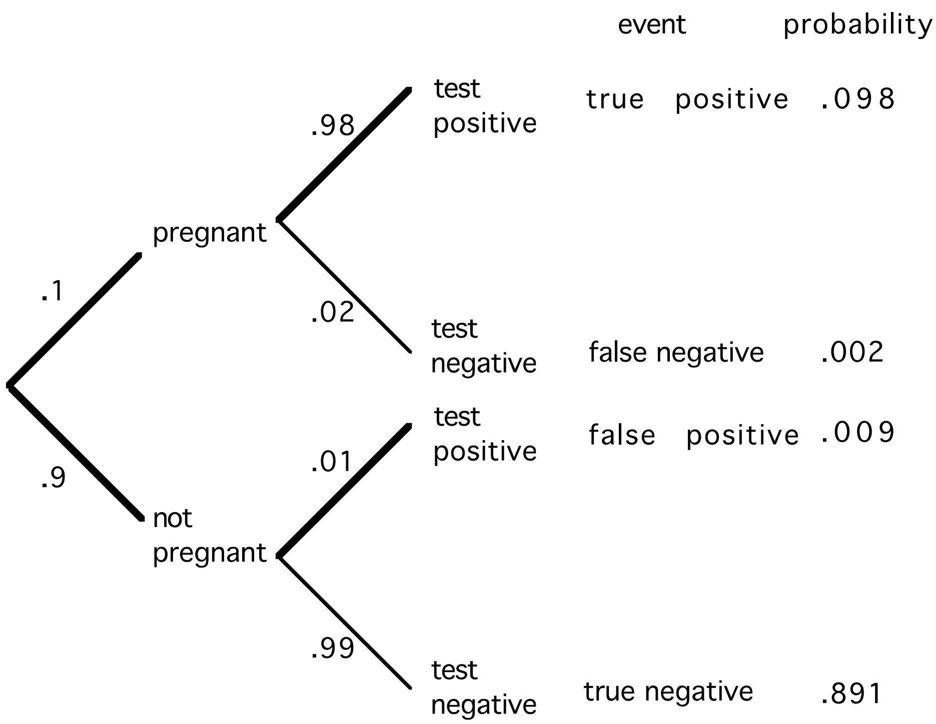
MATH1001 Homework Solution

Chapter 3

3.2.6



(a) There are two ways to test positive. A true positive happens with probability (0.1)(0.98) = 0.098. A false positive happens with probability (0.9)(0.01) = 0.009.

Thus, Pr{test positive} = 0.098 + 0.009 = 0.107.

(b) Using the same reasoning as in part (a),

Pr{test positive} = (0.05)(0.98) + (0.95)(0.01) = 0.049 + 0.095 = 0.0585.

3.3.1

(a) 1213/6549 = 0.1852 $\approx$ 0.185

(b) 247/2115 = 0.1168 $\approx$ 0.117

(c) No; the probability of a person being a smoker depends on whether or not the person has high income, since the answers to (a) and (b) differ.

3.3.2

(a) 634/6549 = 0.0968 $\approx$ 0.097

(b) 1 - 2480/6549 = 1 - 0.3787 $\approx$ 0.621

(c) 1954/6549 = 0.2984 $\approx$ 0.298

(d) (2480 + 1954)/6549 = 0.677 or 1 – 2115/6549 = 1 - 0.323 = 0.677

3.4.2

(a) 1 - 0.07 = 0.93

(b) 1 - 0.03 - 0.20 = 0.77

(c) 0.20 + 0.33 + 0.25 = 0.78

3.5.1

(a) 610/5000 = 0.122

(b) (130 + 26 + 3 + 1)/5000 = 160/5000 = 0.032

(c) (1400 + 1760 + 750)/5000 = 0.782

3.5.5

(0)(0.343) + (1)(0.441) + (2)(0.189) + (3)(0.027) = 0.9

3.5.6

VAR(Y) = $(0 - 0.9)^2(0.343) + (1 - 0.9)^2\,(0.441) + (2 - 0.9)^2\,(0.189) + (3 - 0.9)^2\,(0.027)$ = 0.63. Thus, the standard deviation is $\sqrt{0.63}$ = 0.794.

3.6.1

(a) $4(0.75^3)(0.25)$ = 0.4219

(b) 0.75^4 = 0.3164

(c) $0.75^4 + 0.25^4$ = 0.3203

3.6.8

On average, there are 105 males to every 100 females. Thus, Pr{male} = $\frac{105}{205}$ and Pr{female} = $\frac{100}{205}$.

To use the binomial distribution, we arbitrarily identify "success" as "female."

(a) We have n = 4 and p = $\frac{100}{205}$. To find the probability of 2 males and 2 females, we set j = 2, so n - j = 2. The binomial formula gives

$$\Pr\{\text{2 males and 2 females}\} = {}_4C_2\left(\frac{100}{205}\right)^2\left(\frac{105}{205}\right)^2 = 0.3746.$$

(b) To find the probability of 4 males, we set j = 0, so n - j = 4. The binomial formula gives

$$\Pr\{\text{4 males}\} = {}_4C_0\left(\frac{100}{205}\right)^0\left(\frac{105}{205}\right)^4 = (1)(1)\left(\frac{105}{205}\right)^4 = 0.0688.$$

(c) The condition that all four infants are the same sex can be satisfied two ways: All four could be male or all four could be female. The probability that all four are male has been computed in part (b) to be 0.0688. To find the probability that all four are females, we set j = 4, so n - j = 0.

$$\Pr\{\text{4 females}\} = {}_4C_4\left(\frac{100}{205}\right)^4\left(\frac{105}{205}\right)^0 = (1)(1)\left(\frac{100}{205}\right)^4 = 0.0566.$$

Thus, we find that Pr{all four are the same sex} = 0.0566 + 0.0688 = 0.1254.