1

Day: M T W T F S

Date: / /

Q1:

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Section -A
P180054

(a)

$2^3 = 8$

Assume that

$a = 0$, $f = 1$

$S = \{aaa, aaf, afa, aff, faa, faf, ffa, fff\}$

(b)

$Z_F = \{aaf, aff, faf, fff\}$

$Y_A = \{aaa, afa, aaf, aff\}$

(c)

Since $Z_f \cap X_A = \{aaf, aff\} \neq \phi$

these they are not mutually exclusive

(d)

Since $Z_F \cup Y_A = \{aaa, aaf, afa, faf, fff\} \neq S$

Hence they are not collectively exhaustive

(e)

$C = \{aaa, aaf, afa, faa\}$

$D = \{aff, faf, ffa, fff\}$

(f)

Since $C \cap D \neq 0$ Hencey they are mutually exclusive.

$C \cup D = \{aaa, aaf, afa, faa, aff, faf, ffa, fff\} =$

Hence they are collectively ~~exhaustive~~ exhuastive.

Question#02

S = {1/1, 1/2, --- 1/31, 2/1, 2/1 -- 2/29},
3/1, 3/31, 4/1, --- 4/30, 5/1 --- 5/31
6/1, --- 6/30, 7/1 -- 7/31 -- 8/1, ---,
8/31, — 9/1 --- 9/30 --- 10/1 ---,
10/31 --- 11/1, --- 11/30, --- 12/3 ---
12/31}

The event J,

J = {7/1, ----- 7/31}

Question No. 03

H, M, --- F, W

S = {HF, HW, MF, MW}

P[F] = 0.5

P[HF] = 0.2

P[MW] = 0.1

As

P(F) = {P[HF], P[MF]}

P[F] = {P[HF] + P[MF]

0.5 = 0.2 + P[MF]

P[MF] = 0.3

Sum of all Probabilities equals to 1 therefore

1 = P[HF] + P[HW] + P[MF] + P[MW]

1 = 0.2 + P[HW] + 0.2 + 0.1

P[HW] = 0.4

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(a) $P[W]$

$W = \{HW, MW\}$

$P[W] = P[HW] + P[MW]$

$= 0.4 + 0.1$

$P(W) = 0.5$

(b) $P[MF]$

$P[MF] = 0.3$

(c) $P[H]$

$H = \{HF, HW\}$

$P[H] = P[HF] + P[HW]$

$P(H) = 0.2 + 0.4$

$P[H] = 0.6$

Question no#04

$S = \{S_1, S_2, S_3, S_4, S_5, S_6\}$

The Probabilities of each sample

$P[S_i] = 1/6$ Event

P (even);

$P[E] = P[S_2] + P[S_4] + P[S_6]$

$= 1/6 + 1/6 + 1/6$

$P[E] = 1/2$

Question no#05

(a) $P[L]$

$P[L] = 1 - P($

$= 1 - P[B_1] - P[B_2] - P[B_3]$

$= 1 - \alpha - \alpha(1-\alpha) - \alpha(1-\alpha)^2$

$= 1 - \alpha - \alpha + \alpha^2 - \alpha(1 + \alpha^2 - 2\alpha)$

$= 1 + \alpha^2 - \alpha^3 - \alpha^2 + 2\alpha^2$

$= 1 - \alpha^3 + 2\alpha^2$

$= (1 - 0.171)^3$

$= 0.57$

(b)

$P[4 \text{ minuts, or less}] = \sum_{i=1}^{4} \alpha(1-\alpha)^{i-1}$

$= 1 - (0.57)^3$

$= 0.851723$

Question #05

(a) $P[A \cup B] \geq P[A]$

$A \subset A \cup B$

(b) $P[A \cup B] \geq P[B]$

$B \subset A \cup B$

(c) $P[A \cap B] \leq P[A]$

$A \cap B \subset A$

(d) $P[A \cap B] \leq P[B]$

$A \cap B \subset B$

Question #06

H_0 = zero hand off

H_1 = one hand off

H_2 = more than one hand off

$P[F] = \frac{5}{12}$ f, v

(a)

	H_0	H_1	H_2
F	FH_0	FH_1	FH_2
V	VH_0	VH_1	VH_2

we have to find

$FH_0, FH_1, FH_2, VH_0, VH_1, VH_2$

As

$P[F] = 5/12$

Therefore

$P[F] = FH_0 + FH_1 + FH_2$

$P[F] = 5/12$ (give)

we know that

$P[F] + P[U] = 1$

$5/12 + P[U] = 1$

$P[U] = 1 - 5/12$

$P[U] = 7/12$

$FH_0 + VH_0 = 1/3$

$FH_1 + VH_1 = 1/3$

$FH_2 + UH_2 = 1/3$

It can be seen that

$0 \le P_0 \le 1/3$

$0 \le P_1 \le 1/3$

$1/12 \le P_0 + P_1 \le 5/12$

$P_0 = FH_0$

$P_1 = FH_2$

$P_2 = FH_3$

therefore

$FH_0 = 1/3$, $FH_1 = 1/2$, $FH_2 = 0$

$VH_0 = 0$, $VH_1 = 1/4$, $VH_2 = 1/3$

(b) $\left.\begin{array}{l} FH_0 = 1/4 \\ VH_1 = 1/6 \end{array}\right\} \rightarrow$ give

$FH_0 = 1/4$ $FH_1 = 1/6$, $FH_2 = 0$

$VH_0 = 1/12$ $VH_1 = 1/6$ $VH_2 = 1/3$

Question #07

S_i denotes outcomes

$1 \le i \le 6$, $R_i = \{S_i\}$

$G_j = \{S_{j+1}, \dots S_6\}$

(a) $P[R_3 | G_1]$

$$P[R_3|G_1] = \frac{P[R_3 G_1]}{P[G_1]}$$

$$= 1/5$$

(b) $P[R_6 | G_3]$

$$P[R_6|G_3] = \frac{P[R_6 G_3]}{P[G_3]}$$

$$= \frac{P[S_6]}{P[S_4, S_5, S_6]} = 1/3$$

(c) $P[G_3 | E]$

$$P[G_3|E] = \frac{P[G_3 E]}{P[E]}$$

$$= \frac{P[S_4, S_5, S_6]}{P[S_4, S_6]}$$

$$= \frac{1/3}{1/2} = 2/3$$

Question #02

$$P[D|y] = \frac{P[Dy]}{P[y]}$$

$$P[Dy] = P[yy]$$

$$= 1/4$$

$$P[y] = \frac{\{yy + yg + gy\}}{3/4}$$

$$P[D|y] = \frac{P[Dy]}{P[y]}$$

$$= \frac{1/4}{3/4}$$

$$P[D|y] = 1/3$$

Question 09

$P[L] = 0.16$

$P(H] : 0.10$

$P[LH] \ L \cup H = 0.10$

(a) $P[LH]$

$P[L | L \cup H] = \frac{P[L \cup \cap [L \cup H]]}{P(L \cup H)}$

$= 0.10$

$P[LH] = 0.10(P[L \cup H])$

$= 0.10(P[L] + P(H) - P[L \cap H])$

$= \frac{0.10(0.16 + 0.10)}{1.1}$

$P[LH] = 0.0238$

(b) $P(H|L) =$

$P(H|L) = \frac{P[HL]}{P(L)}$

$= \frac{0.0236}{0.16}$

$P[H|L] = 0.1475$

Question #010

$P[A \cup B] = 5/8$

$P[A] = 3/8$

$P[C \cap D] = 1/3$

$P[C] = 1/2$

A and B $\rightarrow$ dis-joint

C and D $\longrightarrow$ Independent

(8)

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(a) find $P[A \cap B]$, $P(B)$, $P[A \cap B^c]$ & $P[A \cup B^c]$

As A and B are dis-joint

$A \cap B = \emptyset$

$P[A \cap B] = 0$

Now for $P[B] =$

$P[A \cup B] = P[A] + P[B] - P[A \cap B]$

$P[B] = P[A \cup B] - P[A] + P[A \cap B]$

$= 5/8 - 3/8 - 0$

$P(B) = 2/8 = 1/4$

Since

$A \subset B^c$

$P[A \cap B^c] = P[A]$

$P[A \cap B^c] = 3/8$

And

$P[A \cup B'] = P[B']$

$= 1 - 1/4$

$= 3/4$

$P[A \cup B^c] = 3/4$

(b) Are A and B Independent?

NO

Because $P[AB] \neq P[A] P[B]$

$P(AB) = P[A \cap B]$

$0 \neq 1/4 \times 3/8$

$0 \neq 3/32$

(a) Day: M T W T F S Date: / /

(c) find $P[D]$, $P[C \cap D^c]$, $P[C^c \cap D^c]$, $P[C|D]$

As

C and D Independent

Then

$P[CD] = P[C]\,P[D]$

$P(D) = \frac{P[CD]}{P[C]}$

$P(D) = \frac{P[C \cap D]}{P[C]} = 1/3 / 1/2 = 2/3$

Now

$P[C \cap D^c] = P(C) - P[C \cap D]$

$= 1/2 - 1/3$

$P[C \cap D^c] = 1/6$

To find $P[C^c \cap D^c]$

first

$P[C \cup D] = P[C] + P(D) - P[C \cap D]$

$= 1/2 + 2/3 - 1/3$

$P[C \cup D] = 5/6$

From De-Morgan Law

$P[C^c \cap D^c] = P[(C \cup D)^c]$

$= 1 - P[C \cup D]$

$= 1 - 5/6$

$P[C^c \cap D^c] = 1/6$

Now

$P(C|D) = \frac{P[CD]}{P(D)} = \frac{P[C \cap D]}{P(D)}$

$= \frac{3}{6}$

$= 1/2$

(d) find $P(C \cup D)$ and $P(C \cup D^c)$

$P[C \cup D] = P[C] + P(D) - P[C \cap D]$

$= 1/2 + 2/3 - 1/3$

$P[C \cup D] = 5/6$

And

$P[C \cup D'] = P(C) + (1 - P[D]) - P[C \cap D^c]$

$= 1/2 + (1 - 2/3) - 1/6$

$P(C \cup D^c) = 1/2 + 1/3 - 1/6 = 2/3$

(e) Are C and D independent?

Yes

because:

$P(C \cap D^c) = P[C]\,P[D^c]$

$1/6 = 1/2 \times (1 - 2/3)$

$1/6 = 1/6$

Question # 11

S = { rwgg, rwgy, wryy, wrgy }

rryy	rryg	rrgy
rwyy	rwyg	rwgy
wryy	wryg	wrgy
wwyy	wwyg	wwgy

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(1) $P(Y) = 12/16$
$P(Y) = 3/4$

(2) $P(R) = 12/16$
$P(R) = 3/4$

(3) For $P(R|Y)$ and $P(Y|R)$
must first $P(RY)$
$P[RY]$ = Rounded Yellow seed
$P[RY] = 9/16$
Now
$$P(R|Y) = \frac{P(RY)}{P(Y)}$$
$$= \frac{9/16}{12/16} = 3/4$$

(4)
x and R are Independent event
because:
$P(RY) = P[R]\,P(Y)$
$\Rightarrow \frac{9}{16} = \frac{3}{4} \times 3/4$

$\Rightarrow 9/16 = 9/16$

Question # 02

A	AC	
AB	ABC	C
B	BC	//
//	//	//

All have Probability of 1/2
They are Independent
because:
$P[ABC] = P[A]\,P[B]\,P[C]$
$1/8 = 1/2 \times 1/2 \times 1/2$
$1/8 = 1/8$

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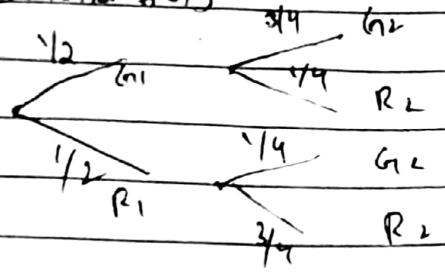
Question #013



$G_1G_2 = 3/8$

$G_1R_1 = 1/8$

$G_1G_2 = 1/8$

$R_1R_2 = 3/8$

$P[G_2] = P(G_1G_2] + P[R_1G_2]$

$= 3/8 + 1/8$

$= 4/8$

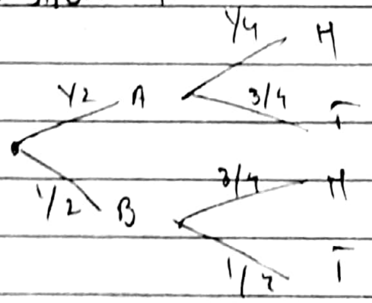
$P[G_2] = 1/2$

$P[G_1|G_2] = \frac{P[G_1G_2])}{P[G_2)}$

$= \frac{3/8}{1/2}$

$P[G_1|G_2] = 3/4$

Question 14



$AH = 1/8$

$AT = 3/8$

$BH = 3/8$

$BT = 1/8$

$P[C] = P[AT] + P[BH]$

$= 3/8 + 3/8$

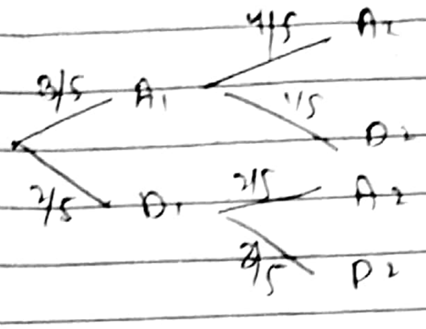
$= 2(3/8)$

$P[C] = 3/4$

Question #15

A : Acceptance

D : defected.



$A_1A_2 = 12/25$

$A_1D_2 = 3/25$

$D_1A_2 = 4/25$

$D_1D_2 = 6/25$

(a) Probability that exactly one photo detectors ℓ a pair is acceptance.

Sol

E_1 = exactly one

$P(E_1) = P(A_1D_2) + P(D_2A_2)$

$= 3/25 + 4/25$

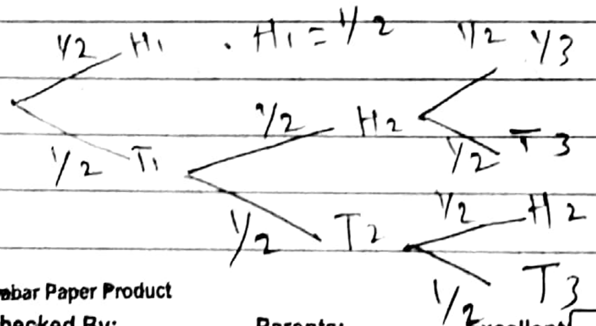
$= 7/25$

(b) Probability that both pairs are defector

$P(D_1D_2) = 6/25$

$P(D_1D_2) = 6/25$

Question 16



$T_1H_2H_3 = 1/8$

$T_1H_2T_3H_4 = 1/16$

$T_1T_2H_3H_4 = 1/16$

$T_1T_2T_3 = 1/8$

(b) $P[H_3]$ and $P[T_3]$ = ??

$P[H_3] = P[T_1 H_2 H_3] + P[T_1 T_2 H_3 H_4]$
$+ P[T_1 T_2 H_3 T_4]$
$= 1/8 + 1/16 + 1/16$
$= 4/16 = 1/4$

$P[T_3] = P[T_1 T_2 T_3 H_4] + P[T_1 H_2 T_3 T_4]$
$+ P[T_1 T_2 T_3]$

$= 1/16 + 1/16 + 1/8$
$= 4/16$
$P[T_3] = 1/4$

(c) D = Diet $P[D]$ = ? and $P[H_1|D]$ = ?

$P[D] = P[T_1 H_2 T_3 T_4] + P[T_1 T_2 H_3 T_4]$
$+ P[T_1 T_2 T_3]$
$= 1/16 + 1/16 + 1/8$
$= 4/16$

$P(D) = 1/4$
$P[H|D] = \frac{P[H_1 D]}{P[D]}$
$P[H_1|D] = 0$
If Steve was head on first flip diet will be cancelled.

(d) Are $H_3 H_2$ Independent event

$P(H_3) = 1/4$

$P(H_2) = P(T_1 H_2 T_3 T_4) + P(T_1 H_2 T_3 H_4)$
$+ P(T_1 H_2 H_3)$
$= 1/16 + 1/16 + 1/8$

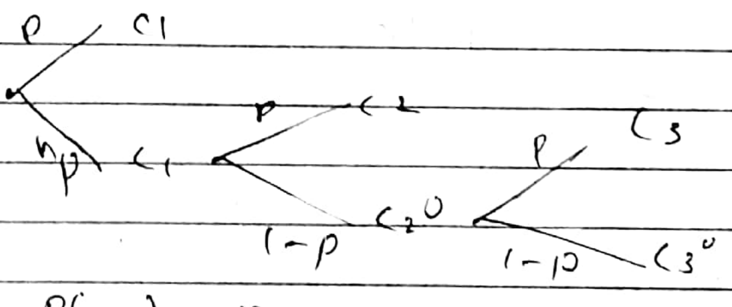
$P(H_2) = 1/4$

$P(H_2 H_3) \neq P(H_2)\, P(H_3)$

$1/8 \neq 1/16$

therefore they are not Independent

Question # 0117



(1) $P(C_1) = p$
(2) $P(C_2) = p(1-p)^{2-1}$
(3) $P(C_n) = p(1-p)^{n-1}$

Question # 018

A, B, C, D

$4^3 = 64$

$4! = 4 \times 3 \times 2 \times 1$

24 possible codes

16

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Question#2.19

15 friends prayers

10 pitches

must exact 8 field player, 1 pitcher and 1 designed hitter

(1) 1 of 10 pitches

$N = \binom{10}{1} = 10$ ways

(2) 1 of 15 fields prayers to be designed hitter

$N_1 = \binom{15}{1} = 15$ ways

(3) 8 of 14 field players

$N_2 = \binom{14}{8}$ ways

(4) for a hatter,

$N_4 = 9!$

Total

$N = N_1 \times N_2 \times N_3 \times N_4$

$= 10 \times 15 \times \binom{14}{8} \times 9!,$

$N = 163,459,296,800$

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Question # 02

3 prime codes Central
4 pare forward
4 pure guards
1 Sigma (goal forward)

① 1 of 3 Central
2 of 4 forward
1 of 4 guards

$N = \binom{3}{1}\binom{4}{2}\binom{4}{1} = N_1 = 72$

②
1 of 3 Centrals
1 of 4 forwards
2 of 4 guards

$N_2 = \binom{3}{1}\binom{4}{1}\binom{4}{2}$

$\boxed{N_2 = 72}$

③
1 of 3 Central
2 of 4 forwards
2 of 4 guards

$N_3 = \binom{3}{1}\binom{4}{2}\binom{4}{2}$

$\boxed{N_3 = 108}$

$N = N_1 + N_2 + N_3 = 252$