This intro to study next time: foundations

read: as in syllabus

$n = \# \text{ children}$

as $n \uparrow$, $P \left( \text{1 or more} \right) \uparrow$

$P(A)$: $A$ is a set (or $A$ is a true/false statement (proposition) of $A$

3800 BCE Mesopotamia

3000 BCE

history

3000 years ago

probability $\leftrightarrow$ quantification of uncertainty

incomplete information

1650: Pascal & Fermat (classical)

8000 years

sampling
How do you achieve representativeness?

IID (independently and identically distributed)

$n = 1 \iff$ IID = SRS

$n = \binom{N}{n} \iff$

$n \geq N \Rightarrow$ IID = SRS

$n \frac{N}{n} \leq 2e$

is a lot smaller than $N$

200,000,000

1,000
if all ways experiment can come out can be enumerated so that no reason one favored over another → elemental outcomes (Eqs)
\[ P(A) = \frac{\text{# EOS favorable}}{\text{# EOS}} \]

Possible T-5 labels

\[ P(1 \text{ or more T-5}) = \frac{5}{6} \]

\[ \text{ELM} \quad 5/6 \]

\[ \text{IF A then B} \]

\[ \text{but ELM} \quad \times \quad \frac{5}{6} \]

3 types of probability

1. Classical
   ELM usually doesn't apply

2. Frequentist
   (1850) John Venn

3. Bayesian
   (1750) Rev. Thomas Bayes
\[ p(\text{red}) = \frac{18}{38} \]

**roulette**

\[ \text{E} \neq M ? \]

\[ 7/23 \]

<table>
<thead>
<tr>
<th>Spin #</th>
<th>Outcome</th>
<th>Cumulative % red so far</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>red</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>green</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>red</td>
<td>67%</td>
</tr>
<tr>
<td>4</td>
<td>black/ red</td>
<td>50%</td>
</tr>
</tbody>
</table>
\[ P(A \lor B) = ? \]
\[ P(A) + P(\text{not } A) \]

\[ P(A \land B) = P(A) \land P(B) \]

**Special case: no overlap, A, B mutually exclusive**

\[ P(A \lor B) = P(A) + P(B) \]

\[ P((A \land B) \lor (A \land B)) = \text{general rule for} \]
\[ P(A \lor B) \geq P(A) + P(B) \]
\[ - P(A \land B) \]
for any $A$, $0 \leq P(A) \leq 1$

$P(A) = 0 \iff A$ is false

$P(A) = 1 \iff A$ is true