

Nome: Raylander Marques Melo

Matrícula: 494563

Prova 2 de Probabilidade e Estatísticas



Nome: Raglander Marques Melo Matrícula: 49.4563

Prática 2

a) $n=4$ $p=0,25$

$$P(1 \leq x \leq 3) = P(x \leq 3) - P(x \leq 1) = P(x=0) + P(x=1) + P(x=2) +$$

$$P(x=3) - P(x=0) =$$

$$\binom{4}{1} 0,25^1 \cdot 0,75^3 + \binom{4}{2} 0,25^2 \cdot 0,75^2 + \binom{4}{3} 0,25^3 \cdot 0,75^1 =$$

$$0,42188 + 0,21094 + 0,04688 = 0,6797 \text{ ou } 67,97\%$$

b) $E(x) = n \cdot p = 4 \cdot 0,25 = 1$

$$\text{Var}(x) = n \cdot p \cdot (1-p) = 4 \cdot 0,25 \cdot 0,75 = 0,75$$

$$\sigma = \sqrt{\text{Var}(x)} = \sqrt{0,75} = 0,866$$

3) $n=10$ $p=0,01$

$$a) P(x=5) = \binom{10}{5} 0,01^5 \cdot 0,99^5 \approx 0$$

$$b) P(x \leq 2) = P(x=0) + P(x=1) + P(x=2) =$$

$$\binom{10}{0} 0,01^0 \cdot 0,99^{10} + \binom{10}{1} 0,01^1 \cdot 0,99^9 + \binom{10}{2} 0,01^2 \cdot 0,99^8 =$$

$$0,90438 + 0,09135 + 0,00425 = 0,99998 \text{ ou } 99,998\%$$



④ $p=0,2 \quad n=4$

$P(x=2) = \binom{4}{2} 0,2^2 \cdot 0,8^2 = 0,0486$ ou 4,86%

⑤ a) $P(Z < 1,45) = 0,9265$

b) $P(0 < Z < 3,2) = P(Z < 3,2) - P(Z < 0) = 0,9938 - 0,5000 = 0,4938$

c) $P(2 < Z < 3,2) = P(Z < 3,2) - P(Z < 2) = 0,8849 - 0,8413 = 0,0436$

d) $P(Z > 0,6) = 1 - P(Z < 0,6) = 1 - 0,7257 = 0,2743$

⑥ $\mu=45 \quad \sigma^2=25 \quad \sigma=\sqrt{\sigma^2}=5$

$P(x \geq 49) = 1 - P(x < 49) = 1 - 0,7887 = 0,2119$ ou 21,19%

$P(x < 49) = Z = \frac{49 - 45}{5} \Rightarrow Z = \frac{4}{5} \Rightarrow Z = 0,8 = 0,7887$

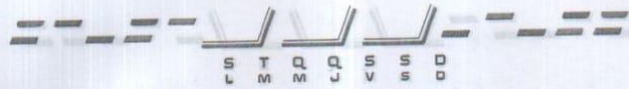
⑦ $\mu=35 \quad \sigma=2$

$P(x < 40) = Z = \frac{40 - 35}{2} \Rightarrow Z = \frac{5}{2} = Z = 2,5 = 0,9938$ ou 99,38%

⑧ $\mu=0,4 \quad \sigma=0,05$

a) $P(x > 0,5) = 1 - P(x \leq 0,5) = 1 - 0,9772 = 0,0228$ ou 2,28%

$P(x \leq 0,5) = Z = \frac{0,5 - 0,4}{0,05} \Rightarrow Z = \frac{0,1}{0,05} \Rightarrow Z = 2 = 0,9772$



$$b) P(0,4 < x < 0,5) = P(x < 0,5) - P(x < 0,4) = 0,9772 - 0,5000 = 0,4772$$

$$P(x < 0,5) = Z = \frac{0,5 - 0,4}{0,05} \Rightarrow Z = \frac{0,1}{0,05} \Rightarrow Z = 2 = 0,9772$$

$$P(x < 0,4) = Z = \frac{0,4 - 0,4}{0,05} \Rightarrow Z = 0 \Rightarrow Z = 0 = 0,5000$$

Lista 2 de Probabilidade e Estatísticas

Raylander Marques Melo Matrícula: 494563

S T Q Q S S O
L M M J V S O

Distribuição de Probabilidade

① Fórmula: $P(x=k) = \binom{n}{k} p^k (1-p)^{n-k}$ $\binom{n}{k} = \frac{n!}{(n-k)!k!}$

a) $P(x=3) = \binom{10}{3} 0,5^3 \cdot 0,5^7$ $\binom{10}{3} = \frac{10!}{(10-3)!3!}$
 $P(x=3) = \binom{10}{3} 0,125 \cdot 0,0078125$
 $P(x=3) = 120 \cdot 0,0009765625$ $\binom{10}{3} = \frac{3628800}{6.5040} = 120$
 $P(x=3) = 0,1171875$

b) $1 - P(x \leq 2)$

$P(x=0) + P(x=1) + P(x=2) = 1 - P(x \leq 2) = 1 - 0,0547 = 0,9453$

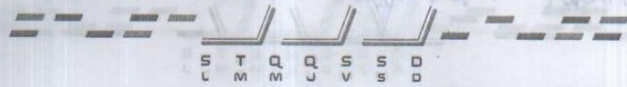
$\binom{10}{0} 0,5^0 \cdot 0,5^{10} + \binom{10}{1} 0,5^1 \cdot 0,5^9 + \binom{10}{2} 0,5^2 \cdot 0,5^8 = 1$
 $0,00098 + 0,00977 + 0,04395 = 0,0547$

c) $P(2 < x < 6) = P(x < 6) - P(x < 2) =$

$P(x=0) + P(x=1) + P(x=2) + P(x=3) + P(x=4) + P(x=5) - P(x=0) - P(x=1) =$

$P(x=2) + P(x=3) + P(x=4) + P(x=5) =$

$\binom{10}{2} 0,5^2 \cdot 0,5^8 + \binom{10}{3} 0,5^3 \cdot 0,5^7 + \binom{10}{4} 0,5^4 \cdot 0,5^6 + \binom{10}{5} 0,5^5 \cdot 0,5^5 =$
 $0,04395 + 0,11719 + 0,20508 + 0,24609 = 0,61231$



$$d) 2 - P(x < 5) = P(x=0) + P(x=1) + P(x=2) + P(x=3) + P(x=4)$$

$$\binom{10}{0} 0,5^0 \cdot 0,5^{10} + \binom{10}{1} 0,5^1 \cdot 0,5^9 + \binom{10}{2} 0,5^2 \cdot 0,5^8 + \binom{10}{3} 0,5^3 \cdot 0,5^7 + \binom{10}{4} 0,5^4 \cdot 0,5^6 =$$

$$0,00098 + 0,00977 + 0,04395 + 0,12779 + 0,20508 = 0,38579$$

2) 0,75 das alunas fizeram curssinho
n=26

$$P(x \geq 12) = 1 - P(x < 12) = 1 - [P(x=0) + P(x=1) + P(x=2) + P(x=3) + P(x=4) + P(x=5) + P(x=6) + P(x=7) + P(x=8) + P(x=9) + P(x=10) + P(x=11)]$$

$$P(x \geq 12) = 1 - \left[\binom{26}{0} 0,75^0 \cdot 0,25^{26} + \binom{26}{1} 0,75^1 \cdot 0,25^{25} + \binom{26}{2} 0,75^2 \cdot 0,25^{24} + \binom{26}{3} 0,75^3 \cdot 0,25^{23} + \binom{26}{4} 0,75^4 \cdot 0,25^{22} + \binom{26}{5} 0,75^5 \cdot 0,25^{21} + \binom{26}{6} 0,75^6 \cdot 0,25^{20} + \binom{26}{7} 0,75^7 \cdot 0,25^{19} + \binom{26}{8} 0,75^8 \cdot 0,25^{18} + \binom{26}{9} 0,75^9 \cdot 0,25^{17} + \binom{26}{10} 0,75^{10} \cdot 0,25^{16} + \binom{26}{11} 0,75^{11} \cdot 0,25^{15} \right]$$

$$P(x \geq 12) = 1 - [0 + 0 + 0 + 0 + 0,00003 + 0,00025 + 0,00136 + 0,00583 + 0,01966 + 0,05843 + 0,1102 + 0,18016]$$

$$P(x \geq 12) = 1 - [0,36982] = 0,63018$$



$$a) E(x) = n \cdot p = 80 \cdot 0,75 = 60$$

$$Var(x) = n \cdot 1 - p = 60 \cdot 0,25 = 15$$

③ 0,4 machines

$$n = 20$$

$$P(x \geq 2) = 1 - [P(x=0) + P(x=1)] =$$

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

$$1 - \left[\binom{20}{0} 0,4^0 \cdot 0,6^{20} + \binom{20}{1} 0,4^1 \cdot 0,6^{19} \right]$$

$$P(x \geq 2) = 1 - [0,00004 + 0,00049] = 0,99947$$

④ $p = 0,2$ $n = 13$

$$P(x \geq 4) = 1 - P(x \leq 3)$$

$$P(x \geq 4) = 1 - [P(x=0) + P(x=1) + P(x=2) + P(x=3)]$$

$$P(x \geq 4) = 1 - \left[\binom{13}{0} 0,2^0 \cdot 0,8^{13} + \binom{13}{1} 0,2^1 \cdot 0,8^{12} + \binom{13}{2} 0,2^2 \cdot 0,8^{11} + \binom{13}{3} 0,2^3 \cdot 0,8^{10} \right]$$

$$P(x \geq 4) = 1 - [0,05498 + 0,17867 + 0,26802 + 0,24567]$$

$$P(x \geq 4) = 1 - 0,74733$$

a) $P(x \geq 4) = 0,25267$

$$1 - 0,74733 = 0,25267$$



$$5a) P(Z < 1,5) = 0,9332$$

$$b) P(0 < Z < 2) = P(Z < 2) - P(Z < 0) = 0,9772 - 0,5000 = 0,4772$$

$$P(Z < 2) = 0,9772 \quad P(Z < 0) = 0,5000$$

$$c) P(Z > 1,2) = 1 - P(Z < 1,2) = 1 - 0,8849 = 0,1151$$

$$d) P(Z > 1,63) = 1 - P(Z < 1,63) = 1 - 0,9484 = 0,0516$$

$$\textcircled{a} \mu = 30 \quad \sigma = \sqrt{16} = 4$$

$$\sigma^2 = 16$$

$$Z = \frac{x - 30}{4} \quad P(x \geq 38) = 1 - P(x < 38) = 1 - 0,9772 = 0,0228$$

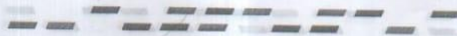
$$P(x < 38) = P\left(\frac{x - 30}{4} < \frac{38 - 30}{4}\right) = P(Z < 2) = P(Z < 2)$$

$$P(Z < 2) = 0,9772$$

$$\textcircled{b} \mu = 100 \quad \sigma^2 = 15$$

$$P(90 < x < 115) = P(x < 115) - P(x < 90) = P\left(Z < \frac{115 - 100}{\sqrt{15}}\right) -$$

$$P\left(Z < \frac{90 - 100}{\sqrt{15}}\right) = P(Z < 2,58) - P(Z < -3,08) = P(Z < 2,58) - P(Z < -0,68)$$
$$= 0,9849 - 0,2546 = 0,6203$$





$$⑧ \mu = 25 \quad \sigma^2 = 9 \quad \sigma = \sqrt{9} = 3$$

$$P(x < 30) \Rightarrow Z = \frac{30 - 25}{3} \Rightarrow Z = \frac{5}{3} \Rightarrow Z = 1,66 = 0,9525$$

$$P(x < 28) \Rightarrow Z = \frac{28 - 25}{3} \Rightarrow Z = \frac{3}{3} \Rightarrow Z = 1 = 0,8413$$

$$⑨ \mu = 10 \quad \sigma = 2$$

$$a) P(x > 13) = 1 - P(x < 13) = 1 - 0,9332 = 0,0668$$

$$P(x < 13) \Rightarrow Z = \frac{13 - 10}{2} \Rightarrow Z = \frac{3}{2} \Rightarrow Z = 1,5 = 0,9332$$

$$b) P(9 < x < 11) = P(x < 11) - P(x < 9) = 0,6915 - 0,3085 = 0,3830$$

$$P(x < 11) \Rightarrow Z = \frac{11 - 10}{2} \Rightarrow Z = \frac{1}{2} \Rightarrow Z = 0,5 = 0,6915$$

$$P(x < 9) \Rightarrow Z = \frac{9 - 10}{2} \Rightarrow Z = \frac{-1}{2} \Rightarrow Z = -0,5 = 0,3085$$

$$c) P(x < x) = 0,98 \Rightarrow 1 < \frac{x - 10}{2} = 0,98$$

A probabilidade é igual a 0,8365



$$\textcircled{10} \mu = 6 \quad \sigma^2 = 4 \quad \sigma = \sqrt{4} = 2$$

$$a) P(5 < x < 7) = P(x < 7) - P(x < 5) = 0,6915 - 0,3085 = 0,3830$$

$$P(x < 7) = Z = \frac{7-6}{2} \Rightarrow Z = \frac{1}{2} \Rightarrow Z = 0,5 = 0,6915$$

$$P(x < 5) = Z = \frac{5-6}{2} \Rightarrow Z = -\frac{1}{2} \Rightarrow Z = -0,5 = 0,3085$$

$$b) P(x > 6,5) = 1 - P(x < 6,5) = 1 - 0,5987 = 0,4013$$

$$P(x < 6,5) = Z = \frac{6,5-6}{2} \Rightarrow Z = \frac{0,5}{2} \Rightarrow Z = 0,25 = 0,5987$$