Subject: Probability Assignment Date

Basic Probability

1.

D1	D2
1	1
2	2
3	3
4	4
5	5
6	6

{ (1,1), (1,3), (1,5),
(2,2), (2,4), (2,6),
(3,1), (3,3), (3,5),
(4,2), (4,4), (4,6),
(5,1), (5,3), (5,5),
(6,2), (6,4), (6,6) }

Total Possible outcomes = 36

And the Sum of no's being even = 18

P_1(Sum of no's being even) $= \frac{18}{36} = \frac{1}{2}$

P_2(One of die shows 6) $= \frac{4}{36} = \frac{1}{9}$

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2) D1 D2

D1 \ D2	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

No of equally likely outcomes = 5+4+3+2+1 = 15

Total Possible outcomes = 36

$P(\text{Sum of no's} < 7) = 15/36 = \frac{5}{12}$

3) $P(2H \mid 1H) = ?$

$P(2H) = \frac{4}{8}$

$P(1H) = \frac{7}{8}$

$P(2H \mid 1H) = \frac{P(2H \cap 1H)}{P(1H)}$

$\frac{P(2H)}{P(1H)} = \frac{4}{8} / \frac{7}{8}$

=) $4/7$

=

HHH ✓

HHT ✓

HTH ✓

HTT

THH ✓

THT

TTH

TTT

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4) Total Possible outcomes = {(A,A), (A,B), (B,A), (B,B)}

$P(A) = \frac{1}{4}$

$P(B) = \frac{3}{4}$

$\therefore P(A|B) = \frac{P(A \cap B)}{P(B)} \Rightarrow \frac{P(A)}{P(B)} = \frac{1}{4} / \frac{3}{4} \Rightarrow \frac{1}{3}$

5) Conditional, Joint and Marginal Probability

R ($\frac{1}{3}$): HT $1/2$ → late $\frac{1}{2}$; NHT $1/2$ late $1/4$

NR ($\frac{2}{3}$): HT $1/4$ late $1/4$; NHT $3/4$ → late $1/8$

(a) $P(NR \cap HT) \cap NL$

$[P(NR) \times P(HT/NR)] \cap NL$

$\left[\frac{2}{3} \times \frac{1}{4}\right] \cap NL \Rightarrow \left[\frac{1}{6}\right] \cap NL \Rightarrow \frac{1}{2} \times \frac{3}{4} = \frac{1}{8}$

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(b) $P(L) = \frac{1}{2}\times\frac{1}{2}\times\frac{1}{3} + \frac{1}{4}\times\frac{1}{2}\times\frac{1}{3} + \frac{1}{4}\times\frac{1}{4}\times\frac{2}{3} + \frac{1}{8}\times\frac{3}{4}\times\frac{2}{3}$

$P(L) \Rightarrow P(RTL) + P(RNTL) + P(NRTL) + P(NRNTL)$

$\Rightarrow \frac{1}{12} + \frac{1}{24} + \frac{1}{24} + \frac{1}{16} \Rightarrow \frac{11}{48}$

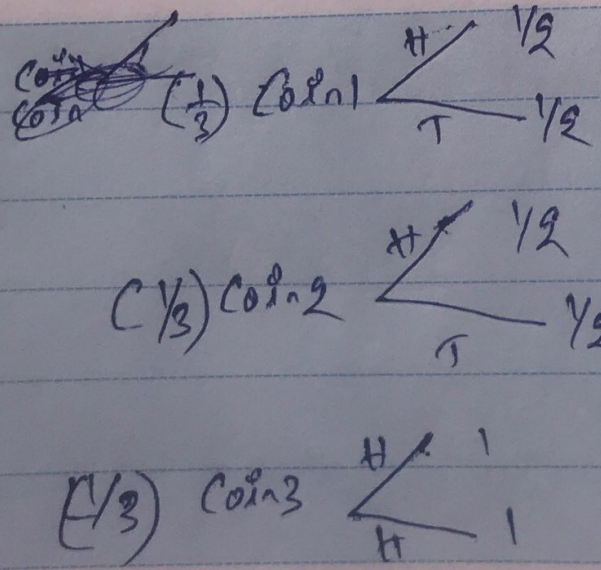
$\frac{4+2+2+3}{48}$

(c) $P(R|L) = \frac{P(L/R)\times P(R)}{P(L)} = \frac{\frac{1}{2}\times\frac{1}{2}\times\frac{1}{3} + \frac{1}{4}\times\frac{1}{2}\times\frac{1}{3}}{11/48}$

$\Rightarrow \frac{1/8}{11/48} = \frac{6}{11}$

6

6)



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(a) $P(H) = \frac{1}{2} \times \frac{1}{3} + \frac{1}{2} \times \frac{1}{3} + 1 \times \frac{1}{3}$

$\Rightarrow \frac{1}{6} + \frac{1}{6} + \frac{1}{3} = \frac{2}{6} + \frac{1}{3}$

$\Rightarrow \frac{2}{3}$

(b) $P(2H/H) = \frac{P(H/2H) \times P(2H)}{P(H)}$

$\Rightarrow \frac{1 \times \frac{1}{3}}{2/3} \Rightarrow \frac{1}{2}$

7) I guess this Question is complete. Kindly advise if i am missing Something.

8) $P(W) = 1/9$ $P(T/W) = 5/6$ $P(T/NW) = 1/6$

$P(NW) = 8/9$

$P(W/T) = \frac{P(T/W) \times P(W)}{P(T)}$

$\Rightarrow \frac{\frac{5}{6} \times 1/9}{5/6 \times \frac{1}{9} + 1/6 \times 8/9} = \frac{5}{13}$

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Subject : Date

9) $P(T/6) = 4/5$ $P(T/N6) = 1/5$ $P(6) = 1/6$ $P(N6) = 5/6$

$\Rightarrow P(6/T) = \frac{P(T/6) \times P(6)}{P(T)}$

$\Rightarrow \frac{4/5 \times 1/6}{4/5 \times 1/6 + 1/5 \times 5/6}$ $\Rightarrow \frac{4/30}{9/30}$

$\Rightarrow 4/9$

10) $P(M \cap S) = 40/100$ $P(M) = 60/100$

$P(S/M) = \frac{P(M/S) \cdot P(S)}{P(M)}$ $\Rightarrow \frac{P(M \cap S)}{P(M)}$

$\Rightarrow \frac{40/100}{60/100} = 2/3$

11)

(a) $P(M \cap G) = P(M) \times P(G/M)$

$\Rightarrow \frac{60}{100} \times \frac{19}{60}$

$\Rightarrow \frac{19}{100}$ $\therefore$ It is a Joint Probability

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Date

Subject :

(b) $P(M) = \frac{60}{100} = 3/5$

(d) (ii) $P(F/Pa) = \frac{P(Pa/F) \times P(F)}{P(Pa)}$

$= \frac{\frac{28}{40} \times \frac{40}{100}}{\frac{69}{100}} = \frac{28}{69}$ ∴ It is Conditional Probability

(c) $P(a) = \frac{31}{100}$ ∴ It is Marginal Probability

2) Bayes Theorem

$P(FF) = 0.1$ $P(NFF) = 0.9$ $P(F/Positive) = ?$

$$\frac{P(Positive/F) \times P(F)}{P(Positive)}$$

$$= \frac{\frac{92}{100} \times 0.1}{\frac{92}{100} \times 0.1 + \frac{10}{100} \times 0.9} = 0.50$$

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13. I am not able to understand this Question.

14	S	NS
Positive	99%	1%
negative	0%	100%

$$P(S) = \frac{1}{10,000} = 0.0001$$

$$P(NS) = 0.9999$$

$$P(S/\text{Positive}) = ?$$

$$\frac{P(\text{Positive}/S) \times P(S)}{P(\text{Positive})}$$

$$= \frac{\frac{99}{100} \times 0.0001}{\frac{99}{100} \times 0.0001 + \frac{1}{100} \times 0.9999}$$

$$\approx 0.0098$$

THE END

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