3.3 (29. 33, 38, 41)

A+

29.

a. $E(X) = 1\times0.05 + 2\times0.1 + 4\times0.35 + 8\times0.4 + 16\times0.1 = 6.45$

b. $V(X) = (1-6.45)^2\times0.05 + (2-6.45)^2\times0.1 + (4-6.45)^2\times0.35 + (8-6.45)^2\times0.4 + (16-6.45)^2\times0.1 = 15.6475$

c. The standard deviation of x is $\sqrt{V(X)} = 3.956$

d. $V(X) = E(X^2) - [E(X)]^2 = 57.5725 - 41.6025 = 15.6475$

33.

a. $E(X^2) = P$

b. $V(X) = E(X^2) - [E(X)]^2 = P - P^2 = P(1-P)$

c. $E(X^{79}) = P$

38.

$E(\frac{1}{X}) = 1\times\frac{1}{6} + \frac{1}{2}\times\frac{1}{6} + \frac{1}{3}\times\frac{1}{6} + \frac{1}{4}\times\frac{1}{6} + \frac{1}{5}\times\frac{1}{6} + \frac{1}{6}\times\frac{1}{6} = \frac{49}{120} > \frac{1}{3.5}$

gamble

41.

$h(x) = aX + b$, $E(h(x)) = aE(x) + b$

$V(h(X)) = \sigma^2_{h(x)} = \sum_D \{h(x) - E(h(X))\}^2 \cdot P(x)$

$= \sum (aX - a\mu)^2 \cdot P(X)$

$= a^2 \cdot \sigma_X^2$

A

3.4 (46, 47, 48, 54)

a. $b(3;8,0.35) = (0.35)^3 \cdot (1-0.35)^5 \binom{8}{3} = 0.279$

b. $b(5;8,0.6) = (0.6)^5 \cdot (1-0.6)^3 \binom{8}{5} = 0.279$

c. $P(3 \le X \le 5)$; $\sum_{x=1}^{5} b(x;7,0.6) - \sum_{x=1}^{2} (x;7,0.6) = 0.745$

d. $b(1;9,0.1) = (0.1)^1 \cdot (1-0.1)^8 \binom{9}{1} = 0.613$

47. a. $B(4;15,0.3) = \sum_{y=1}^{x} B(y;15,0.3) = 0.515$

b. $b(4;15,0.3) = \binom{15}{4}(0.3)^4(1-0.3)^{11} = 0.219$

c. $b(6;15,0.7) = \binom{15}{6}(0.7)^6(1-0.7)^9 = 0.012$

d. $B(4;15,0.3) - B(1;15,0.3) = 0.48$

e. $1 - B(1;15,0.3) = 1 - B(1;15,0.3) = 0.965$

f. $B(1;15,0.7) =$

g. $B(5;15,0.3) - B(2;15,0.3) = 0.595$

48.

a. $P(X \le 2) = B(2;25,0.05) = 0.873$

b. $P(X \ge 5) = 1 - B(4;25,0.05) = 0.007$

c. $P(1 \le X \le 4) = B(4;25,0.05) - B(0;25,0.05) = 0.277$

d. $P = (1-0.05)^{25} = 0.277$

e. $\sigma_X = \sqrt{np(1-p)} = 1.07$

54. X = the number of customers want oversize

a. $P(X \ge 6) = 1 - B(5;10,0.6) = 0.633$

b. $\sigma_X = \sqrt{np(1-p)} = \sqrt{10 \times 0.6 \times 0.4} = 1.55$

$P(X \le 1) = B(1;10,0.6) = 0.067$

c. $P(3 \le X \le 7) = B(7;10,0.6) - P(2;10,0.6)$

$= 0.821$

3.5 (68, 69, 72, 75)

Hypergeometric distribution

$n = 6 \quad M = 12 \quad N = 20$

b.

$P(X=2) = h(2,6,12,20) = 0.1192$

$P(X \le 2) = \sum_{y=0}^{2} h(y,6,12,20) = 0.9819$

$P(X \ge 2) = 1 - \sum_{y=0}^{1} h(y,6,12,20)$

c.

$E(X) = n \cdot \frac{M}{N} = \frac{18}{5}$

$\sigma_X = \sqrt{V(X)} = \sqrt{\frac{(N-n)}{(N-1)} \cdot n \cdot \frac{M}{N} \cdot \left(1-\frac{M}{N}\right)} = 1.03$

69.

a. $P(X=5) = h(5,6,7,12) = 0.114$

b. $P(X \le 4) = \sum_{x=0}^{4} h(x,6,7,12) = 0.879$

c.

$\sigma_X = \sqrt{V(X)} = \sqrt{\frac{(12-6)}{12-1} \cdot 6 \cdot \frac{7}{12} \cdot \left(1-\frac{7}{12}\right)} = 0.8$

$P(X > 4.5) = P(5 \le X \le 6) = 0.121$

d.

72.

a. $P = h(x;6,4,11)$

$= \frac{\binom{4}{x}\binom{7}{6-x}}{\binom{11}{6}}$

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

15.

a. $p = nb(x; 2, 0.5) = \binom{x+1}{1}(0.5)^2(1-0.5)^x$

b. $P = nb(2; 2, 0.5) = 0.188$

c. $P(2 \le x \le 4) = nb(\text{[illegible]}; 2, 0.5) + nb(2; 2, 0.5) + 0.25$
$= 0.688$

d.
$E(X) = \frac{r(1-p)}{p} = \frac{2(1-0.5)}{0.5} = 2$

~~e. f~~ $\cancel{P(8;5) - P(5;5)}$

84. $n = 10000,\ p = 0.001$

so $\mu = np = 10$

a. $E(X) = \mu = 10$

$\sigma_x = \sqrt{npq} = 3.16$

b. $P(X > 10) = 1 - F(10;10) = 1 - 0.583 = 0.417$

c. $P(X = 0) = F(0;10) = \dfrac{e^{-10}10^{0}}{0!}$

86. $\mu = 5$

a. $P = F(4;5) - F(3;5)$.

b. $P = \cancel{F(4;5)}\ 1 - F(3;5) = 0.735$

c. $\mu \cdot \dfrac{45}{60} = 3.75$

87.

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

b. $P = F(0;2) = 0.135$

c. $\frac{1}{2}$, $\mu = 2$

79.

a. $P = F(8;5) = 0.932$

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

c. $P = 1 - F(8;5) = 0.068$

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

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