Homework #8 Ch. 4-2 (1, 3, 7, 9, 12, 13, 16, 21)

1) a) $\binom{7}{1}(0.3)^1(1-0.3)^6 = 0.2471$

b) $\binom{7}{2}(0.3)^2(1-0.3)^5 = 0.3177$

c) $\binom{7}{0}(0.3)^0(1-0.3)^7 = 0.0824$

d) $\binom{7}{5}0.3^5 \cdot 1-0.3^2 + \binom{7}{6}0.3^6 \cdot 1-0.3^1 + \binom{7}{7}0.3^7 \cdot 1-0.3^0$

$= 0.0288$

e) $X \sim Bin(7, 0.3)$ $\quad 7(0.3) = 2.1$

f) $7(0.3)(1-0.3) = 1.47$

3) a) $\binom{4}{2}0.6^2 \cdot 1-0.6^2 = 0.3456$

b) $1-\binom{8}{0}0.2^0 \cdot 1-0.2^8 - \binom{8}{1}0.2^1 \cdot 1-0.2^7 - \binom{8}{2}0.2^2 \cdot 1-0.2^6$

$= 0.2031$

c) $\binom{5}{0}0.4^0 \cdot 1-0.4^5 + \binom{5}{1}0.4^1 \cdot 1-0.4^4 + \binom{5}{2}0.4^2 1-0.4^3$

$= 0.6826$

7) a) $\frac{20!}{5!\,15!}(0.15)^5(0.85)^{15} = 0.1028$

b) $0.1028 + \frac{20!}{1!\,19!} \cdot 0.15^1 \cdot 0.85^{19} + \frac{20!}{2!\,18!} \cdot 0.15^2 \cdot 0.85^{18} + \frac{20!}{3!\,17!} \cdot (0.15)^3(0.85)^{17}$

$= 0.6477$

c) $\frac{20!}{0!\,20!} \cdot 0.15^0 \cdot 0.85^{20} = 0.0388$

d) $20(0.15) = 3$

e) $\sqrt{20(0.15)(0.85)} = 1.597$

9) a) $1 - \frac{5!}{4!\,1!} \times 0.6^4 \times 0.4^1 - \frac{5!}{5!\,0!} \times 0.6^5 \times 0.4^0 = 0.6630$

b) $\frac{5!}{2!\,3!} \times 0.6^2 \times 0.4^3 + \frac{5!}{3!\,2!} \times 0.6^3 \times 0.4^2 = 0.5760$

12) a) $1 - 0.60(0.20) = 0.08$

b) $\frac{20!}{2!\,18!} \times 0.08^2 \times 0.92^{18} = 0.2710$

13) a) $0.90 + 0.06 = 0.96$

b) $1 - \frac{10!}{0!\,10!} \times 0.04^0 \times 0.96^{10} - \frac{10!}{1!\,9!}(0.04)^1(0.96)^9$
$= 0.0582$

16) a) $1 - \frac{10!}{0!\,10!} \times 0.1^0(0.9)^{10} - \frac{10!}{1!\,9!} \cdot 0.1^1(0.9)^9 = 0.2639$

b) $1 - \frac{10!}{0!\,10!}(0.2)^0(0.8)^{10} - \frac{10!}{1!\,9!}(0.2)^1(0.8)^9 = 0.6242$

c) $1 - \frac{10!}{0!\,10!}(0.02)^0(0.98)^{10} - \frac{10!}{1!\,9!}(0.02)^1(0.98)^9 = 0.0162$

d) $\frac{n!}{0!\,n!}(0.2)^0(0.8)^n = 0.8^n \leq 0.01$ $\ln$ both sides
$n \ln 0.8 \leq \ln 0.01$
$n \geq 20.6$

21) a) $\frac{5!}{3!\,2!} \times 0.7^3 \times 0.3^2 + \frac{5!}{4!\,1!} \times 0.7^4 \times 0.3^1 + \frac{5!}{5!\,0!} \times 0.7^5 \times 0.3^0$
$= 0.8369$

b) $\frac{7!}{4!\,3!} \times 0.7^4 \times 0.3^3 + \frac{7!}{5!\,2!} 0.7^5 \times 0.3^2 + \frac{7!}{6!\,1!} 0.7^6 \times 0.3^1 + \frac{7!}{7!\,0!}(0.7)^7(0.3)^0$
$= 0.8374$

$\frac{9!}{5!\,4!} 0.7^5 0.3^4 + \frac{9!}{6!\,3!} \cdot 0.7^6 \times 0.3^3 + \frac{9!}{7!\,2!}(0.7)^7(0.3)^2 +$

$\frac{9!}{8!\,1!}(0.7)^8(0.3)^1 + \frac{9!}{9!\,0!}(0.7)^9(0.3)^0 = 0.901$

1) a) $\frac{e^{-4} 4^1}{1!} = 0.0733$

b) $\frac{e^{-4} 4^0}{0!} = 0.0183$

c) $0.0733 + 0.0183 = 0.0916$

d) $1 - 0.0183 - 0.0733 = 0.9084$

e) $\lambda = 4$

f) $\sqrt{\lambda} = 2$

3) a) $\frac{e^{-5} 5^6}{6} = 0.1462$

b) $\frac{e^{-5} 5^4}{4} = 0.1247$

c) $\frac{e^{-5} 5^4}{4} = 0.2507$

d) $\mu_x = 5$

e) $\sigma_x = \sqrt{5} = 2.23$

8) a) $(4^3)(2.71828^{-4})/3! = 0.1954$

b) $(4 \cdot 3^8)(2.71828)^{-4 \cdot 3}/8! = 0.0655$

c) $1 - \frac{(4 \cdot 2^0)(e^{-4 \cdot 2})}{0!} - \frac{(4 \cdot 2^1)(e^{-4 \cdot 2})}{1!} - \frac{4 \cdot 2^2)(e^{-4 \cdot 2})}{2!} - \frac{(4 \cdot 2^3)(e^{-4 \cdot 2})}{3!} = 0.9576$

13) a) $e^{-20} 20^{15}/15! = 0.0516$

b) $\frac{15!}{10!(15-10)!} 0.60^{10}(1-0.60)^5 = 0.1859$

c) $p = 0.60$ d) $(0.0516)(0.136) = 0.0096$

17) a) $25/2 = 12.5$

b) $14/2 = 7$

c) $\sqrt{\frac{12.5}{2}} = 2.5$

d) $\sqrt{\frac{7}{2}} = 1.87$

e) $\sqrt{6.25} + 3.5 = 3.122$