Stat 330

HW 1

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1. a) $\Omega = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$

b) i. $\{HTT, THT, TTH\} = A$
ii. $\{HTT, THT, TTH, TTT\} = B$
iii. $\{THH, HHH\}$

c) i. $\bar{A} = \{HHH, HHT, HTH, THH, TTT\}$
ii. $A \cup B = \{HTT, THT, TTH, TTT\}$
iii. $A \cap B = \{HTT, THT, TTH\}$
iv. $A \cap C = \{\} = \emptyset$

2. $P(MB \cup HD) = P(MB) + P(HD) - P(MB \cap HD)$
$= .35 + .30 - .20$

A) $= .45$

B) $P(\overline{MB} \cap \overline{HD}) = P(\overline{MB \cup HD}) = 1 - P(MB \cup HD)$
$= 1 - .45$
$= .55$

3. a) $\binom{12}{3} = \frac{12!}{(12-3)!} = \frac{12!}{9!} = 12 \cdot 11 \cdot 10 = 1320$

b) $\frac{\binom{12}{3}}{3!} = \frac{1320}{6} = 220$

c) $3 \cdot 2 \cdot 1 = 6$

4. 56 56 56 56 56 56 56 56 all lower case
& all upper case
& 3 symbols

$26 \cdot 2 + 3$

So, 55^8. Are all combinations without a number
10^8 All combinations
55+10 for numbers

65^8 are all combinations with numbers

$= 65^8 - 55^8 - 10^8$

5.

a) $\frac{\binom{7}{4}}{\binom{12}{4}} = .0\overline{7}$

b) $\frac{\binom{7}{1}\cdot\binom{4}{2}\cdot\binom{1}{1}}{\binom{12}{4}} = \frac{42}{495} = .08\overline{4}$

c) Atleast one is a comet 260

Find probability that none are comet 260s

$\binom{8}{4} = 70$ so, $P\left(\begin{matrix}\text{None}\\ \text{being}\\ \text{comet 260}\end{matrix}\right) = \frac{70}{\binom{12}{4}} = \frac{70}{495}$

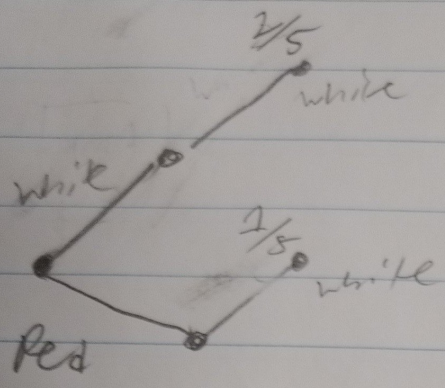
$P\left(\begin{matrix}\text{Atleast one}\\ \text{being}\\ \text{comet 260}\end{matrix}\right) = 1 - \frac{70}{495} = .8\overline{5}$

$P\left(\begin{matrix}\text{None being}\\ \text{comet 260}\end{matrix}\right) = \frac{5}{12}\cdot\frac{4}{11}\cdot\frac{3}{10}\cdot\frac{2}{9} = 1 - 0.0\overline{10} = P(\text{None comet}$

$= .9\overline{8}$

4w1 continued

6. Urn 1 contains 2 red chips & 4 white
Urn 2 contains 3 red chips & 1 white



$$P(W \mid 2) = P(W \mid 1) \cdot P(W \text{ transfered}) + P(R \mid 1) \cdot P(W \text{ not transfered})$$

$$= \left(\frac{4}{1} \cdot \frac{2}{5}\right) + \left(\frac{2}{6} \cdot \frac{1}{5}\right)$$

$$= .3$$

7. $P(A \cap B \cap C) = P(A)P(B)P(C)$

$P(A) = 2/6$
$P(B) = 3/6$
$P(C) = 6/36 = 1/6$

1	1	(1,3) = 4	(6,6) = 12
2	2	(2,2) = 4	
3 +	3 =	(3,1) = 4	
4	4	(6,5) = 11	
5	5	(5,6) = 11	
6	6		

$6 \times 6 = 36$ combinations

$P(A \cap B \cap C) =$

Red	Green	Sum
1	3	$1/2 \cdot 3$
2	4	
	5	

$1/3 \cdot 1/2 \cdot 1/6 = P(A) \cdot P(B) \cdot P(C)$

$P(A \cap B) =$

Red	Green
1	3
2	4
	5

$1/3 \cdot 1/2 = P(A) \cdot P(B)$

$P(A \cap C) =$

Red	Green	Sum
1	1	$3/12$
2	2	
	3	
	4	
	5	
	6	

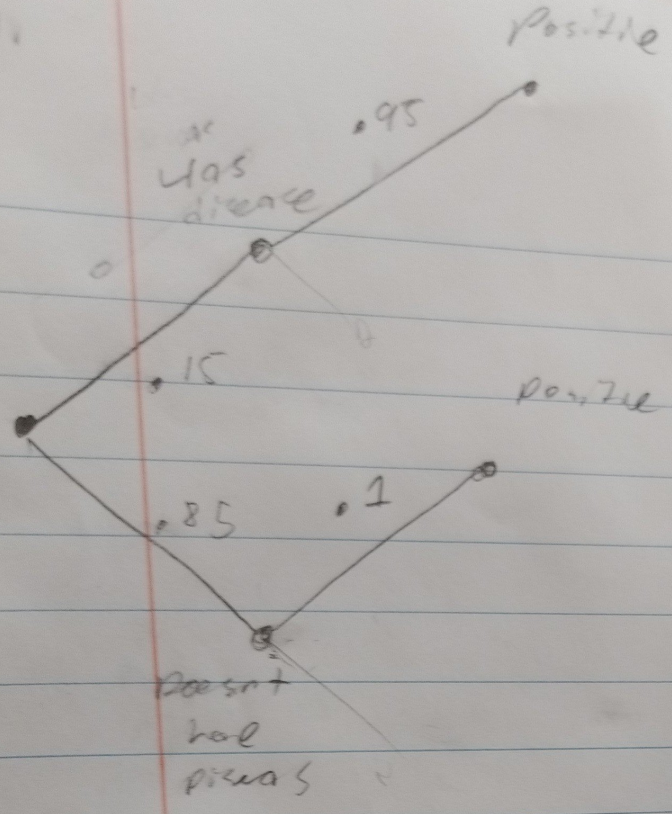
$1/3 \cdot 1/6 = P(A) \cdot P(C)$

$P(B \cap C) =$

Red	Green	Sum
1	3	(1,3)
2	4	(6,5)
3	5	$6 \cdot 3 = \frac{2}{18} = \frac{1}{9}$
4		
5		
6		

$1/2 \cdot 1/9 \neq P(B) \cdot P(C)$

8.



$P(D) = .15$

$P(\bar{D}) = .85$

$P(P|D) = .95$

$P(P|\bar{D}) = .1$

a) $P(P) = P(P|D) \cdot P(D) + P(P|\bar{D}) \cdot P(\bar{D})$

$= .95 \cdot .15 + .1 \cdot .85$

$= .2275$

b) $P(D|P) = \dfrac{P(D) \cdot P(P|D)}{P(P)}$

$= \dfrac{0.15 \cdot .95}{.2275} = .62637$

c) $P(\bar{D}|P) = \dfrac{P(\bar{D}) \cdot P(P|\bar{D})}{P(P)}$

$= \dfrac{.85 \cdot .1}{.15} = .5\overline{6}$

9. $A = 0.95$ $B = 0.9$ $C = 0.8$ $D = 0.7$

a) $P(\text{series } A \,\&\, B) = 0.95 \cdot 0.9 = 0.855$

b) $P(\text{parallel } (\text{series } A \,\&\, B) \,\&\, (\text{series } (C \,\&\, D)) =$

$.855$ $\quad$ $.56$

$1 - .855$ $\quad$ $1 - .56$

$.145$ $\quad$ $.44$

$1 - (.145 \cdot .44)$

$= 1 - .0638 = .936$

c) $P(\text{parallel } A \,\&\, B \,\&\, C) =$

$1 - 0.95$ $\quad$ $1 - 0.9$ $\quad$ $1 - 0.8$

$.05$ $\quad$ $.1$ $\quad$ $.2$

$= 1 - (.05 \cdot .1 \cdot .2)$

$= .999$