

Problem 1

(a) $E(x) = 2(.3) + 5(.15) + 7(.2) + 8(.35) = 5.55$

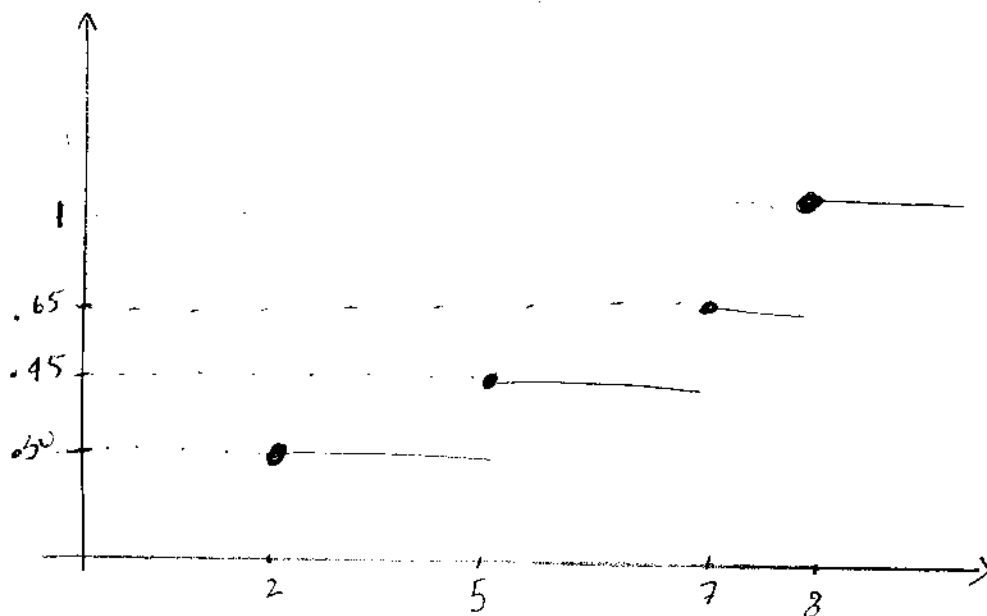
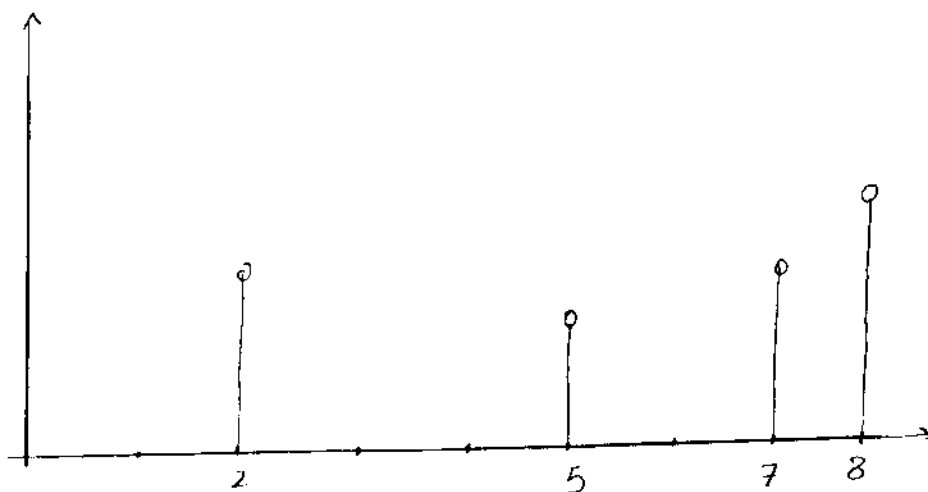
$E(3x - 90) = 3E(x) - 90 = 3(5.55) - 90 = -73.55$

$V(x) = (4)(.3) + (25)(.15) + (49)(.2) + (64)(.35) - (5.55)^2$

$\Rightarrow V(x) = 6.3475$

$V(3x - 90) = 9V(x) = 57.1275$

(b)



2- Solve Exercise 31 on Devore page 118. Show all your work.

31.

$$\begin{aligned} \text{a. } & \left\{ \begin{aligned} E(X) &= (13.5)(.2) + (15.9)(.5) + (19.1)(.3) = 16.38, \\ E(X^2) &= (13.5)^2(.2) + (15.9)^2(.5) + (19.1)^2(.3) = 272.298, \\ V(X) &= 272.298 - (16.38)^2 = 3.9936 \end{aligned} \right. \end{aligned}$$

$$\text{b. } \left\{ \begin{aligned} E(25X - 8.5) &= 25 E(X) - 8.5 = (25)(16.38) - 8.5 = 401 \end{aligned} \right.$$

$$\text{c. } \left\{ \begin{aligned} V(25X - 8.5) &= V(25X) = (25)^2 V(X) = (625)(3.9936) = 2496 \end{aligned} \right.$$

$$\text{d. } \left\{ \begin{aligned} E[h(X)] &= E[X - .01X^2] = E(X) - .01E(X^2) = 16.38 - 2.72 = 13.66 \end{aligned} \right.$$

3- Solve Exercise 48 on Devore page 126. Show all your work.

48. Let $S =$ comes to a complete stop, so $p = .25$, $n = 20$

$$\left\{ \begin{aligned} \text{a. } P(X \leq 6) &= B(6; 20, .25) = .786 \end{aligned} \right.$$

$$\left\{ \begin{aligned} \text{b. } P(X = 6) &= b(6; 20, .25) = B(6; 20, .25) - B(5; 20, .25) = .786 - .617 = .169 \end{aligned} \right.$$

$$\left\{ \begin{aligned} \text{c. } P(X \geq 6) &= 1 - P(X \leq 5) = 1 - B(5; 20, .25) = 1 - .617 = .383 \end{aligned} \right.$$

$$\left\{ \begin{aligned} \text{d. } E(X) &= (20)(.25) = 5. \text{ We expect 5 of the next 20 to stop.} \end{aligned} \right.$$

Problem 4

$$\text{Success} = \{(1, 5) (2, 4) (3, 3) (4, 2) (5, 1)\}$$

$$P = \text{Pr. of success in a single trial} = \frac{5}{36}$$

$$q = \text{Pr of failier in a single trial} = 1 - \frac{5}{36} = \frac{31}{36}$$

(a)

$$b(4, 12, \frac{5}{36}) = \binom{12}{4} \left(\frac{5}{36}\right)^4 \left(\frac{31}{36}\right)^8 = .055686$$

(b)

$$B(4, 12, \frac{5}{36}) = \sum_{i=0}^4 b(i, 12, \frac{5}{36})$$

$$= \binom{12}{0} \left(\frac{5}{36}\right)^0 \left(\frac{31}{36}\right)^{12} + \binom{12}{1} \left(\frac{5}{36}\right)^1 \left(\frac{31}{36}\right)^{11} + \binom{12}{2} \left(\frac{5}{36}\right)^2 \left(\frac{31}{36}\right)^{10}$$

$$+ \binom{12}{3} \left(\frac{5}{36}\right)^3 \left(\frac{31}{36}\right)^9 + \binom{12}{4} \left(\frac{5}{36}\right)^4 \left(\frac{31}{36}\right)^8$$

$$(c) \quad b(12, 12, \frac{5}{36}) = \binom{12}{12} \left(\frac{5}{36}\right)^{12} \left(\frac{31}{36}\right)^0 = \left(\frac{5}{36}\right)^{12} = 5.152 \times 10^{-11}$$

Problem 5

(a) 3 failure happened at first 9th trial + 10th fails

$$= \binom{9}{3} (.01)^3 (.99)^6 (.01) = \binom{9}{3} (.01)^4 (.99)^6 = 7.208 \times 10^{-7}$$

(b) Probability of no error in the first 4 + failure of 5th

$$\binom{4}{0} (.01)^0 (.99)^4 (.01) = \binom{4}{0} (.01)^1 (.99)^4 = .0096059$$

(c) $r = 1$:

$$E(Z) = \frac{r}{p} = \frac{1}{.01} = 100$$

$$V(Z) = \frac{r(1-p)}{p^2} = \frac{1(.99)}{.0001} = 9900$$

$r = 3$

$$E(Z) = \frac{3}{.01} = 300$$

$$V(Z) = \frac{3(.99)}{.0001} = 29700$$

Problem 6

(a) $P(\text{defective}) = .04$ $M = .04(250) = 10$ $N = 250$
 $n = 30$

$$= \frac{{}^{10}C_0 {}^{240}C_{30}}{{}^{250}C_{30}} + \frac{{}^{10}C_1 {}^{240}C_{29}}{{}^{250}C_{30}}$$

(b) $P(\text{defective}) = .06$ $M = 15$ $N = 250$ $n = 30$

$$= \frac{{}^{15}C_0 {}^{235}C_{30}}{{}^{250}C_{30}} + \frac{{}^{15}C_1 {}^{235}C_{29}}{{}^{250}C_{30}}$$

(c) probability of Zero def. = $(1 - .04)^{30}$

Pr. of One def = $\binom{30}{1} (.04) (.96)^{29}$

Probability of zero or one = $(1 - .04)^{30} + \binom{30}{1} (.04) (.96)^{29}$