Distribuição Poisson

$$P(K) = \frac{e^{-\lambda}\,\lambda^{K}}{K!}$$

1) $\lambda = 1$ $K = 0$ $e \cong 2{,}718$

$$P(0) = \frac{2{,}718^{-1} \cdot 1^{0}}{0!} \rightarrow P(0) = \left(\frac{1}{2{,}718}\right)^{1} \cdot 1$$

$$P(0) = \frac{1}{2{,}718} \cong 0{,}37 \rightarrow 1 - P(0) = 1 - 0{,}37 = 0{,}63$$

63%

$$P(2) = \frac{2{,}718^{-1} \cdot 1^{2}}{2!} = \left(\frac{1}{2{,}718}\right)^{1} \Big/ \frac{2}{1} = \frac{1}{5{,}436} \cong 0{,}18$$

$$P(3) = \frac{2{,}718^{-1} \cdot 1^{3}}{3!} = \left(\frac{1}{2{,}718}\right)^{1} \Big/ \frac{6}{1} = \frac{1}{16{,}308} \cong 0{,}06$$

$$P(4) = \frac{2{,}718^{-1} \cdot 1^{4}}{4!} = \left(\frac{1}{2{,}718}\right)^{1} \Big/ \frac{24}{1} = \frac{1}{65{,}232} \cong 0{,}02$$

$$P(2) + P(3) + P(4) = 0{,}18 + 0{,}06 + 0{,}02 = 0{,}26 = 26\%$$

② $x = 2 \rightarrow (1,1) = 1/36$

$x = 3 \rightarrow (1,2)\ (2,1) = 2/36$

$x = 4 \rightarrow (1,3)\ (2,2)\ (3,1) = 3/36$

$x = 5 \rightarrow (1,4)\ (3,2)\ (4,1)\ (2,3) = 4/36$

$$\frac{1}{36} + \frac{2}{36} + \frac{3}{36} + \frac{4}{36} = \frac{10^{\div 2}}{36_{\div 2}} = \frac{5}{18} \cong 0,3 = 30\%$$

③ $P(x) = \binom{n}{x} p^{x} q^{n-x}$

$n = 3$ vezes $\quad x = 2$ vezes, face 5

$p = 1/6 \quad q = 5/6$

$$P_{(2)} = \frac{3}{2} \cdot \left(\frac{1}{6}\right)^{2} \cdot \left(\frac{5}{6}\right)^{3-2}$$

$$\binom{3}{2} = \frac{3!}{2!\,(3-2)!}$$

$$\frac{3!}{\cancel{2}!}\ \frac{\cancel{2}!}{1!} = \frac{3}{1} = 3$$

$$P(2) = \frac{3}{1} \cdot \frac{1}{36} \cdot \frac{5}{6} = \frac{15}{216} \cong 0,07 = 7\%$$

(4) $n = 5 \quad x = 4 \quad p = \frac{1}{4} \quad q = \frac{3}{4}$

$P(4) = (5/4) \cdot (1/4)^4 \cdot (3/4)^{5-4}$

$P(4) = 5/1 \cdot 1/256 \cdot (3/4)^1$

$P(4) = 15/1024$

$n = 5 \quad x = 5 \quad p = 1/4 \quad q = 3/4$

$P(5) = (5/5) \cdot (1/4)^5 \cdot (3/4)^{5-5}$

$P(5) = 1/1 \cdot 1/1024 \cdot 1/1$

$P(5) = 1/1024$

$15/1024 + 1/1024 = \overset{\div 16}{16/1024} = 1/64 \cong 0{,}02 = 2\%$

(5) - a) $n = 5 \quad x = 3 \quad p = 1/2 \quad q = 1/2$

$P(3) = (5/3) \cdot (1/2)^3 \cdot (1/2)^{5-3}$

$P(3) = 10/1 \cdot 1/8 \cdot 1/4 = 5/16 = 0{,}3125 \quad 31{,}25\%$

$5/3 = 5!/3!(5-3)!$

$= \frac{5 \cdot 4 \cdot \cancel{3!}}{\cancel{3!}\, 2!} = \frac{20}{1 \cdot 2} = \frac{20}{2} = 10$

b) $n = 5$ $x = 0$ $p = 1/2$ $q = 1/2$

$P(0) = (5/0) \cdot (1/2)^0 (1/2)^5$

$P(0) \; 1 \cdot \frac{1}{1} \cdot \frac{1}{32} = \boxed{1/32}$

$n = 5$ $x = 1$ $p = 1/2$ $q = 1/2$

$p(1) = (5/1) \cdot (1/2)^1 (1/2)^{5-1}$

$P(1) = 5 \cdot 1/2 \cdot 1/16 = \boxed{5/32}$

$n = 5$ $x = 2$ $p = 1/2$ $q = 1/2$

$p(2) = (5/2) \cdot (1/2)^2 (1/2)^{5-2}$

$P(2) = 10 \cdot \frac{1}{4} \cdot \frac{1}{8} = \boxed{10/32}$

$\frac{1}{32} + \frac{5}{32} + \frac{10}{32} = \frac{16}{32}^{16}_{16} = \frac{1}{2} = 0,5 = 50\%$

6. $p = 1/4$ $q = 3/4$ $n = 6$ $K = 3$

$P(K) = n/K \; p^K \; q^{n-K}$

$P(3) \; (6/3) \; (1/4)^3 \; (3/4)^{6-3}$

$P(3) = 20 \cdot 1/64 \cdot 27/64 = 540/4096 = 135/1024 = 0,13$

$\boxed{13\%}$

7) $P = 0,3 \quad q = 0,7 \quad n = 4$

$K = 3$	$K = 4$
$P(3) = 4/3 \cdot 0,3^3 \cdot 0,7^1$	$P(4) = 4/4 \cdot 0,3^3 \cdot 0,7$
$P(3) = 4 \cdot 0,027 \cdot 0,7$	$P(4) = 1 \cdot 0,027 \cdot 0,7$
$P(3) = 0,0756$	$P(4) = 0,0081$

$P(3) + P(4) = 0,0756 + 0,0081$
$= 0,0837 = 8,37\%$

8) $n = 15 \quad K = 10 \quad p = 85\% = 0,85 \quad q = 15\% = 0,15$

$P(10) = (15/10) \cdot 0,85^{10} \cdot 0,15^5$
$P(10) = 3003 \cdot 0,20 \cdot 0,00008$
$P(10) \cong 0,05 = 5\%$

$\frac{15}{10} = \frac{15!}{10!\,(15-10)!}$
3003