Probability Homework

10.43 Living Arrangements Continued

Age in Years

	15-19	20-24	25-34	35-44	Total
Alone	0.001	0.011	0.031	0.030	0.073
w/ spouse	0.001	0.023	0.155	0.216	
w/ others	0.169	0.123	0.142	0.089	
Total	0.171				

(a.) P(person is 20 years old or older)
$$= 1 - P(\text{person is } 15\text{-}19)$$
$$= 1 - 0.171 = \boxed{0.829}$$

(b.) P(person does not live alone)
$$= 1 - P(\text{lives alone})$$
$$= 1 - 0.073 = \boxed{0.927}$$

10.44 Let X be the number of nonword errors

X	0	1	2	3	4	← problem stated
P(x)	0.1	0.2	0.3	0.3	0.1	X has max of 4

(a) The random variable X is discrete because it has a finite sample space.

(b) "At least one nonword error in terms of X is $\{X \geq 1\}$ or $\{X > 0\}$.
$$P(X \geq 1) = 1 - P(X = 0) = \boxed{0.9}$$

(c) $\{X \leq 2\}$ means "at most 2 nonword errors".
"no more than 2 nonword errors"
$$P(X \leq 2) = P(X = 0) + P(X = 1) + P(X = 2)$$
$$\boxed{= 0.60}$$

$$P(X < 2) = P(X = 0) + P(X = 1) = \boxed{0.3}$$

12.12	Assist Prof	Assoc Prof	Full Prof	Total
women	123	76	73	272
men	215	187	302	704
Total	338	263	375	976

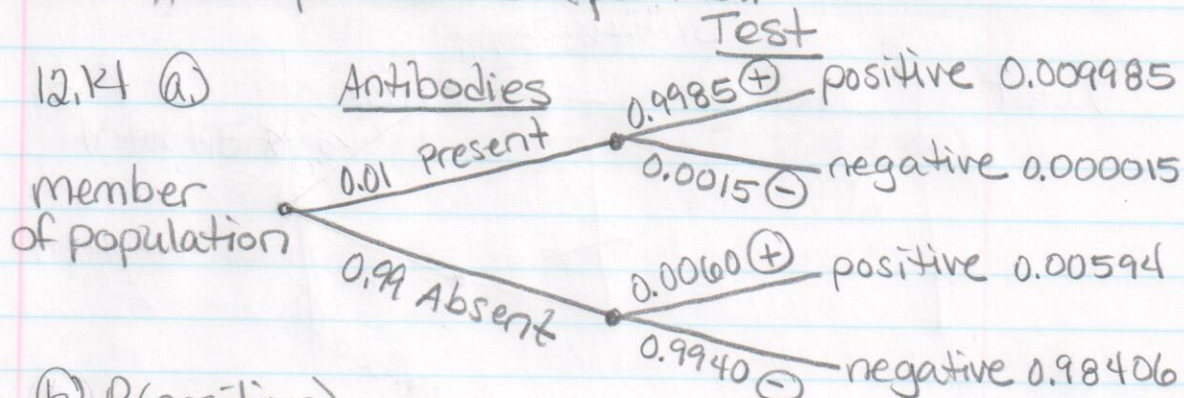ⓐ P(selected professor is a woman) = $\frac{272}{976}$ = 0.2787

≈ 28%

ⓑ P(woman | full) = $\frac{73}{375}$ = 0.1947 ≈ 19%

      B   A

↑
proportion of woman who are
full professors

$$P(B|A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{\frac{73}{976}}{\frac{375}{976}} = \frac{73}{375}$$

ⓒ Gender and rank are not independent because the probability of selecting a woman out of all the professors (part a) is not the same as selecting a woman out of the full professors (part b).

12.14 ⓐ

               Antibodies   Test

member
of population
  0.01 Present   0.9985 ⊕ positive 0.009985
                0.0015 ⊖ negative 0.000015

  0.99 Absent   0.0060 ⊕ positive 0.00594
                0.9940 ⊖ negative 0.98406

ⓑ P(positive) =

0.009985 + 0.00594 = 0.015925

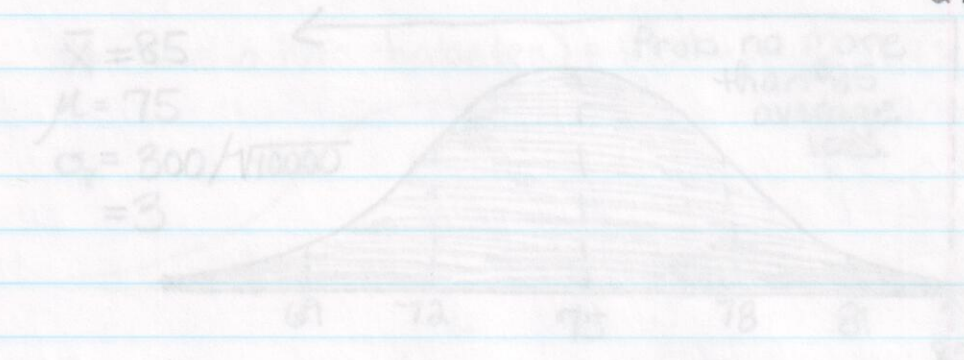| 12.31 + 12.33	success	failure	total
infection	0.02	0.01*	0.03*
no infection	0.84	0.13	0.97
total	0.86	0.14*	

* Given in problem

12.31 The percent of operations that are
successful AND free from infection is 84%.

12.33 P(infection | successful) = $\dfrac{P(\text{infection AND success})}{P(\text{success})}$

$= \dfrac{0.02}{0.86} = 0.0233$

$\approx 2.3\%$