\[ P = \text{Prob of success} \]
\[ 1 - P = \text{Prob of failure} \]

Ex 1. a) \( n = 2 \)

Ind
\[ p = 0.8 \]
\[ q = 1 - 0.8 = 0.2 \]
mutually exclusive.

Yes.

b) \( P(1) = \frac{1}{52} \)
\( P(2) = \frac{1}{51} \)

\( P(\text{success}) = \frac{4}{52} \).
\( P_2(\text{success}) = \frac{3}{51} \).

c) \( n = 10 \)
\[ p = \frac{1}{4} = 0.25 \]
\[ q = 1 - \frac{1}{4} = 0.75 \]
\[ p(x) = nC_x \ p^x \ q^{n-x} = \frac{n!}{(n-x)! \ x!} \ p^x \ q^{n-x} \]

**Ex. 2.**

\[ p(x = 5) = 10 \ C_5 \ (0.7)^5 \ (0.3)^5 = 0.1029 \]

The probability that theshown is successful for exactly 5 patients is about 0.1029 or 10.29%.

**Binomial (n, p, x)**

\[ p(x = 5) = \text{bin pdf} \ (10, 0.7, 5) \]

b) \[ p(x \leq 7) = p(0) + p(1) + \ldots + p(7) \]

c) \[ = \text{bin} \ (10, 0.7, 0) + \text{bin} \ (10, 0.7, 1) + \ldots + \text{bin} \ (10, 0.7, 7) \]

\[ \text{L1} \rightarrow \text{QUIT} \rightarrow \text{2nd VARS} \rightarrow \text{bin pdf} \ (10, 0.7) \rightarrow \text{STORE} \rightarrow \text{ENTER} \]
<table>
<thead>
<tr>
<th>x</th>
<th>p(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0000</td>
</tr>
<tr>
<td>1</td>
<td>0.0001</td>
</tr>
<tr>
<td>2</td>
<td>0.0045</td>
</tr>
<tr>
<td>3</td>
<td>0.0090</td>
</tr>
<tr>
<td>4</td>
<td>0.0368</td>
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<tr>
<td>5</td>
<td>0.1029</td>
</tr>
<tr>
<td>6</td>
<td>0.2001</td>
</tr>
<tr>
<td>7</td>
<td>0.2668</td>
</tr>
<tr>
<td>8</td>
<td>0.2325</td>
</tr>
<tr>
<td>9</td>
<td>0.1211</td>
</tr>
<tr>
<td>10</td>
<td>0.0283</td>
</tr>
</tbody>
</table>

\[ P(x \leq 5) = 0.6172 \]

\[ P(x \leq 7) = p(0) + p(1) + \ldots + p(6) \]

\[ \text{bin}(10, \theta = 6) = 0.3504 \]

The probablity of less than 7 patients having a success is about 0.3504.

\[ P(x > 1) = 1 - P(x \leq 1) \]

\[ = 1 - (P(x = 0) + P(x = 1)) \]

\[ = 0.999 \]
2) \( P(X \geq 3) = P(3) + \ldots + P(0) \)
   \[= 1 - P(X \leq 2) \]
   \[= 1 - \text{binomcdf}(10, 0.3, 2) \]
   \[= 0.9984 \]

\[ \text{in May} \]

\[ \begin{align*}
\mu &= 31 \\
P &= 0.38 \\
\bar{X} &= 1 - 0.38 = 0.62 \\
\mu &= nP = 31 \times 0.38 = 11.78
\end{align*} \]

On average, the month of May will have about 17 clear days.

\[ 6 = 31 \times 0.38 \times 0.62 = 7.3036 \]  \([\text{No Rounding}]

\[ 6 = \sqrt{\text{var}} \]

\[ = \sqrt{7.3036} \approx 2.7025 \]

On average, there is a spread of 3 clear days from the mean of 12 clear days in SD,

Rule of thumb

\[ \mu - 2 \delta = 12 - 2 \times 3 = 6 \]

\[ \mu + 2 \delta = 12 + 2 \times 3 = 18 \]
Ex 7

\[ n = 100 \quad \Rightarrow \quad m = 100 \times 0.5 = 50 \]

On Avg, if you flip a coin 100 times, you will get 50 Heads.

\[ 6^2 = 100 \times 0.5 \times 0.5 = 25 \]

\[ 6 = \sqrt{25} = 5 \]

On Avg, there is a spread of 5.

\[ m - 2s = 50 - 2 \times 5 = 40 \]

\[ m + 2s = 50 + 2 \times 5 = 60 \]

12 is unusual.

Ex 3

\[ n = 10 \]

\[ p = 0.2 \]

\[ q = 0.8 \]

a) \[ P(X = 5) = \binom{10}{5} \times 0.2^5 \times 0.8^5 = 0.0264 \]

The prob that 5 out of 10 adults believe in reincarnation is about 0.0264, or 2.64%.
b) \( P(X = 10) = \binom{10}{0.2, 10} = 0.00000124 \approx 0 \).

There is hardly any chance that all 10 adults believe in reincarnation.

2) \( P(X > 5) = 1 - P(X \leq 4) = 1 - \text{bin cdf}(10, 0.2, 4) \\
= 0.0328 \)

d) \( n = 6 \)
\( X = 5 \)
\( P(X = 5) = \text{bin pdf}(6, 0.2, 5) \approx 0.0015 \)

0.15\% less than 5%