2022...10185 王渝章

DATE:

X ~ Bin(10, 0.6)

a. $P(X \geq 6) = 1 - P(X \leq 5) = 0.633$ ✓

b. $\mu = np = 6$ $\sigma = \sqrt{10(0.6)0.4} = 1.55$ $\mu \pm \sigma = (4.45, 7.55)$

$P(4.45 < X < 7.55) = P(5 \leq X \leq 7) = P(X \leq 7) - P(X \leq 4) = 0.6675$

c. $P(3 \leq X \leq 7) = P(X \leq 7) - P(X \leq 2) = 0.821$ ✓

✓

Section 3.5

68. a. X is hypergeometric $N = 20$ $M = 12$ $n = 6$

b. $P(X = 2) = \dfrac{\binom{12}{2}\binom{8}{4}}{\binom{20}{6}} = 0.1192$ ✓

$P(X \leq 2) = P(X=0) + P(X=1) + P(X=2)$

$= \dfrac{\binom{12}{0}\binom{8}{6}}{\binom{20}{6}} + \dfrac{\binom{12}{1}\binom{8}{5}}{\binom{20}{6}} + 0.1192 = 0.1373$

✓

$P(X \geq 2) = 1 - P(X \leq 1) = 1 - [P(X=0) + P(X=1)] = 0.9819$

c. $E(X) = n \cdot \dfrac{M}{N} = 3.6$ $V(X) = \left(\dfrac{20-6}{20-1}\right) 6(0.6)(0.4) = 1.061$

$\sigma = 1.030$ ✓

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64. X is hyper geometric $n=6$ $N=12$ $M=7$.

a. $P(X=5) = \dfrac{\binom{7}{5}\binom{5}{1}}{\binom{12}{6}} = 0.114$

b. $P(X \le 4) = 1 - P(X>4) = 1 - [P(X=5)+P(X=6)]$

$= 1 - \dfrac{[0.114 + \binom{7}{6}\binom{5}{0}]}{\binom{12}{6}} = 0.879$

c. $E(X) = n \cdot \dfrac{M}{N} = 3.5$ $V(X) = 0.795$ $\sigma = 0.892$

$P(X>4.392) = P(X=5)+P(X=6) = 0.121$

d. We can approximate the hyper geometric distribution with binomial if population and sucess rate are high. If $n=5$ $M/N = 40/400 = 0.1$

So $h(x;5,40,400) \approx b(x;5,0.1)$

$P(X \le 5) \approx B(5;15,0.1) = 0.993$

72.

a. $N=11$ $M=4$ $n=6$

$h(x;6,4,11)$

$\dfrac{\binom{4}{x}\binom{7}{6-x}}{\binom{11}{6}}$

b $E(X) = n\dfrac{M}{N} = 2.18$

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75 a. S = a female child F = a male child

X = the number of F's before the 2nd S

$$P(X=x) = nb(x;2,0.5) = \binom{x+2-1}{2-1}(0.5)^2(0.5)^x = (x+1)(0.5)^{x+2}$$

b. $P(X=2) = 0.188$

c. $P(X \le 2) = \sum_{x=0}^{2} nb(x;2,0.5) = 0.688$

d. $E(X) = \frac{r(1-p)}{p} = 2$

$E(X+2) = 4$

Section 3.6

79. $F(x;5)$

a. $P(X \le 8) = 0.932$

b. $P(X = 8) = F(8;5) - F(7;5) = 0.065$

c. $P(X \ge 9) = 1 - P(X \le 8) = 0.068$

d. $P(5 \le X \le 8) = F(8;5) - F(4;5) = 0.492$

e. $P(5 < X < 8) = F(7;5) - F(5;5) = 0.251$

84

a. $n = 10000 \quad p = 0.001 \quad \mu = np = 10 \quad \sigma\ \sqrt{npq} = 3.16$

b. $\mu = 10 \quad P(x > 10) \approx 1 - F(10; 10) = 0.417$

c. $P(x=0) \approx \frac{e^{-10} 10^0}{0!} = e^{-10} = 0.0000454$

86 a. $P(x=4) = \frac{e^{-5} 5^4}{4!} = 0.175$

b. $P(x \geq 4) = 1 - P(x \leq 3) = 1 - F(3;5) = 0.735$

c. Arrivals are 5 per hour so $\mu = 5(0.75) = 3.75$

87.

a. $\lambda t = (4)(2) = 8$

$P(x=10) = F(10;8) - F(9;8) = 0.099$

b. For a 30 min period $\lambda t = 4(0.5) = 2$

$P(x=0) = F(0, 2) = 0.135$

c: $E(x) = \lambda t = 2$