STATISTICS 1211 (SECTION 4)
HOMEWORK 1 - ANSWER KEY
Chapter 2 (2.1.5, 2.2.20, 2.4.55, 2.4.64, 2.5.73, 2.5.84)

2.1.5)

a- {121 111 112 113 211
221 212 222 213 223
311 312 313 321 322
323 331 332 333
122 123 131 132 133
231 232 233}

b.- {111 222 333}

c.- {123 132 213 231
312 321}

d.- {111 113 311 313
331 333 131 133}

2.2.20)

a.- {Day/Unsafe; Day/Unrelated to Conditions;
Swing/Unsafe; Swing/Unrelated to Conditions;
Night/Unsafe; Night/Unrelated to Conditions}

b.-

Day — .10 Unsafe; .35 Unrelated
Swing — .08 Unsafe; .20 Unrelated
Night — .05 Unsafe; .22 Unrelated

P(Accident due to unsafe conditions) =
P(Day-Unsafe or Swing-Unsafe or Night-Unsafe) =
$.10 + .08 + .05$
$= \boxed{.23}$

c. $-$ P(Did not occur during Day) =

1 $-$ P(Did occur during Day)

$= 1 - [P(\text{Day} \mid \text{Unsafe conditions})$ or $P(\text{Day} \mid \text{Unrelated})]$

$= 1 - [.10 + .35]$

$= 1 - .45$

$= \boxed{.55}$

2.4.55) .16 $-$ Lyme Disease

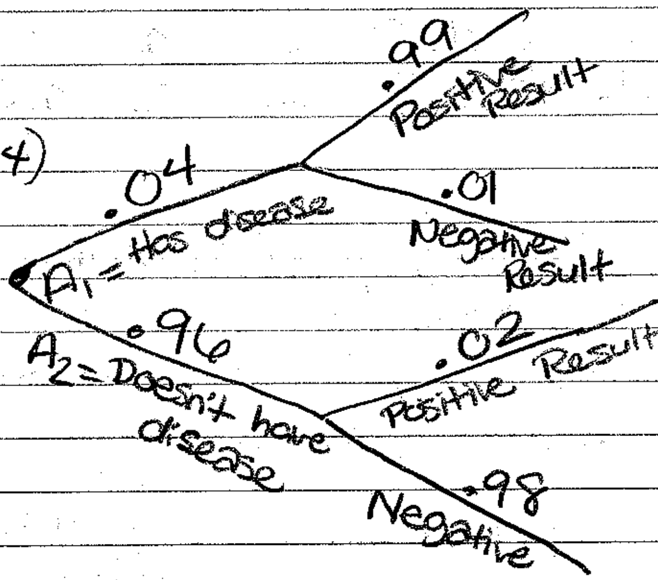
.10 $-$ HGE

.10 $-$ carry ~~both~~

P(Lyme Disease | HGE) =

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)} = \frac{.0236}{.10} = .236$$

2.4.64)



P(Positive Test Result) = P(Positive | Has disease) or P(Positive | Doesn't have)

$= (.99)(.04) + (.02)(.96)$

$= \boxed{0.0588}$

$$P\left(\begin{matrix}\text{Has}\\\text{disease}\end{matrix}\,\middle|\,\begin{matrix}\text{Positive}\\\text{Result}\end{matrix}\right) = \frac{P\left(\begin{matrix}\text{Has}\\\text{Disease}\end{matrix} \cap \begin{matrix}\text{Positive}\\\text{Result}\end{matrix}\right)}{P(\text{Positive Result})}$$

$$= \frac{(.04)(.99)}{0.0588}$$

$$= \boxed{0.67}$$

$$P\left(\begin{matrix}\text{Does not}\\\text{have disease}\end{matrix}\,\middle|\,\begin{matrix}\text{Negative}\\\text{Result}\end{matrix}\right) = \frac{P\left(\begin{matrix}\text{No}\\\text{disease}\end{matrix} \cap \begin{matrix}\text{Negative}\\\text{Result}\end{matrix}\right)}{P(\text{Negative Result})}$$

$$= \frac{(.98)(.96)}{0.94} = \boxed{.999}$$

$$P(\text{Negative Result}) = P\left(\text{Negative}\,\middle|\,\begin{matrix}\text{Have}\\\text{disease}\end{matrix}\right) \text{ or } P\left(\text{Negative}\,\middle|\,\begin{matrix}\text{Do not}\\\text{have disease}\end{matrix}\right)$$

$$= (.01)(.04) + (.98)(.96)$$

$$= 0.94$$

2.5.73)

$$P(A \cap B) = P(A)P(B) = (1 - P(A'))P(B)$$
$$= P(B) - P(A')P(B)$$

$$P(A' | B) = 1 - P(A|B) = 1 - P(A)$$
$$P(A'|B)\,P(B) = P(B) - P(A)P(B)$$
$$P(A' \cap B) + P(B) = P(A)\,P(B)$$
$$P(A' \cap B) + P(B) = P(B) - P(A')P(B)$$
$$P(A' \cap B) = P(A')\,P(B)$$

2.84) .343 a

.657 b

.063 · 3 = .189 c

$0.3^3 + 0.189 = .216$ d

e) $\frac{0.7^3}{1-0.3^3} = 0.353$

2.84) a- P(all of next three vehicles passing)
$= (.7)(.7)(.7) = \boxed{.343}$

b.- P(at least 1 of next three fails)
$=$ 1 - P(all three passing)
$= 1 - .343 = \boxed{.657}$

c.- P(exactly one of the next three passes)
= P(1st. vehicle passes and 2nd./3rd. fail or
2nd. vehicle passes and 1st./3rd. fail or
3rd. vehicle passes and 1st./2nd. fail)

$= (.7)(.3)(.3) + (.7)(.3)(.3) + (.7)(.3)(.3)$
$= 0.063 + 0.063 + 0.063$
$= \boxed{0.189}$

d.- P(at most one of the next three passes)
= P(zero pass) + P(one passes)
= P(all three fail) + P(one passes)
$= (0.3 \cdot 0.3 \cdot 0.3) + 0.189$
$= 0.027 + 0.189 = \boxed{0.216}$

e.- P(all three pass | at least one passes)
$= \frac{(0.7)^3}{1-(0.3)^3} = \boxed{0.353}$