20170269 정은경 HW

5.2)

$P(X=3)$

$= \binom{12}{3}\left(\frac{1}{2}\right)^3\left(\frac{1}{2}\right)^9$

$= 220 \cdot \frac{1}{4096} = 0.0537$

5.4) $n=5$, $p=0.175$, $q=0.25$.

(a) $P(X=2) = \binom{5}{2}(0.175)^2(0.25)^3$

$= 0.0878$

(b) $P(X\leq 3) = P(X=0)+P(X=1)+P(X=2)+P(X=3)$

$= \binom{5}{0}(0.175)^0(0.25)^5 + \binom{5}{1}(0.175)^1(0.25)^4 + \binom{5}{2}(0.175)^2(0.25)^3 + \binom{5}{3}(0.175)^3(0.25)^2$

$= 0.3671$

5.5) $p=0.3$ $n=20$, $q=0.70$

(a) $P(X\geq 10) = P(X=10)+P(X=11)+P(X=12)+P(X=13)+P(X=14)+P(X=15)+P(X=16)+P(X=17)+P(X=18)+P(X=19)+P(X=20)$

$\Rightarrow \binom{20}{10}(0.3)^{10}(0.7)^{10} + \binom{20}{11}(0.3)^{11}(0.7)^9 + \binom{20}{12}(0.3)^{12}(0.7)^8 + \binom{20}{13}(0.3)^{13}(0.7)^7 + \binom{20}{14}(0.3)^{14}(0.7)^6 + \binom{20}{15}(0.3)^{15}(0.7)^5 + \binom{20}{16}(0.3)^{16}(0.7)^4 + \binom{20}{17}(0.3)^{17}(0.7)^3 + \binom{20}{18}(0.3)^{18}(0.7)^2 + \binom{20}{19}(0.3)^{19}(0.7)^1 + \binom{20}{20}(0.3)^{20}(0.7)^0 = 0.0478.$

(b) $P(X\leq 4) = P(X=0)+P(X=1)+P(X=2)+P(X=3)+P(X=4)$

$= 0.2375$

(c) $P(X=5) = \binom{20}{5}(0.3)^5(0.7)^{15}$

$= 0.1789.$

5.6) $n=6$, $p=\frac{1}{2}$, $q=\frac{1}{2}$

(a) $P(2\leq x\leq 5) = P(X=2)+P(X=3)+P(X=4)+P(X=5)$

$= 0.8751$

(b) $P(x<3) = P(X=0)+P(X=1)+P(X=2)$

$= 0.3438.$

5.15) $n=5$, $p=0.4$, $q=0.6$

(a) $P(X=0) = \binom{5}{0}(0.4)^0(0.6)^5$

$= 0.0778$

(b) $P(X<2) = P(x=0)+P(x=1)$

$= \binom{5}{0}(0.4)^0(0.6)^5 + \binom{5}{1}(0.4)^1(0.6)^4$

$= 0.3370.$

(c) $P(X>3) = P(X=4)+P(x=5)$

$= \binom{5}{4}(0.4)^4(0.6)^1 + \binom{5}{5}(0.4)^5(0.6)^0$

$= 0.0870$

5.16)

- Probability of 2-engines plane make a successful flight

$n=2$, $p=0.4$, $q=0.6$

$P(X=1)+P(X=2)$

$= \binom{2}{1}(0.4)^1(0.6)^1 + \binom{2}{2}(0.4)^2(0.6)^0$

$= 0.64$

- Probability of 4-engines plane make a successful flight

$n=4$, $p=0.4$.

$P(X=2)+P(X=3)+P(X=4)$

$= \binom{4}{2}(0.4)^2(0.6)^2 + \binom{4}{3}(0.4)^3(0.6)^1 + \binom{4}{4}(0.4)^4(0.6)^0 = 0.5248$

∴ 2-engines has the higher probability of successful flight.

5.20)

P(Cocaine) = 0.225

P(Marijuana) = 0.544

P(others) = 0.231

(a) $f(2,5,3; 0.225, 0.544, 0.231, 10)$

$= \left(\frac{10!}{2!5!3!}\right)(0.225)^2(0.544)^5(0.231)^3$

$= 0.0023.$

(b) $f(0,10,0; 0.225, 0.544, 0.231, 10).$

$\Rightarrow \frac{10!}{10!}(0.225)^0(0.544)^{10}(0.231)^0$

$= 0.0023.$

(c) $f(0,10; 0.225, 0.7795).$

$= \binom{10}{0}(0.225)^0(0.7795)^{10}$

$= 0.082.$

5.23)

$f(3,3,1,2, 0.4, 0.2, 0.3, 0.1)$

$= \frac{9!}{3!3!1!2!}(0.4)^3(0.2)^3(0.3)^1(0.1)^2$

$= 0.0077$

5.22)

$f(5,2,1; 0.5, 0.25, 0.25, 8)$

$\Rightarrow \frac{8!}{5!2!1!}(0.5)^5(0.25)^2(0.25)^1 = 0.0820$

5.29)

$\frac{\binom{5}{4}\binom{4}{2}}{\binom{9}{6}} = 0.3571$

5.33)

(a) $\frac{\binom{12}{2}\binom{40}{5}}{\binom{52}{7}} = 0.3246.$

(b) $1 - \frac{\binom{4}{0}\binom{48}{7}}{\binom{52}{7}} = 0.4497.$

5.34)

$\frac{\binom{4}{2}\binom{5}{3}}{\binom{9}{5}} = \frac{!}{} 0.4761$

5.46)

(a) $\frac{\binom{2}{1}\binom{13}{4}}{\binom{15}{5}} = 0.4962$

(b) $\frac{\binom{2}{2}\binom{13}{3}}{\binom{15}{5}} = 0.0952$

5.47)

(a) $\frac{\binom{3}{0}\binom{17}{5}}{\binom{20}{5}} = 0.3991$

(b) $\frac{\binom{3}{2}\binom{17}{3}}{\binom{20}{5}} = 0.1316.$

5.49)

$b^*(10; 5, 0.3) = \binom{9}{4}(0.3)^5(0.7)^5$

$= 0.515$

5.50)

(a) $b^*(7;3,0.5) = \binom{6}{2}(0.5)^3(0.5)^4 = 0.1172$

(b) $b^*(4;1,0.5) = \binom{3}{0}(0.5)^1(0.5)^3 = 0.0625$

5.52)

$b^*(8;2,\frac{1}{6}) = \binom{7}{1}(\frac{1}{6})^2(\frac{5}{6})^6 = 0.0651$

5.54)

(a) $g(5;\frac{2}{3}) = (\frac{2}{3})(\frac{1}{3})^4 = 0.00823.$

(b) $b^*(5;3,\frac{2}{3}) = \binom{4}{2}(\frac{2}{3})^3(\frac{1}{3})^2.$

$= 0.1975$

5.55)

(a) $g(3;0.7) = 0.7(0.3)^2 = 0.0630.$

(b) $P(X<4) = \sum_{x=1}^{3} g(x;0.7)$

$= \sum_{x=1}^{3}(0.7)(0.3)^{x-1}$

$= 0.9730.$

5.80)

$X \sim Po(2.7)$

(a) $P(X \le 4) = P(X=0)+P(X=1)+P(X=2)+$

$P(X=3)+P(X=4)$

$= \frac{e^{-2.7}(2.7)^0}{0!} + \frac{e^{-2.7}(2.7)^1}{1!} + \frac{e^{-2.7}(2.7)^2}{2!} + \frac{e^{-2.7}(2.7)^3}{3!}$

$+ \frac{e^{-2.7}(2.7)^4}{4!} = 0.8629.$

(b) $P(X<2) = P(X \le 1) = P(X=0)+P(X=1)$

$= \frac{e^{-2.7}(2.7)^0}{0!} + \frac{e^{-2.7}(2.7)^1}{1!} = e^{-2.7}[1+2.7]$

$= 0.2489.$

(c) $P(X>10) = 1-P(X \le 10)$

$\Rightarrow 1-0.2730 = 0.7269$

5.82)

$X \sim Po(0.2 \times 5)$

$P(X>1) = 1-P(X \le 1)$

$\Rightarrow 1-0.7358 = 0.2642.$

5.84)

(a) $X \sim Po(\frac{5}{3})$

$P(X=0) = \frac{e^{-\frac{5}{3}}(\frac{5}{3})^0}{0!} = 0.0067$

(b) $P(X \ge 5) = 1-P(X \le 4) = 1-0.6160$

$= 0.3840.$

5.62)

(a) $X \sim B(1875, 0.004)$

(a) $P(X \le 5) = P(X \le 4)$

$= P(X=0)+P(X=1)+P(X=2)+P(X=3)+P(X=4)$

$\eta = np = 1875 \times 0.004 = 7.5.$

$\rightarrow \sum_{x=0}^{4} p(x;7.5) \approx 0.1321$

(b) $P(8 \le X \le 10)$

$\sum_{x=0}^{10} p(x;7.5) - \sum_{x=0}^{7} (x;7.5)$

$\approx 0.8622 - 0.5246 =$

$0.3376.$

5.61)

$\lambda = np = 0.001 \times 10000 = 10.$

$P(6 \le X \le 8) = \sum_{x=0}^{8} P(X;10) - \sum_{x=0}^{5} P(X;10)$

$\approx 0.3328 - 0.0671 = 0.2657.$

5.64)

$\mu = np = 10.$

$\sigma^2 = npq = 0.9999 \approx 10.$

5.17)

$X \sim B(5, 0.7)$

$\mu = np = 3.5.$

$\sigma^2 = npq = 3.5 \times 0.3 = 1.05.$

5.16) $b(x; 6, \frac{1}{2})$

(a) $P(2 \le X \le 5) = P(X=2) + P(X=3) +$

$P(X=4) + P(X=5)$

$= 0.8051.$

(b) $P(X<3) = P(X=0) + P(X=1) + P(X=2)$

$= 0.3438.$