Counting/Probability

a random process

sample space

event
Probability of an event \( P(E) \)

all outcomes equally likely

\[
P(E) = \frac{\text{the number of outcomes in } E}{\text{# outcomes in the sample space}}
\]
Monty Hall Problem

Chosen Door 1:

<table>
<thead>
<tr>
<th>Cases: Prize is Behind</th>
<th>Stay</th>
<th>Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>√</td>
<td>×</td>
</tr>
<tr>
<td>2</td>
<td>×</td>
<td>√</td>
</tr>
<tr>
<td>3</td>
<td>×</td>
<td>√</td>
</tr>
</tbody>
</table>
If \( m, n \) are integers and \( m \leq n \), then there are \( n - m + 1 \) integers from \( m \) to \( n \) inclusive.

How many 3 digit numbers are divisible by 3?

\[
100, 101, 102, 103, 104, 105, \ldots, 996, 997, 998, 999
\]

\[
1, 1, 7, T
\]

\[
3.34, 3.35, 3.32, 3.33
\]

34...333

\[
333 - 34 + 1 = 300
\]
Possibility Trees

Best of 3 tournament

between A, B

Game 1

A

B

A

B

Game 2

A

B

A
subsets of \{A, B, C\}

A

B

C

\{A, B, C\}

\{A, B\}

\{A, C\}

\{B\}

\{C\}

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\{\}
2 monitors \( \{a, b\} = M_0 \)
3 keyboards \( \{c, d, e\} = K \)
2 mice \( \{f, g\} = M_i \)

\[ M_0 \times K \times M_i \]
If an operation consists of \( k \) steps and for each step \( i \) can be performed in \( n_i \) different ways, the entire operation can be done in \( n_1 \cdot n_2 \cdot n_3 \cdots n_k \) ways.
Identifiers

\[\{A..Z,a..z,-,0..9,\$\}\] 64

First char \[\{\ "\ "\ "\ X\ \}\] 54

# of identifiers of length 4

\[54 \cdot 64 \cdot 64 \cdot 64 = a \text{ lot}\]

\[> 14 \text{ million}\]

14, 155, 776