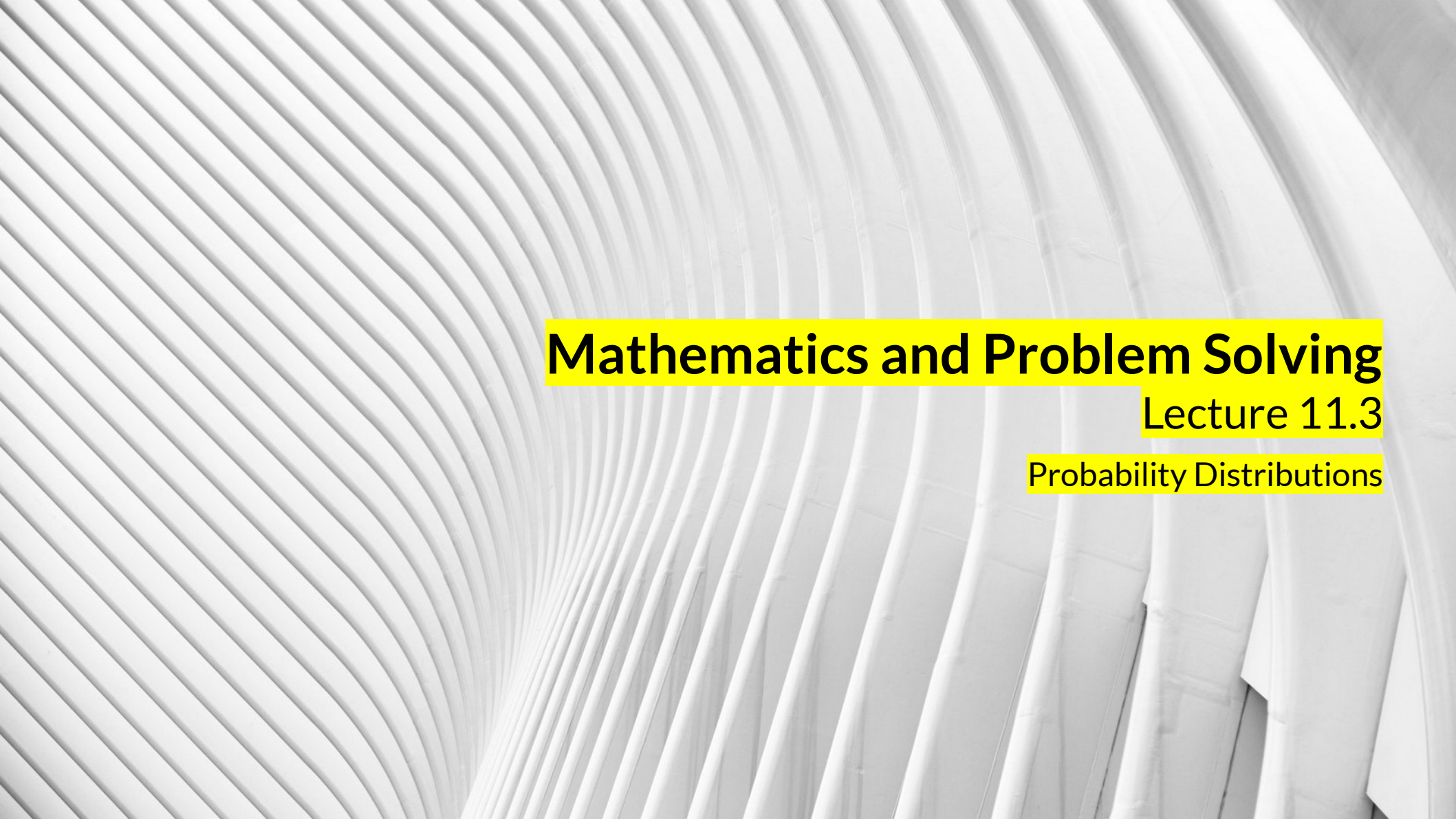
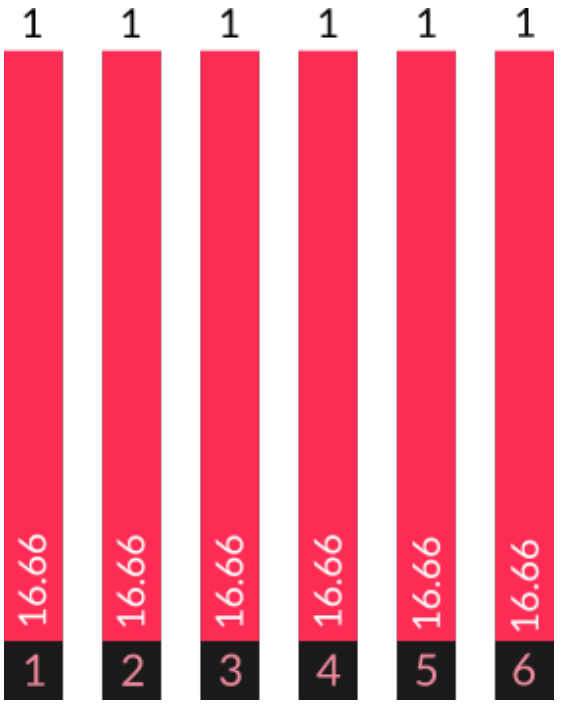


Mathematics and Problem Solving

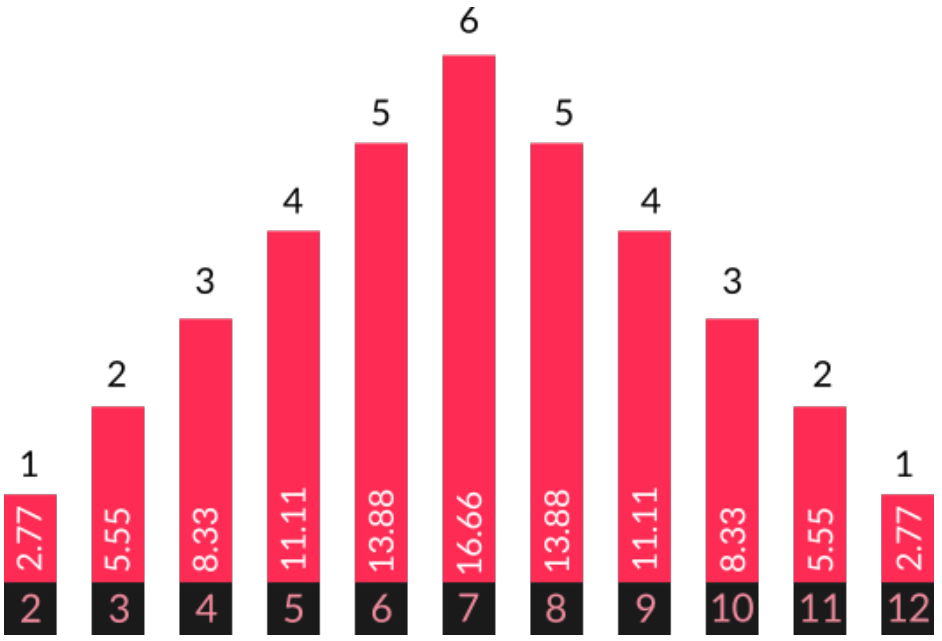
Lecture 11.3

Probability Distributions

- Roll one dice
  - The **probability** of getting each number **is the same**



- Roll two dice and add them together
  - The **probability** differs for **each number**

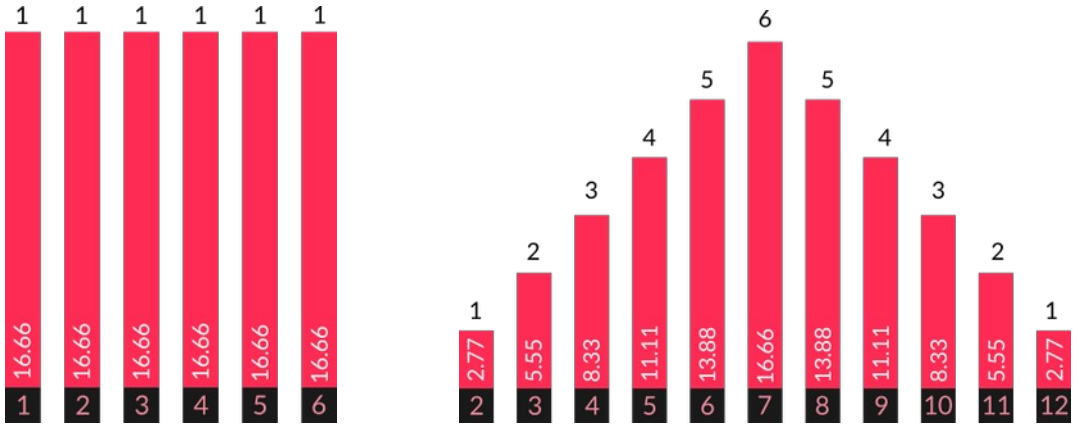


- What’s the probability of rolling 7?

  6/36 = 1/6 = 16.66

P(1) * P(6)
+ P(2) * P(5)
+ P(3) * P(4)
+ P(4) * P(3)
+ P(5) * P(2)
+ P(6) * P(1)

- These are two different **probability distributions**

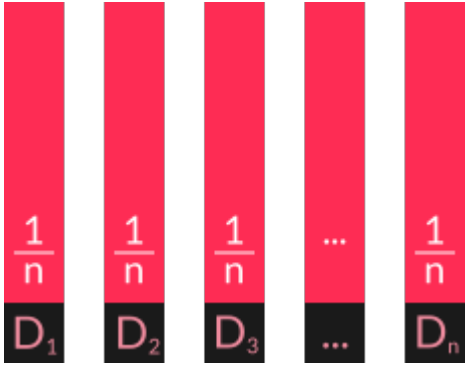


Discrete Distribution

- Discrete
  - **Countable** $D_1 \ldots D_n$
- **Probability mass function** = list of values and their probabilities
  - Sum to 1

Discrete **Uniform** Distribution

- Discrete
  - **Countable** $D_1 \ldots D_n$
- Uniform
  - All **same probability**



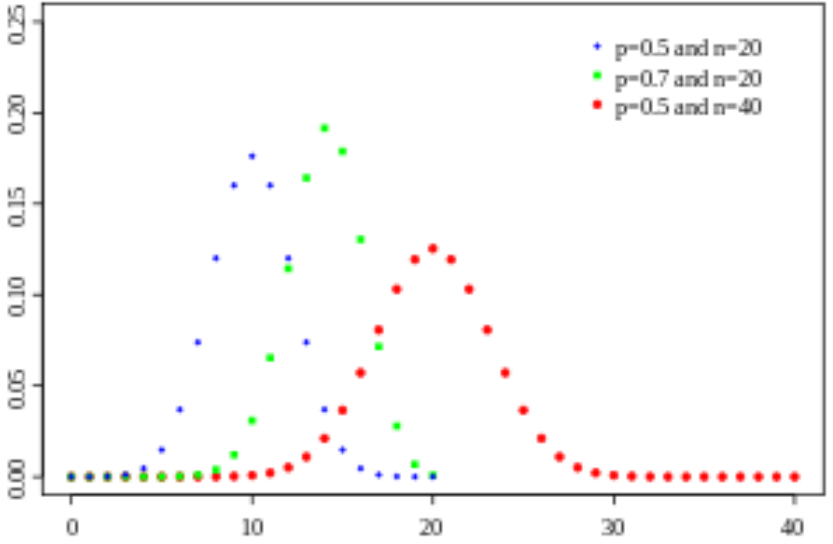
Binomial Distribution

- Flip a coin, twice
  - Probability of success constant = 0.5
  - Independant trials
  - Variable = number of heads

Number of Heads	Probability
0	0.25
1	0.5
2	0.25

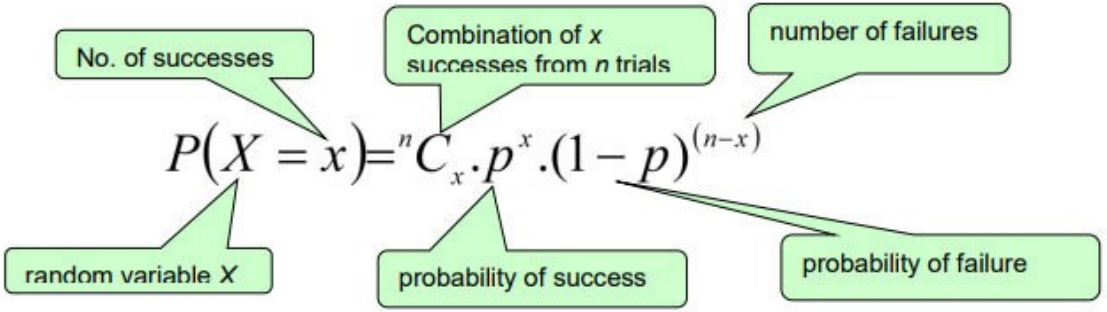
Binomial Distribution

- Number of successes in a sequence of yes/no questions
  - e.g. flip a coin 10 times, count the number of heads
- Defined by
  - **n** (number of questions) and
  - **p** (probability of a “yes”)



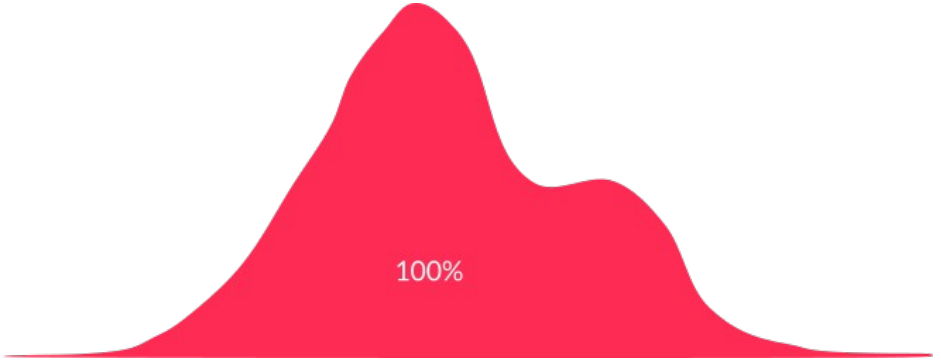
Binomial Distribution

- Binomial formula
  - Probability of x successes



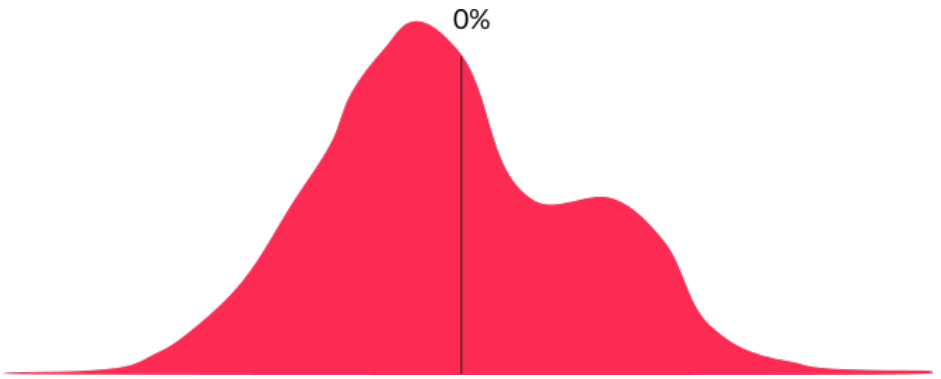
Continuous Distribution

- Probability density function represents a curve
  - Area under curve **adds up to 1**



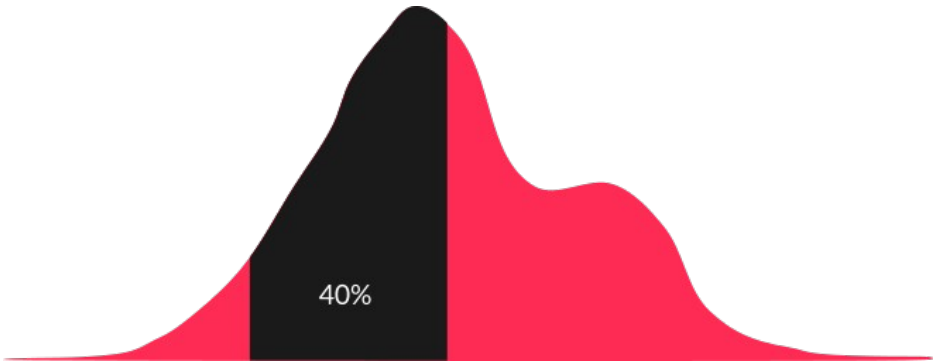
Continuous Distribution

- Probability density function represents a curve
  - Probability of **single value** = 0



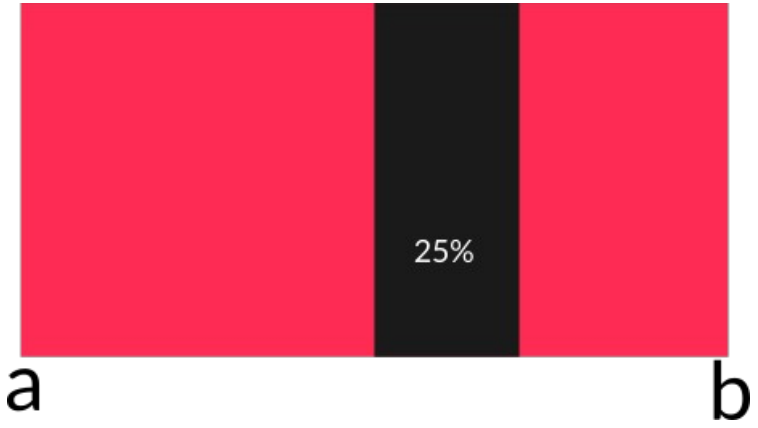
Continuous Distribution

- Probability density function represents a curve
  - **Area under the curve** is probability of **range** of values



Continuous **Uniform** Distribution

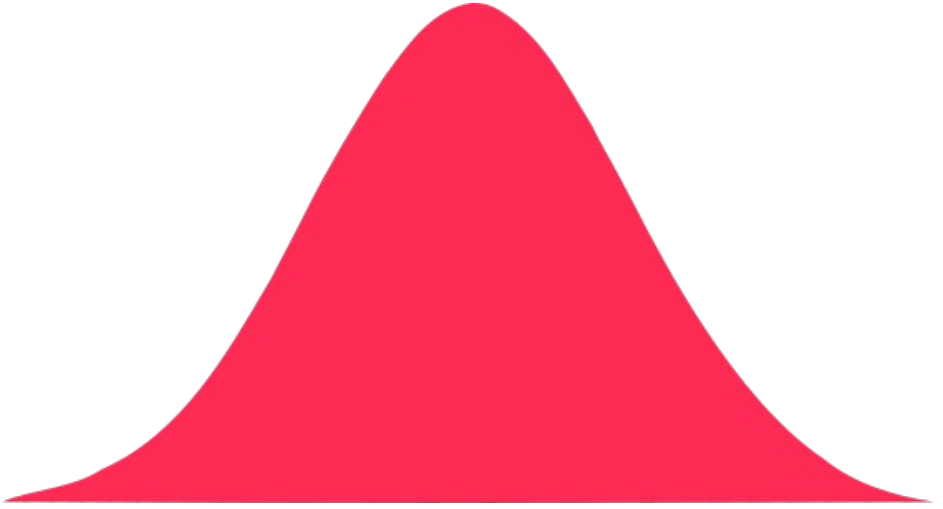
- Continuous
  - **Range** a → b
- Uniform
  - All **same probability**



Normal Distribution

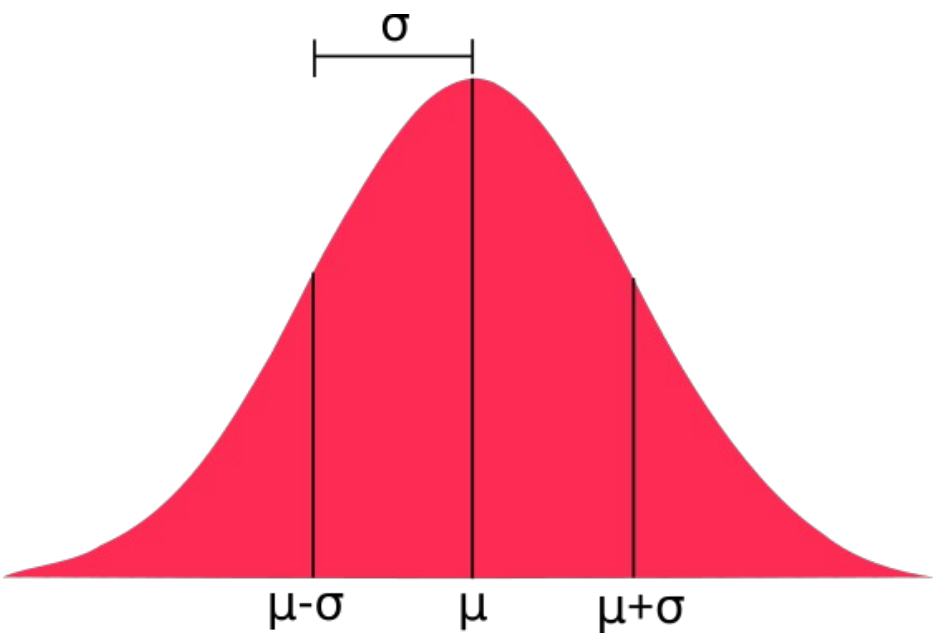
- Measure height of everyone in a class

1.56	1.37	1.14	1.38
1.09	1.18	1.68	1.22
1.15	1.43	1.58	1.59
1.02	….		

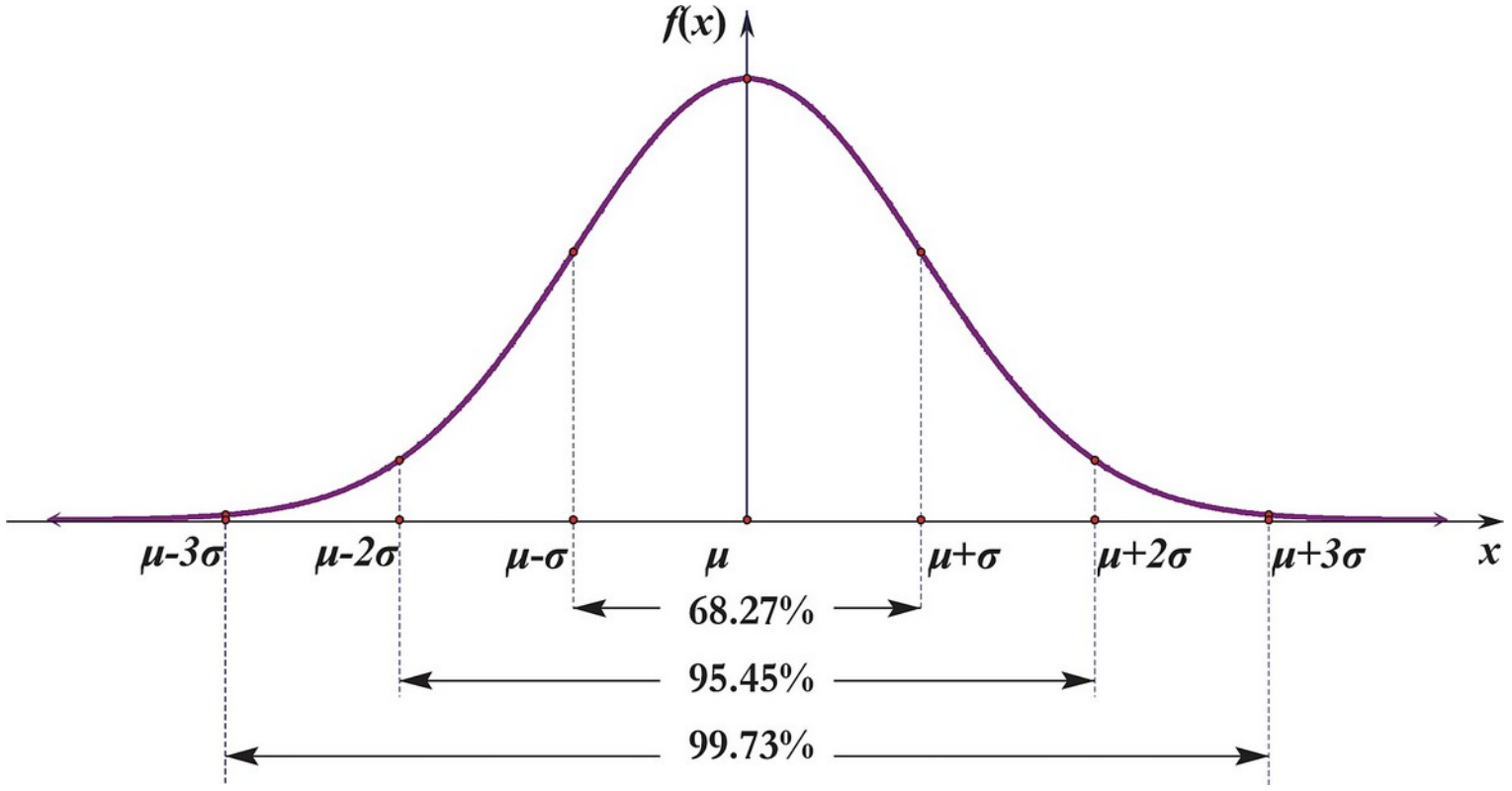


Normal Distribution

- Defined by:
  - **mean** (μ)
  - **standard deviation** (σ)
- Used a lot in inferential statistics

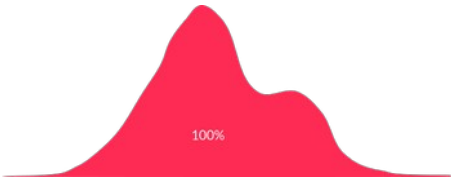


Normal Distribution

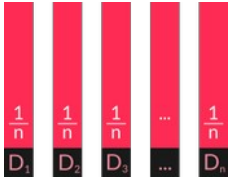


Summary

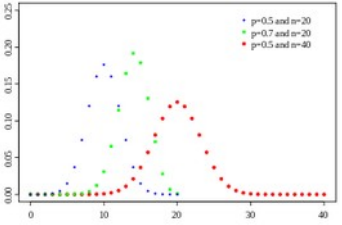
- Discrete vs. Continuous



- Uniform



- Binomial



- Normal