70. An instructor who taught two sections of engineering statistics last term, the first with 20 students and the second with 30, decided to assign a term project. After all projects

had been turned in, the instructor randomly ordered them before grading. Consider the first 15 graded projects.

a. What is the probability that exactly 10 of these are from the second section?

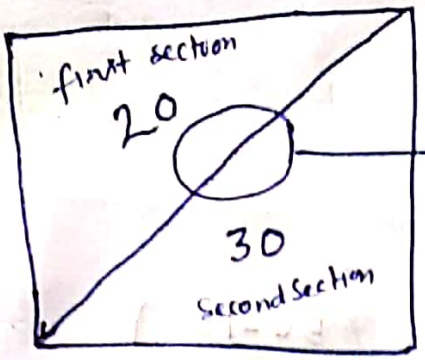
b. What is the probability that at least 10 of these are from the second section?

c. What is the probability that at least 10 of these are from the same section?

d. What are the mean value and standard deviation of the number among these 15 that are from the second section?

e. What are the mean value and standard deviation of the number of projects not among these first 15 that are from the second section?

3.5
Q 70



$n = 15$ (drawn sample)

No.- 50

X: no of grade project from individuals section

a) $p_X(10) = \dfrac{\binom{30}{10}\binom{20}{5}}{\binom{50}{15}}$

b) $P(X \geq 10) = p_X(10) + p_X(11) + p_X(12) + p_X(13) + p_X(14) + p_X(15)$

$= \dfrac{\binom{30}{10}\binom{20}{5}}{\binom{50}{15}} + \dfrac{\binom{30}{11}\binom{20}{4}}{\binom{50}{15}} + \dfrac{\binom{30}{12}\binom{20}{3}}{\binom{50}{15}} + \cdots + \dfrac{\binom{30}{15}\binom{20}{0}}{\binom{50}{15}}$

$= 0.0140$

(c) required prob. $= 0.0140 + \left[\dfrac{\binom{20}{10}\binom{30}{5}}{\binom{50}{15}} + \dfrac{\binom{20}{11}\binom{30}{4}}{\binom{50}{15}} + \dfrac{\binom{20}{12}\binom{30}{3}}{\binom{50}{15}} + \cdots \dfrac{\binom{20}{15}\binom{30}{0}}{\binom{50}{15}}\right]$

$= 0.0140 + 0.3799$

$= 0.3939$ Ans

Signature of Student
Date-

Signature of Supervisor
Date-

d) $E(X) = n \cdot \frac{K}{M}$

$E(X) = 15 \times \frac{30}{50} = 9$

$V(X) = 15 \times \frac{30}{50}\left(1 - \frac{30}{50}\right) \cdot \left(\frac{50-15}{50-1}\right)$

$\sigma_X = 1.6036$

(e) $E(X) = 15 \times \frac{20}{50} = 6$

$V(X) = 15 \times \frac{20}{50}\left(1 - \frac{20}{50}\right)\left(\frac{50-15}{50-1}\right)$

$\sigma_X = \sqrt{V(X)}$

3.3

45 If $a \leq X \leq b$, show that $a \leq E(X) \leq b$.

Soln : $a \leq X \leq b$

Take Expectation of above term,

$E(a \leq X \leq b) = E(a) \leq E(X) \leq E(b)$

$= a \leq E(X) \leq b$

2.3
42 $E(X) = 5$ and $E(X(X-1)) = 27.5$

No.- 50

a) $E(X^2)$?

b) $V(X)$?

c) The general relationship among the quantities $E(X)$, $E(X(X-1))$, and $V(X)$?

Soln a) $E(X^2) = E(X(X-1)+X)$

$= E(X(X-1)) + E(X)$

$= 27.5 + 5$

$= 32.5$

b) $V(X) = E(X^2) - (E(X))^2$

$= 32.5 - 25$

$= 7.5$ Ans

c) $\therefore$ $V(X) = E(X(X-1)+X)$

$V(X) = E(X^2) - (E(X))^2$

$= E(X(X-1)+X) - (E(X))^2$

$V(X) = E(X(X-1)) + E(X) - (E(X))^2$

(46) Compute the following binomial prob. from the formula for $b(x; n, p)$

$$P_X(x) = \binom{n}{x} p^x q^{n-x} ; x = 0, 1, \cdots n$$

a) $b(3; 8, 0.35)$

b) $b(5; 8, 0.6)$

c) $P(3 \le X \le 5)$ when $n = 7$ and $p = 0.6$

d) $P(1 \le X)$ when $n = 9$ and $p = 0.1$

Sol'n

a) $b(3; 8, 0.35) = \binom{8}{3} (0.35)^8 \cdot (0.65)^{8-3}$

b) $b(5; 8, 0.6) = \binom{8}{5} (0.6)^8 (0.4)^{8-5}$

c) $P(3 \le X \le 5) = P(X=3) + P(X=4) + P(X=5)$

$$= \binom{7}{3}(0.6)^3(0.4)^{7-3} + \binom{7}{4}(0.6)^4(0.4)^{7-4} + \binom{7}{4}(0.6)^5(0.4)^{7-5}$$

d) $P(X \ge 1) = 1 - P(X < 1)$

$$= 1 - P(X=0)$$

$$= 1 - \binom{9}{0}(0.1)^0(0.9)^{9-0}$$