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§5.4 Hypergeometric Prob. Distribution

49. (a) $$\frac{C^2_1 C^1_1}{C^3_2} = \frac{2 \cdot 1}{3} = \boxed{\frac{2}{3}}$$

(b) $$\frac{C^4_0 C^2_2}{C^6_2} = \frac{1 \cdot 1}{15} = \boxed{\frac{1}{15}}$$

(c) $$\frac{C^2_2 C^2_1}{C^4_3} = \frac{1 \cdot 2}{4} = \boxed{\frac{1}{2}}$$

50. (a) $$P(4) = \frac{C^5_4 C^3_0}{C^8_4} = \frac{5 \cdot 1}{70} = \boxed{\frac{1}{14}}$$

(b) $$P(1) = \frac{C^5_1 C^3_3}{C^8_4} = \frac{5 \cdot 1}{70} = \frac{1}{14}$$

(c) $$P(x \le 2) = \underbrace{P(0)}_{\text{IMPOSSIBLE}} + P(1) + P(2) = \frac{C^5_1 C^3_3}{C^8_4} + \frac{C^5_2 C^3_2}{C^8_4}$$

$$= \frac{5 \cdot 1 + 10 \cdot 3}{70} = \boxed{\frac{2}{7}}$$

51. (a) $\dfrac{C^3_1 C^2_1}{C^5_2} = \dfrac{3 \cdot 2}{10} = \boxed{\dfrac{3}{5}}$

(b) $\dfrac{C^4_2 C^3_1}{C^7_3} = \dfrac{6 \cdot 3}{35} = \boxed{\dfrac{18}{35}}$

(c) $\dfrac{C^5_4 C^3_0}{C^8_4} = \dfrac{5 \cdot 1}{70} = \boxed{\dfrac{1}{14}}$

52. (a) $P(x=0) = 0$

THERE ARE ONLY $10 - 6 = 4$ ITEMS CONSIDERED "NOT SUCCESS".
SO YOU CAN'T PICK 5 AND HAVE NO SUCCESSES.

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

$= 1 - \dfrac{C^6_1 C^4_4}{C^{10}_5} = 1 - \dfrac{6 \cdot 1}{252} = \dfrac{246}{252} \approx \boxed{.9762}$

(c) $P(2) = \dfrac{C^6_2 C^4_3}{C^{10}_5} = \dfrac{15 \cdot 4}{252} = \dfrac{60}{252} \approx \boxed{.2381}$

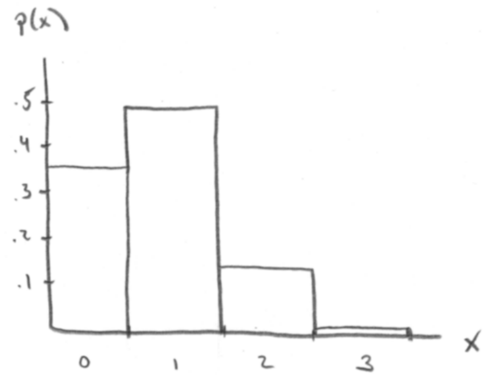
53. (a) $p(0) = \dfrac{C^4_0 C^{11}_3}{C^{15}_3} = \boxed{.3626}$

$$p(1) = \frac{C^4_1 C^{11}_2}{C^{15}_3} = \frac{4 \cdot 55}{455} = \boxed{.4835}$$

$$p(2) = \frac{C^4_2 C^{11}_1}{C^{15}_3} = \frac{6 \cdot 11}{455} = \boxed{.1451}$$

$$p(3) = \frac{C^4_3 C^{11}_0}{C^{15}_3} = \frac{4 \cdot 1}{455} = \boxed{.0088}$$

(b)




(c) $\mu = n\left(\frac{M}{N}\right) = 3\left(\frac{4}{15}\right) = \frac{12}{15} = \boxed{.8}$

$$\sigma^2 = n\left(\frac{M}{N}\right)\left(\frac{N-M}{N}\right)\left(\frac{N-n}{N-1}\right) = 3\left(\frac{4}{15}\right)\left(\frac{11}{15}\right)\left(\frac{12}{14}\right) = \frac{1584}{3150} = \boxed{.5029}$$

(d) $\sigma = \sqrt{\sigma^2} \approx .7091$

$(\mu \pm 2\sigma) \rightarrow [-.6182, 2.2182] \longrightarrow P(0 \le x \le 2) =$

$(\mu \pm 3\sigma) \rightarrow [-1.3273, 2.9273]$ $\quad P(0) + P(1) + P(2)$

( SAME ) $\quad = \underline{.9912}$ ✓

54. $N = 8$, $\underbrace{(\text{SUCCESS} = \text{BLUE})}_{\text{MY (ARBITRARY) CHOICE}}$ $M = 5$, $N - M = 3$

$n = 3$

(a) $$p(2) = \frac{C^5_2 C^3_1}{C^8_3} = \frac{10 \cdot 3}{56} \approx \boxed{.2679}$$

(b) $$p(0) = \frac{C^5_0 C^3_3}{C^8_3} = \frac{1}{56} \approx \boxed{.0179}$$

(c) $$p(3) = \frac{C^5_3 C^3_0}{C^8_3} = \frac{10 \cdot 1}{56} \approx \boxed{.1786}$$

55.

| $x$ | $p(x) = \dfrac{C^2_x C^4_{3-x}}{C^6_3}$ |
|---|---|
| 0 | $\frac{1 \cdot 4}{20} = .2$ |
| 1 | $\frac{2 \cdot 6}{20} = .6$ |
| 2 | $\frac{1 \cdot 4}{20} = .2$ |

(SAME A 4.90)

56. (a) $$p(x) = \frac{C^2_x C^3_{2-x}}{C^5_2}$$

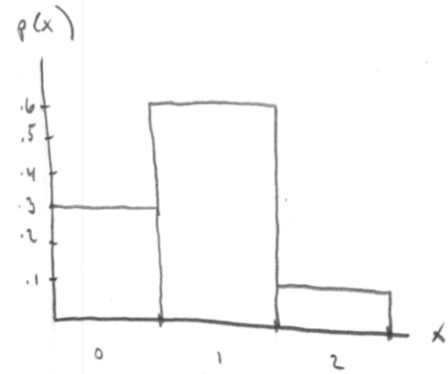
(b) $\mu = n\left(\frac{M}{N}\right) = 2 \cdot \frac{2}{5} = \boxed{.8}$

$\sigma = n\left(\frac{M}{N}\right)\left(\frac{N-M}{N}\right)\left(\frac{N-n}{N-1}\right)$

$= 2\left(\frac{2}{5}\right)\left(\frac{3}{5}\right)\left(\frac{3}{4}\right) = \frac{36}{100} = .36$

(c)

| $x$ | $p(x) = \frac{C^2_x C^3_{2-x}}{C^5_2}$ |
|---|---|
| 0 | $\frac{1 \cdot 3}{10} = .3$ |
| 1 | $\frac{2 \cdot 3}{10} = .6$ |
| 2 | $\frac{1 \cdot 1}{10} = .1$ |




57. (a) HYPERGEOMETRIC SINCE $\frac{n}{N} = \frac{3}{8} = .375 \geq .05$

"RULE OF THUMB"

(b) $P(3) = \frac{C^5_3 C^3_0}{C^8_3} = \frac{10 \cdot 1}{56} = \boxed{.1786}$

(c) $P(0) = \frac{C^5_0 C^3_3}{C^8_3} = \frac{1 \cdot 1}{56} = \boxed{.0176}$

(d) $P(x \leq 1) = P(0) + P(1) = .0176 + \frac{C^5_1 C^3_2}{C^8_3}$

$= .0176 + .2679 = \boxed{.2855}$

58. $N = 10$, $M = 5$, $n = 4$

(a) $P(x=4) = \dfrac{C^5_4 \, C^5_0}{C^{10}_4} = \dfrac{5 \cdot 1}{210} = \boxed{.0238}$

(b) $P(x \le 3) = 1 - P(x=4) = 1 - .0238 = \boxed{.9762}$

(c) $P(2 \le x \le 3) = P(x=2) + P(x=3)$

$$= \frac{C^5_2 \, C^5_2}{C^{10}_4} + \frac{C^5_3 \, C^5_1}{C^{10}_4} = \frac{10 \cdot 10 + 10 \cdot 5}{210}$$

$$\approx \boxed{.7143}$$