Formação Cientista de Dados

Distribuição Binomial

Exemplo

- Se eu jogar uma moeda 5 vezes. Qual a probabilidade de dar cara 3 vezes?

- X = 3
- p = 0,5
- n = 5

$$f(x) = \binom{n}{x} p^x \, (1-p)^{(n-x)}$$

$$\binom{n}{x} = \frac{n!}{x!\,(n-x)!}$$

$$\binom{n}{x} = \binom{5}{3} = \frac{5!}{3!\,(5-3)!} = \frac{120}{6(2)!} = \frac{120}{12} = 10$$

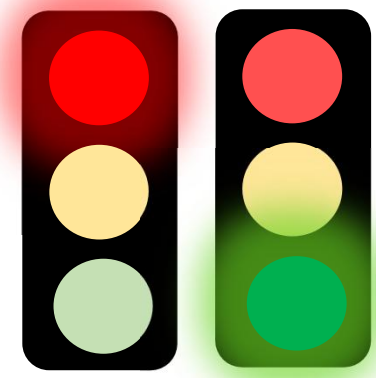
$$f(x) = 10 \ * 0{,}125 \ * (1-0{,}5)^{(5-3)}$$

$$f(x) = 1{,}25 * (0{,}5)^2$$

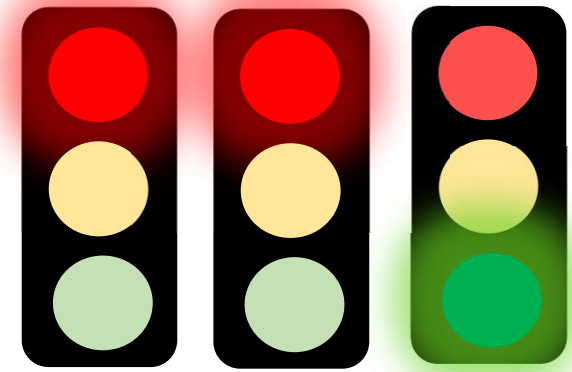
$$f(x) = 1{,}25 * 0{,}25$$

$$f(x) = 0{,}3125$$

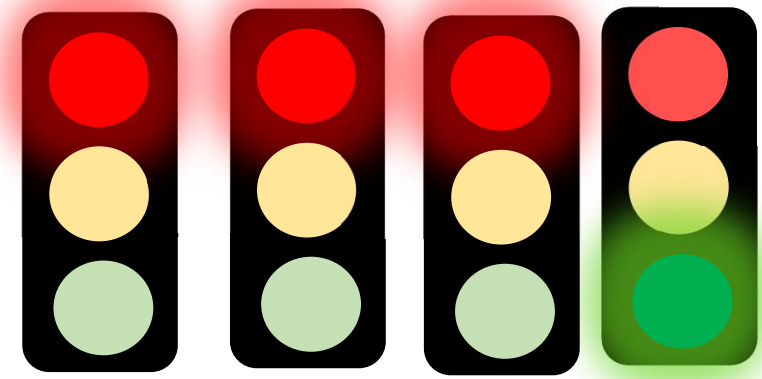
Sinal (Semáforo)



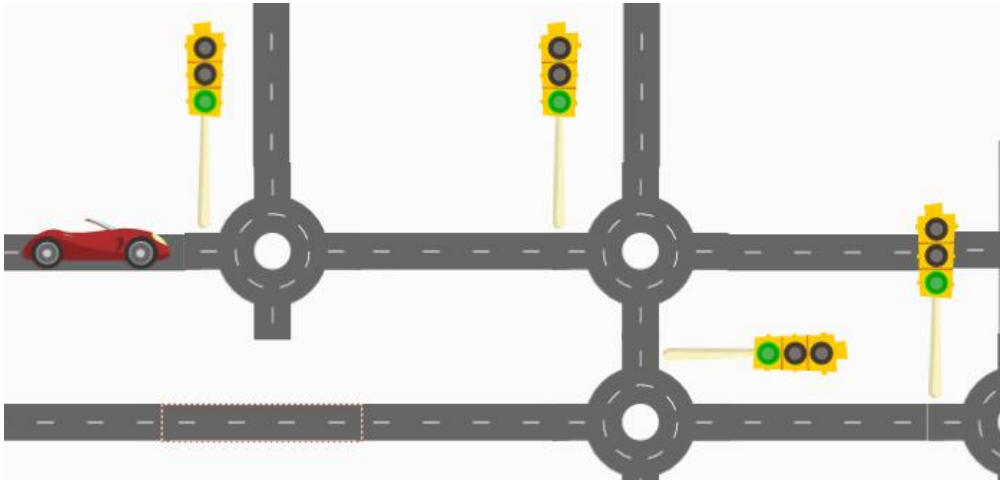
2 Tempos



3 Tempos



4 Tempos



0,316406
0,421875
0,210938
0,046875
0,003906
1

Exemplo

- Se eu passar 4 sinais de quatro tempos cada. Qual a probabilidade de eu pegar 0,1,2,3 e 4 sinais verdes?

- X = 0,1,2,3,4
- p = 0,25
- n = 4

Exemplo

- Se você fizer a prova de um concurso com 12 questões. “chutando” todas as questões, qual a probabilidade de acertar 7 questões? (4 alternativas cada questão)
- X = 7 certos
- p = 0,25
- n = 12

0,01147127

Tabela de Distribuição

- X = 7 certos
- p = 0,25
- n = 12

		p										
n	*r*	.01	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
11	6	.000	.000	.000	.002	.010	.027	.057	.099	.147	.193	.226
	7	.000	.000	.000	.000	.002	.006	.017	.038	.070	.113	.161
	8	.000	.000	.000	.000	.000	.001	.004	.010	.023	.046	.081
	9	.000	.000	.000	.000	.000	.000	.001	.002	.005	.013	.027
	10	.000	.000	.000	.000	.000	.000	.000	.000	.001	.002	.005
	11	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
12	0	.886	.540	.282	.142	.069	.032	.014	.006	.002	.001	.000
	1	.107	.341	.377	.301	.206	.127	.071	.037	.017	.008	.003
	2	.006	.099	.230	.292	.283	.232	.168	.109	.064	.034	.016
	3	.000	.017	.085	.172	.236	.258	.240	.195	.142	.092	.054
	4	.000	.002	.021	.068	.133	.194	.231	.237	.213	.170	.121
	5	.000	.000	.004	.019	.053	.103	[illegible]	.204	.227	.223	.193
	6	.000	.000	.000	.004	.016	.040	[illegible]	.128	.177	.212	.226
	7	.000	.000	.000	.001	.003	.011	[illegible]	.059	.101	.149	.193
	8	.000	.000	.000	.000	.001	.002	.00[illegible]	.020	.042	.076	.121
	9	.000	.000	.000	.000	.000	.000	.001	.005	.012	.028	.054
	10	.000	.000	.000	.000	.000	.000	.000	.001	.002	.007	.016
	11	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.003
	12	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Tabela de Distribuição

- X = 7 certos (5 fracassos)
- p = 0,25 (0,75)
- n = 12

p

n	r	.01	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75
11	6	.000	.000	.000	.002	.010	.027	.057	.099	.147	.193	.226	.236	.221	.183	.132	.080
	7	.000	.000	.000	.000	.002	.006	.017	.038	.070	.113	.161	.206	.236	.243	.220	.172
	8	.000	.000	.000	.000	.000	.001	.004	.010	.023	.046	.081	.126	.177	.225	.257	.258
	9	.000	.000	.000	.000	.000	.000	.001	.002	.005	.013	.027	.051	.089	.140	.200	.258
	10	.000	.000	.000	.000	.000	.000	.000	.000	.001	.002	.005	.013	.027	.052	.093	.155
	11	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.004	.009	.020	.042
12	0	.886	.540	.282	.142	.069	.032	.014	.006	.002	.001	.000	.000	.000	.000	.000	.000
	1	.107	.341	.377	.301	.206	.127	.071	.037	.017	.008	.003	.001	.000	.000	.000	.000
	2	.006	.099	.230	.292	.283	.232	.168	.109	.064	.034	.016	.007	.002	.001	.00	.00
	3	.000	.017	.085	.172	.236	.258	.240	.195	.142	.092	.054	.028	.012	.005	.00	.00
	4	.000	.002	.021	.068	.133	.194	.231	.237	.213	.170	.121	.076	.042	.020	.00	.002
	5	.000	.000	.004	.019	.053	.103	.158	.204	.227	.223	.193	.149	.101	.059	.029	.011
	6	.000	.000	.000	.004	.016	.040	.079	.128	.177	.212	.226	.212	.177	.128	.079	.040
	7	.000	.000	.000	.001	.003	.011	.029	.059	.101	.149	.193	.223	.227	.204	.158	.103
	8	.000	.000	.000	.000	.001	.002	.008	.020	.042	.076	.121	.170	.213	.237	.231	.194
	9	.000	.000	.000	.000	.000	.000	.001	.005	.012	.028	.054	.092	.142	.195	.240	.258
	10	.000	.000	.000	.000	.000	.000	.000	.001	.002	.007	.016	.034	.064	.109	.168	.232
	11	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.003	.008	.017	.037	.071	.127
	12	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.002	.006	.014	.032

Distribuição Binomial ou Cálculo “Manual”?

- Qual a probabilidade de passar em dois sinais de dois tempo e os dois estarem verdes?
- Fazendo manualmente
  1/2 * 1/2 = 0,25
- Calculando
- [1] 0.25