BUSINESS STATISTICS ASSIGNMENT #1 SOLUTIONS

4.137

(a)

RRG GGR
RGR GRG
RRR GGG
RGG GRR

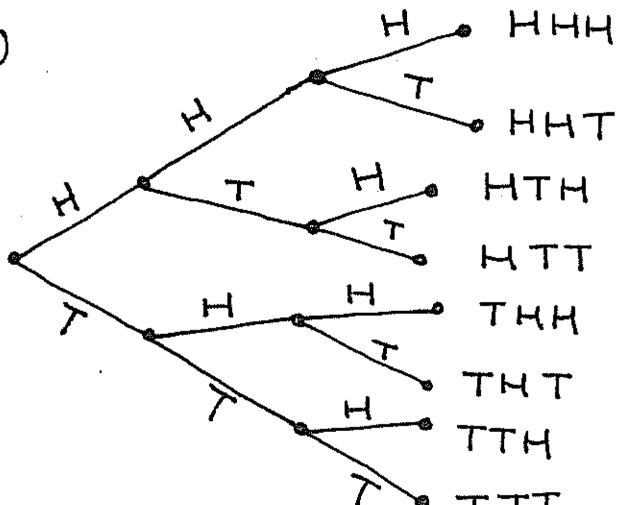
(b) THERE ARE THREE WAYS OF STOPPING AT ONE red light

RGG
GGR
GRG so $\boxed{3/8}$

(c) At least ONE Red light is ANYthing BUT GGG, so $\boxed{7/8}$

4.140

(a)



(b) THE BRANCHES WHERE EXACTLY ONE HEAD OCCURRED ARE HTT, THT & TTH

(c) $\boxed{3/8}$

4.142

FIRST WE Add the TOTAL NUMBER OF PEOPLE TO get THE NUMBER OF ELEMENTS IN THE SAMPLE SPACE:

$$6013 + 5493 + 1846 + 4150 = 17502$$

(a) $$\frac{\text{TOTAL \# OF MALES}}{\text{TOTAL}} = \frac{2877 + 2757 + 779 + 1502}{17502}$$

$$= \boxed{\frac{7915}{17502} = 0.452}$$

(b) $$\frac{\text{TOTAL \# OF people BETWEEN 20 TO 24 yrs}}{\text{TOTAL}} = \boxed{\frac{5493}{17502} = 0.314}$$

(c) $$\frac{\text{TOTAL \# OF people THAT ARE BOTH FEMALE \& 30+ yrs}}{\text{TOTAL}} = \boxed{\frac{2648}{17502} = 0.151}$$

(d) $$\frac{\text{\# OF people that are MALE OR* 19- yrs}}{\text{TOTAL}} = \frac{\underset{\text{(MALE)}}{7915} + \underset{\text{(Female \& 19 yrs)}}{3136}}{17502}$$

$$= \boxed{\frac{11051}{17502} = 0.631}$$

* DON'T COUNT people TWICE!

(e) $\dfrac{\text{\# OF 25-29 years THAT ARE Female}}{\text{\# OF Females}} = \boxed{\dfrac{1846}{9587} = 0.193}$

(SAMple space is Reduced because we know that it was a Female student)

(f) $\dfrac{\text{\# OF Males 20 yrs or older}}{{}^{*}\ \text{\# OF 20 yrs or older}} = \dfrac{2757+779+1502}{5493+1846+4150}$

* Because THIS is GiVEN THE SAMple space is Reduced

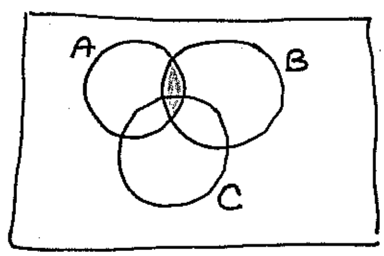
$= \boxed{\dfrac{5038}{11489} = 0.439}$

\# 4.144

(a) $P(A \cap B)$

$= 0.1 + 0.1$

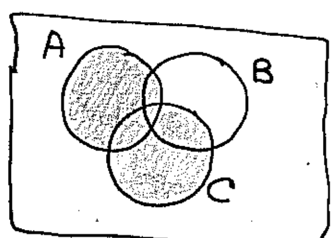
$= \boxed{0.2}$



$A \cap B$ is SHaded

(b) $P(A \text{ OR } C)$

$= P(A \cup C)$

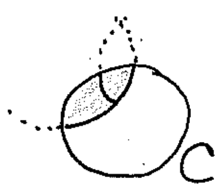


$A \cup C$ is SHAded

(c) $P(A|C)$

$= \dfrac{P(A \cap C)}{P(C)} = \dfrac{0.2}{0.4}$

$\boxed{= 0.5}$



SAMple space is reduced TO 0.4

4.148

Let E be event that AUTO Entered from Connecticut

C be event that AUTO CONTINUED ON CONNECTICUT

" OF THOSE $\underbrace{\text{entering from conn,}}_{\text{E is given}}$ 0.7 continued "

$$P(C|E) = 0.7$$

" 0.8 OF AUTOS ENTERED FROM CONN."

$$P(E) = 0.8$$

WE WANT $P(E \cap C) = P(C|E) \cdot P(E)$

$= (0.7)(0.8)$

$\boxed{= 0.56}$

4.150

LET T be EVENT THAT THERE is A THUNDERSTORM in the VICINITY

L be event that plANE LANDS on time

WE have $P(T) = 0.7$

& $P(L|T) = 0.8$

$$P(L \cap T) = P(L|T) \cdot P(T)$$

$$= (0.8) \cdot (0.7) = \boxed{0.56}$$

4.154

(a) $P(\text{blue eyes}) = 90/300 = \boxed{0.3}$

(b) $P(\text{has trait}) = 120/300 = \boxed{0.4}$

(c) A blue eyes
B has trait

We want to check if
$P(A|B) \stackrel{?}{=} P(A)$

$P(A) = 0.3$
& $P(A|B) = \dfrac{P(A \cap B)}{P(B)} = \dfrac{70}{120} = 0.58$

Since $P(A|B) \neq P(A)$
then the events are $\boxed{\text{NOT independent}}$

(d) A blue eyes
C brown eyes

$P(A|C) = 0/140$ given brown eyes there are no blue eyes obviously

$P(A) = 0.3$

$\boxed{\text{NOT independent}}$

They are however
$\boxed{\text{mutually exclusive}}$ because $P(A \cap C) = 0$

4.158

C has cances

N Test Negative (does NOT Test positive)

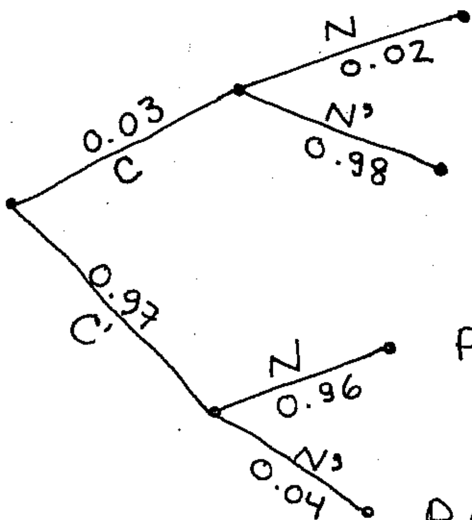
Given probabilities

$P(C) = 0.03$, $P(C') = 0.97$

$P(N'|C) = 0.98$ $P(N'|C') = 0.04$

we want $P(C|N')$

Cancer given that you Test positive



$P(C \cap N) = 0.0006$

$P(C \cap N') = 0.0294$ ← Test positive

$P(C' \cap N) = 0.9312$

$P(C' \cap N') = 0.0388$ ← Test positive

$P(N') = P(\text{Testing positive})$

$= 0.0294 + 0.0388 = 0.0682$

$P(C \cap N') = 0.0294$

$$P(C|N') = \frac{P(C \cap N')}{P(N')} = \frac{0.0294}{0.0682} = \boxed{0.431}$$

4.160

a. $P(A) = 8/20 = \boxed{0.4}$ b. $P(B) = 4/20 = \boxed{0.2}$

c. $P(C) = 4/20 = \boxed{0.2}$ d. $P(D) = 5/20 = \boxed{0.25}$

e. $$P(A \cap B) = \frac{\{(0,3) \,\&\, (3,0)\}}{20} = \frac{2}{20} = \boxed{0.10}$$

f. $P(B \cap C) = 0/20 = \boxed{0}$ g. $P(A \cup B)$

$$= P(A) + P(B) - P(A \cap B)$$
$$= 8/20 + 4/20 - \frac{2}{20}$$
$$= 10/20 = \boxed{0.5}$$

h. $$P(B \cup C) = 4/20 + 4/20 - 0/20 = 8/20 = \boxed{0.4}$$

i. $$P(A \mid B) = \frac{\{(0,3),\ (3,0)\}}{\{(0,3),(1,2),(2,1),(3,0)\}} = 2/4 = \boxed{0.5}$$

j. $$P(B \mid D) = \frac{\{(2,1)\}}{\{(0,1),\ (1,1),(2,1),(3,1),(4,1)\}} = 1/5 = \boxed{0.2}$$

K. $$P(C \mid B) = \frac{\emptyset}{\{(0,3),(1,2),(2,1),(3,0)\}} = \boxed{0}$$

l. $$P(B \mid \overline{A}) = \frac{\{(1,2),\ (2,1)\}}{12} = \frac{2}{12} = \boxed{0.167}$$

m. $$P(C \mid \overline{A}) = \frac{\{(1,1),(2,2),(3,3)\}}{12} = \frac{3}{12} = \boxed{0.25}$$

n. $$1 - P(\text{NEITHER A NOR B NOR C}) = 1 - \frac{\{(3,1),(4,1),(4,3),(3,2),(4,2),(2,3),(1,3)\}}{20}$$
$$= 1 - 7/20 = 13/20 = 0.65$$

o. p. & q. ONLY $\boxed{B \& C}$ are mutually exclusive BECAUSE $P(B \cap C) = 0$

OTHERS $P(A \cap B) = 0.10$

& $P(B \cap D) = 1/20 = 0.05$

r. s. & t.

A & B are NOT independent as

$$P(A|B) \neq P(A)$$
$$(0.5) \qquad (0.4)$$

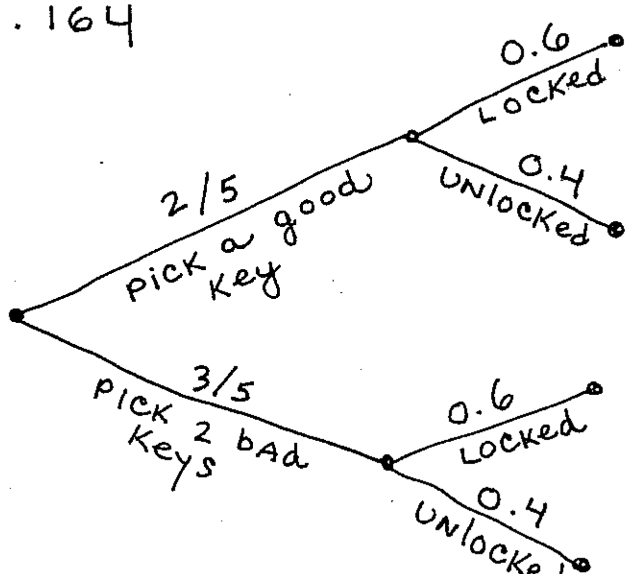
B & C are NOT independent as

$$P(C|B) \neq P(C)$$
$$(0.0) \qquad (0.2)$$

$\boxed{B \& D}$ ARE independent

$$P(B|D) = P(B)$$
$$0.2 = 0.2$$

4.164



OPEN (0.24)

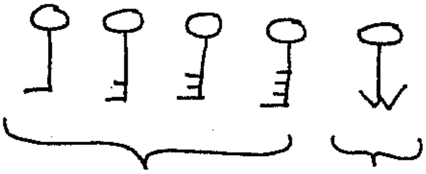
OPEN (0.16)

CLOSED (0.36)

OPEN (0.24)

P(opening door) = 0.24 + 0.16 + 0.24 = $\boxed{0.64}$

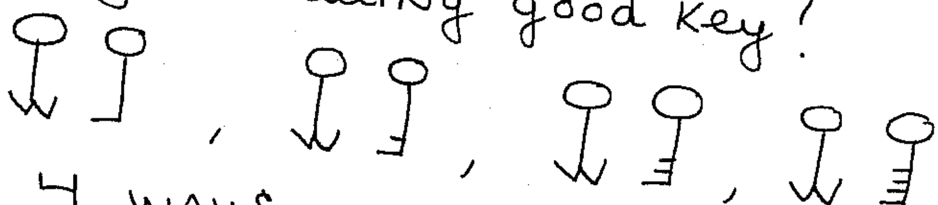
NOTE: INTUITIVELY WE KNEW P(picking good Key) = 2/5
BUT WHERE does THIS VALUE OF 2/5 COME FROM?

5 Keys 

4 BAD 1 Good

HOW MANY WAYS OF picking 2 different Keys?
$_5C_2 = 10$

How MANY including good key?



4 WAYS

P(picking good key) = $4/10 = 2/5$

PERMUTATIONS & COMBINAISIONS

1- (a) $_{12}P_{12} = 479001600$

(b) $2 \times {}_5P_5 \times {}_7P_7 = 1209600$

(WHICH subject is FIRST ON SHELF 2 WAYS) (STATS BOOK orderings) (ECONOMICS BOOK ORDERINGS)

(c) $\underbrace{_8P_8}\cdot {}_5P_5 = 4838400$

(8 books ordered where one is THE CLUMP OF STATS BOOKS) (orderings OF STATS BOOKS)

2- (a) $_{12}C_6 = 924$

(b) $_8C_6 = 28$

(c) $924 - 28 = 896$ *

(d) $_4C_3 \ {}_8C_3 = 224$

3 TEACHERS 3 STUDENTS

* ALTERNATIVELY

$$_4C_1 \ {}_8C_5 + {}_4C_2 \ {}_8C_4 + {}_4C_3 \ {}_8C_3 + {}_4C_4 \ {}_8C_2$$

ONE Teacher, 2 Teachers, 3 TEACHERS, 4 TEACHERS

$$= 224 + 420 + 224 + 28$$

$$= 896$$