Chapter 6 Homework

1. a) $P(x=1) = 0.17$

   b) $P(x \leq 1) = P(x=1) + P(x=0)$
   $$= 0.03 + 0.17 = 0.20$$

   c) $P(x \geq 3) = P(x=3) + P(x=4) + P(x=5)$
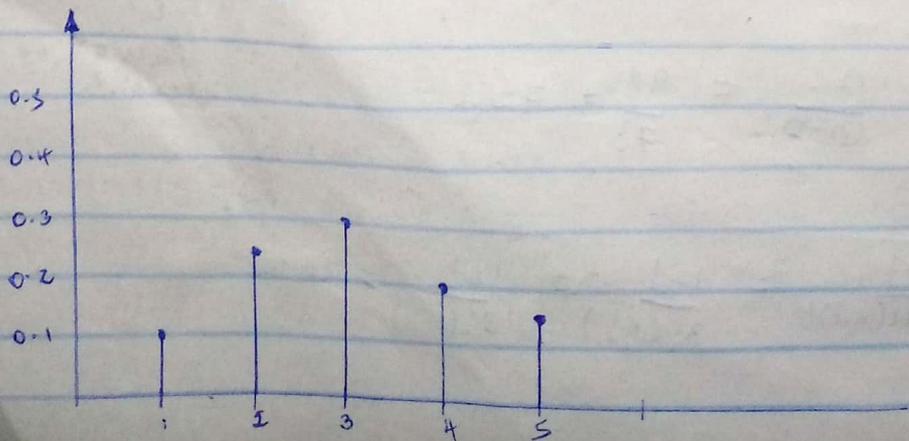 $$= 0.37 + 0.15 + 0.12 \qquad = 0.58$$

   d) $P(0 \leq x \leq 2) = P(x=0) + P(x=1) + P(x=2)$
   $$= 0.03 + 0.17 + 0.22 = 0.42$$

2. a)

X	1	2	3	4	5
P(x=x)	0.1	0.25	0.3	0.2	0.15

   $n = 80$

   b) This is approximate probability. It follows a normal distribution when graphed peaking at 0.3

c) $P(X=3) = 0.3$

$P(X \geq 3) = P(X=4) + P(X=5) + P(X=3)$

$\qquad = 0.3 + 0.2 + 0.15 = 0.65$

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

$\qquad = 0.25 + 0.3 + 0.2 = 0.75$

$P(x<4) = P(x=1) + P(x=2) + P(x=3)$

$\qquad = 0.1 + 0.25 + 0.3$

$\qquad = 0.65$

3.

		$P(x=x)$
Office building	10M	— 0.15
Theatre	5M	— 0.30
Parking	2M	— 0.45
lose		= 0.10

X	10M	5M	2M	0
$P(x=x)$	0.15	0.3	0.45	0.10

$\mu = \Sigma X P(x) = 10M \times 0.15 + 5M \times 0.3 + 2 \times 0.45 + 0 \times 0.10$

$\qquad = 3.9 \text{ million}$

$\sigma = \sqrt{\Sigma x^2 P(x) - \mu^2}$

$\qquad = \sqrt{24.3 - 3.9^2} = 3.015 \text{ Million}$

4. $C(n,r) = \dfrac{n!}{r!(n-r)!} = \dfrac{9!}{2!(7!)} = 36$

$P(n,r) = \dfrac{n!}{(n-r)!} = \dfrac{9!}{7!} = 72$

5. $C(n,r) = \dfrac{n!}{r!(n-r)!} = \dfrac{12!}{3!(9!)} = \dfrac{12!}{3!(9!)} = 220$

$P(n,r) = \dfrac{n!}{(n-r)!} = \dfrac{12!}{9!} = 1320$

6. a) $P(x=5)$ for $n=8$ $P=0.70$

   $P(x=5) = 8^C5 (0.7)^5 (0.3^3)$

   $= 0.2541$

b) $P(x=3)$ $n=4$ and $P=0.40$

   $P(x=3) = 4^C3 (0.4^3) 0.6^1$

   $= 0.1536$

c) $P(x=2)$ for $n=6$ and $P=0.30$

   $P(x=2) = 6^C2 \ 0.3^2 \ 0.7^4$

   $= 0.3241$

7. $n=16$

   $P=0.6$

a) at most 7

   $P(x \le 7) = P(x=0) + P(x=1) + P(x=2) + P(x=3) + P(x=4) + P(x=5) + P(x=6) + P(x=7)$

   $= 16^C0 (0.6^0) 0.4^{16} + 16^C1 (0.6^1)(0.4)^{15} + 16^C2 (0.6)^2 0.4^{14} +$

   $= 16^C3 (0.6)^3 0.4^{13} + 16^C4 (0.6)^4 0.4^{12} + 16^C5 (0.6)^5 0.4^{11} +$

   $16^C6 (0.6)^6 0.4^{10} + 16^C7 \times 0.6^7 \times 0.4^9$

   $= 4.295 \times 10^{-7} + 1.03 \times 10^{-5} + 1.1596 \times 10^{-4} + 8.0117 \times 10^{-4} + 3.947 \times 10^{-3} +$

   $0.01425 + 0.03917 + 0.08395$

   $= 0.1423$

b) $P(x \ge 10) = P(x=10) + P(x=11) + P(x=12) + P(x=13) + P(x=14) + P(x=15) +$

   $P(x=16)$

   $= 16^C10 (0.6^{10}) 0.4^6 + 16^C11 (0.6)^{11} 0.4^5 + 16^C12 (0.6)^{12} 0.4^4 +$

   $16^C13 (0.6^{13}) 0.4^3 + 16^C14 (0.6)^{14} 0.4^2 + 16^C15 (0.6)^{15} 0.4^1 +$

   $16^C16 (0.6)^{16} 0.4^0$

   $= 0.5271$

c) $P(8 \leq X \leq 11) = P(X=8) + P(X=9) + P(X=10) + P(X=11)$

$= 16^C_8 (0.6)^8 0.4^8 + 16^C_9 (0.6)^9 0.4^7 + 16^C_{10} (0.6^{10}) 0.4^6 +$

$16^C_{11} (0.6)^{11} 0.4^5$

$= 0.6912$

8. a) $P(X \leq 1)$ for $\lambda = 5$

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

$= \dfrac{5^0 e^{-5}}{0!} + \dfrac{5^1 e^{-5}}{1!}$

$= 6.7379 \times 10^{-3} + 0.0336 = 0.04042$

b) $P(X=2)$ for $\lambda = 2.5$

$P(X=2) = \dfrac{2.5^2 e^{-2.5}}{2!} = 0.2565$

9. $\lambda = 1.7$

$P(X=3) = \dfrac{1.7^3 e^{-1.7}}{3!} = 0.1496$

10. $\lambda = 5.4$

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

$= \dfrac{5.4^0 e^{-5.4}}{0!} + \dfrac{5.4^1 e^{-5.4}}{1!} + \dfrac{5.4^2 e^{-5.4}}{2!} + \dfrac{5.4^3 e^{-5.4}}{3!}$

$= 4.5165 \times 10^{-3} + 0.02439 + 0.06585 + 0.1185$

$= 0.2133$

11.

X	350	-10000
P(X)	0.998	0.002

$-100\,000 \times 0.002 = 149.3$

$\mu = X\,P(X) = 350 \times 0.998 \approx 149.7 / \approx 150$

$\sigma = \sqrt{X^2 P(X) - \mu^2} = \sqrt{350^2 \times 0.998 + 100000^2 \times 0.002 - 149.3^2}$

$= 4467.60$