

Probability Assignment

Basic Prob:

1.)

~~Prob~~

2 dice are rolled, prob of sum of numbers being even & one of the dice shows '6'

Ans $= 3/36 = \boxed{\frac{1}{12}}$

a) Sum of n.o being less than 7 \rightarrow 2 dice are rolled.

Ans $P(\text{sum} < 7) = 15 = \frac{15}{36}$
 $= \frac{5}{12}$

3) Toss a coin 3 times. Given that you have observed at least one head, prob of at least 2 heads.

Ans $P(\text{atleast 2 heads}) = 1 - \left(\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}\right) = \boxed{\frac{4}{8}}$
 $= 1 - \frac{1}{8}$
 $= \boxed{\frac{7}{8}}$

$P(\text{atleast 1 head}) = 1 - \frac{1}{8} = \frac{7}{8}$

12 36

1	1	2
2	2	4
3	3	6
4	4	8
5	5	10
6	6	12

$\frac{3}{36}$

$$P(\text{At least 2 heads}) = 1/8$$

$$P(AB) = \left[\text{where at least 1 head in 2 heads} \right] = 4/8$$

$$P(A/B) = P(AB/B) = 4/8 / 7/8 = \boxed{4/7}$$

4. A & B are a married couple with 2 kids. One of them is a girl. What is the prob that their other kid is also a girl?

$$P(A) = P(\text{one of them is a girl})$$

$$P(\text{Prob of both girls is}) = \boxed{1/3}$$

$$\text{gg} \rightarrow \frac{1}{2}$$

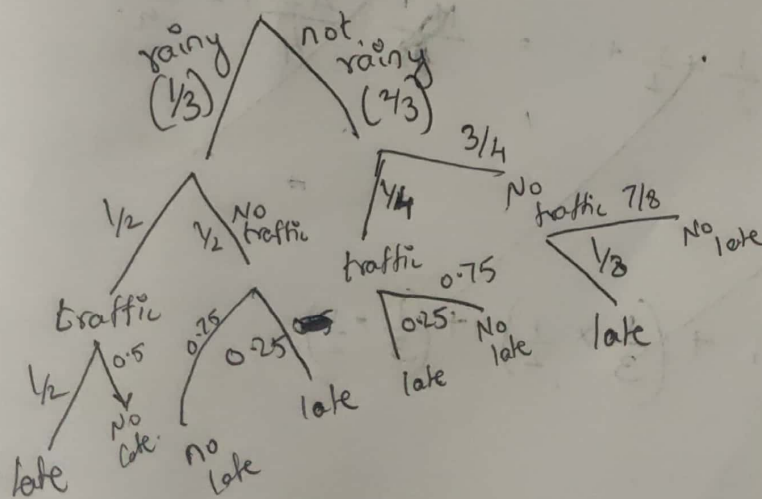
gb

bg

bb

$$\begin{array}{r} 0.6 \\ 0.6 \\ 0.6 \\ \hline 1.8 \end{array}$$

5. In my town rainy $1/3$ of days.



$$1 - \frac{1}{3}$$

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

$$1 - \frac{1}{4} = \frac{4-1}{4}$$

$$1 - 0.25$$

$$\frac{3}{4} \quad \begin{array}{r} 0.75 \\ 0.75 \\ 0.75 \\ \hline 2.25 \end{array}$$

$$1 - \frac{1}{8}$$

$$\frac{7}{8}$$

a) prob not raining, no traffic & Not late = 0.43

7/18

$$b) P(\text{Late}) = \left(\frac{1}{3} \times \frac{1}{2} \times \frac{1}{2}\right) + \left(\frac{1}{3} \times \frac{1}{2} \times \frac{1}{4}\right) + \left(\frac{2}{3} \times \frac{1}{4} \times \frac{1}{4}\right) + \left(\frac{2}{3} \times \frac{3}{4} \times \frac{1}{4}\right)$$

$$c) P(\text{Late} \cap \text{raining}) = P(\text{raining}) * P(\text{traffic/Late}) + P(\text{raining}) * P(\text{No traffic/Late})$$

$$= \left(\frac{1}{3} \times \frac{1}{2} \times \frac{1}{2}\right) + \left(\frac{1}{3} \times \frac{1}{2} \times \frac{1}{4}\right)$$

$$= \frac{1}{12} + \frac{1}{24}$$

$$= \frac{2+1}{24} = \frac{3}{24} = \frac{1}{8}$$

6) A box contains 3 coins 2 regular coins & one fake ~~coin~~ two headed coin $P(H)=1$. You pick a coin at random & toss it

$$a) P(H) = \frac{1}{2} \times \frac{1}{2} + 1 = \frac{2+2+4}{4} = \frac{8}{4} = 2$$

$$b) = \frac{1}{3} \times 1 + \left(\frac{1}{3} \times \frac{1}{2}\right) + \left(\frac{1}{3} \times \frac{1}{2}\right)$$

a) $P(\text{it lands head up}) =$

$$P(H) = \frac{1}{3} \times 1 + \frac{1}{2} \times \frac{1}{3} + \frac{1}{3} \times \frac{1}{2} = \frac{1}{3} + \frac{1}{6} + \frac{1}{6}$$

$$= \frac{2+1+1}{6} = \frac{4}{6}$$

~~P(H)~~

$P(2-H \text{ coin} / H) =$

$$P(H) = \boxed{\frac{2}{3}}$$

A \Rightarrow Two Head

B \Rightarrow Flip is Head

$$P(B) = \frac{1}{3} + \frac{1}{6} + \frac{1}{6}$$

$$P(A|B) = \frac{P(B|A) \times P(A)}{P(B)} = \frac{\frac{1}{3} \times 1}{\frac{1}{3} + \frac{1}{6} + \frac{1}{6}}$$

$$= \frac{1}{3 \left(\frac{2+1+1}{6} \right)}$$

$$= \frac{6}{12} = \boxed{\frac{1}{2}}$$

7. Suppose that all customers are at a coffee shop

a) 70% purchase coffee.

b) 40% purchase cake

c) 20% both cake & coffee. Given that a randomly chosen customer has purchased a piece of cake, what is the prob that he/she also purchased a cup of

coffee.

coffee

Ans

$$P(A) = 70\%$$

cake

$$P(B) = 40\%$$

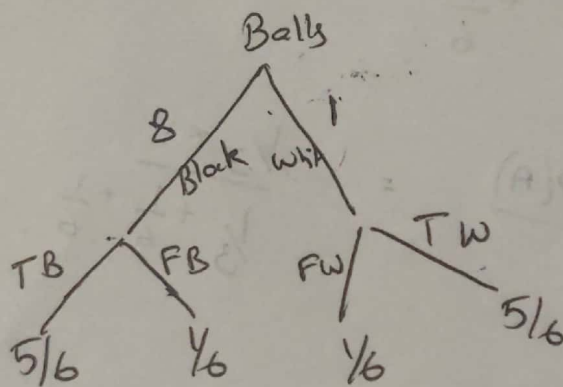
$$P(A \cap B) = 20\%$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

coffee & cake

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.2}{0.4} = \boxed{\frac{1}{2}}$$

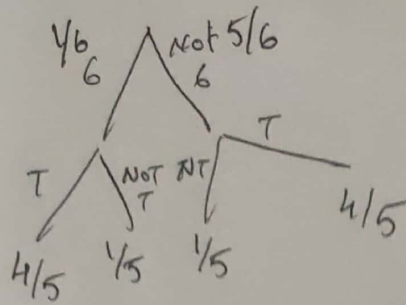
8. A is known to tell the truth in 5 cases out of 6 & he states that a white ball was drawn from a bag containing 8 blacks & 1 white balls. $P(\text{white ball})$?



$$P(w|T) = \cancel{P(w)} \times \cancel{\frac{5}{6}} \times \frac{P(Tw|w) * P(w)}{P(Tw)}$$

$$= \frac{\cancel{1} \times \frac{5}{6} \times \frac{1}{9}}{\left(\frac{5}{6} \times \frac{1}{9}\right) + \left(\frac{5}{6} \times \frac{8}{9}\right)} = \boxed{1.74}$$

9.



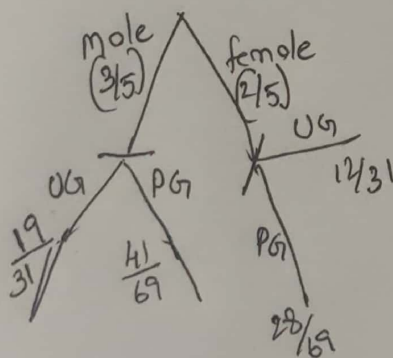
$$P(G/T) = \frac{P(T/G) \times P(G)}{P(T)} = \frac{4/5 \times 4/6}{(4/6 \times 4/5) + (5/6 \times 4/5)}$$

10.) 40% study maths & science = $P(mns)$

60% study math = $P(m)$

$$P(s/m) = \frac{P(mns)}{P(m)} = \frac{40 \times 100}{60 \times 100} = \frac{4}{6} = \boxed{\frac{2}{3}}$$

11)



$$\frac{60}{100} = \boxed{\frac{3}{5}}$$

$$\frac{40}{100} = \frac{2}{5}$$

3

a)

$$P(mnug) = \frac{P(g/m) \times P(m)}{P(g)} = \frac{\frac{19}{31} \times \frac{3}{5}}{\left(\frac{3}{5} \times \frac{19}{31}\right) + \left(\frac{12}{31} \times \frac{2}{5}\right)}$$

It is a joint probability

ii)

$$P(m) = \frac{3}{5} \times \frac{19}{31} + \frac{2}{5} \times \frac{41}{69}$$

$$\text{iii) } P(G) = \left(\frac{3}{5} \times \frac{19}{31} \right) + \left(\frac{2}{5} \times \frac{12}{31} \right)$$

$$\text{iv) } P(F \cap P_G) = P(P_G/F)$$

It is a conditional probability

Bayes Theorem

12.)

