STAT 110 A, Probability & Statistics for Engineers I

UCLA Statistics, Fall 2004

http://www.stat.ucla.edu/~dinov/courses_students.html

SOLUTION HOMEWORK 1

Section 2.9/ Problem #29

a. (5)(4) = 20 (5 choices to select a president and 4 choices for a vice-president)

b. (5)(4)(3) = 60

c. $\binom{5}{2} = \frac{5!}{2!3!} = 10$ (Order is not important)

Section 2.9/ Problem #33

a. $\binom{20}{5} = \frac{20!}{5!5!} = 15{,}504$

b. $\binom{8}{4} \bullet \binom{12}{1} = 840$

c. $\dfrac{\binom{8}{4}\binom{12}{1}}{\binom{20}{5}} = \dfrac{840}{15{,}504} = .0542$

d. $\dfrac{\binom{8}{4}\binom{12}{1}}{\binom{20}{5}} + \dfrac{\binom{8}{5}\binom{12}{0}}{\binom{20}{5}} = .0542 + .0036$

Section 2.3/ Problem #40

a. $\frac{12!}{(3!)^4} = 369,600$

b. $\frac{4!}{369,600} = .00006494$

Section 2.4/ Problem #45

a.P(A) = .15 + .10 + .10 + .10 = .45 , P(B) = .10 + .15 = .25, P(A and B) = .10

b..P(A|B) = (A and B)/P(B) = .10/.25 This restricts our attention to only the Black column, and asks what proportion are represented by A. P(B|A) = P(B and A)/P(A) = .10/.45 This restricts our attention to only the A row, and asks what proportion are represented by B.

c.The probability that A occurs given C = P(A and C)/P(C) = .15/.30. The probability that A occurs given C' = P(A and C)/P(C') = .15/.70. Note the probability that sum of A occurring over two conditions where the conditions completely specify the sample space is going to yield the same answer as the simple unconditional probability of A.

b. $P(A \mid C) = \frac{P(A \cap C)}{P(C)} = \frac{.200}{.500} = .400$

Problem 2.5/ # 72

a. $P(O_1 \cap O_2) = P(O_1)P(O_2) = (.44)(.44) = .1936$

b.
$P(A_1 \cap OA_2) + P(B_1 \cap B_2) + P(AB_1 \cap AB_2) + P(O_1 \cap O_2) = .42^2 + .10^2 + .04^2 + .44^2 = .3816$

Section 2.5/ #75

a. P(seam needs work) = .14 = 1 – P(seam doesn't need work) = 1 – P(no rivets are defective) = 1 – P(first isn't defective and second isn't defective and … twenty-fifth isn't defective) = 1 – (1 – q)^25 so .86 = (1 – q)^25, 1 – q = (.86)^1/25, and q = 1 – (.86)^1/25

b. 10 = 1 – (1 – q)^25 and (1 – q)^25 = .90 and q = 1 - .99579

Section 2.5/ #77

Call the probability of the old failing independently P(A)
Call the probability of the new failing independently P(B)
Call the probability of them both failing together X

Then the probability that the old fails = P(A) + X
The probability of the new failing is = P(B) + X

They fail together with probability [P(A) + X][P(B) + X] = (.10 + X)(.05 + X). Setting this equal to zero and solving for X yields the desired probability.