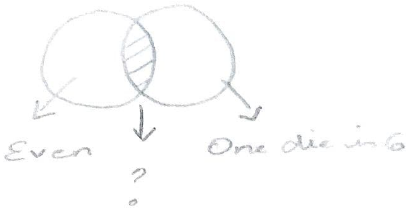
PROBABILITY ASSIGNMENT

1. Two dies, sum of number is even and one dies shows 6.

Sample space = {36}



favourable outcomes ⇒ {(2,6), (4,6), (6,2), (6,4), (6,6)}

⇒ P(Sum is even ∩ one die is 6} = 5/36

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2. Sample space ⇒ Two die = {36}

Sum of numbers less than 7 ?

P(Sum of no. < 7) ⇒ { (1,1), (1,2), (1,3), (1,4), (1,5)
(2,1), (2,2), (2,3), (2,4)
(3,1), (3 2), (3,3)
(4,1), (4,2)
(5,1) }

⇒ 15/36

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3. Sample space ⇒ Fair coin × 3 ⇒ 2^3 ⇒ {8}

P(2 head for 3 coins) = 4/8

P(1 head for 3 coins) = 7/8

Given it is observed 1 head is seen;

∴ Probability of 2 head occuring would be;

⇒ $P\left(2H/_{1H}\right) = 4/7$

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4. Sample space ⇒ Married couple with two kids ⇒
Either boy or girl ⇒ 2^2 = {4} ⇒ {(B,B), (B,G), (G,B), (G,G).

P(1 girl in 2 children) ⇒ 3/4

Determine other kid is also a girl?

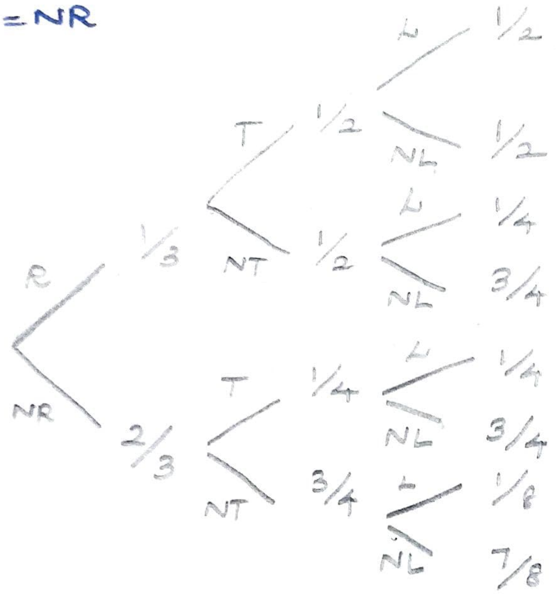
$P(\text{2 girl in 2 children}) = 1/4$

$\therefore P(\text{2 girl}/\text{1 girl}) = \dfrac{1/4}{3/4} = 1/3$ //

Conditional, Joint and Marginal Probability.

5. Rain = R ; Traffic = T & NT ; Late = L & NT

No Rain = NR



1) $P(NR \cap T \cap NL) \Rightarrow$ (Joint Probability)

$= 3/4 \times 1/4 \times 2/3 \Rightarrow 1/8$

2) $P(L) \Rightarrow$ (Marginal)

$\Rightarrow 1/2 \times 1/2 \times 1/3 + 1/4 \times 1/2 \times 1/3 + 1/4 \times 1/4 \times 2/3$

$+ 1/8 \times 3/4 \times 2/3$

$\Rightarrow 11/48$

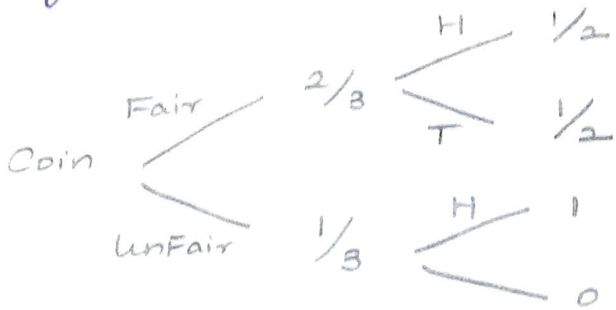
3) $P(R/L) \Rightarrow$ (Conditional)

$\Rightarrow \dfrac{P(R \cap L)}{P(L)} = \dfrac{(1/2 \times 1/2 \times 1/3) + (1/4 \times 1/2 \times 1/3)}{11/48}$

$\Rightarrow 6/11$

6. Box with 3 coins.

2 fair, 1- double headed coin.



1) $P(\text{Heads}) \Rightarrow \frac{1}{2} \times \frac{2}{3} + \frac{1}{3} \times 1$

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

2) Bayes theorem;

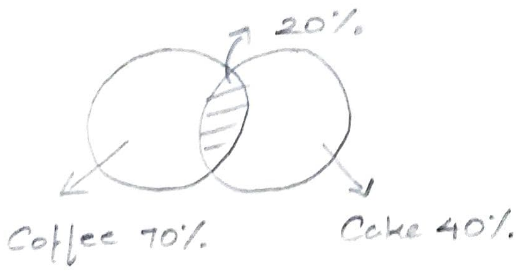
$P(\text{Badcoin}/H) = ?$

$P(H/\text{Badcoin}) = 1$

$\therefore P(BC/H) = \dfrac{P(H/BC) \times P(BC)}{P(H)}$

$\Rightarrow \dfrac{1 \times \frac{1}{3}}{\frac{2}{3}} = \frac{1}{2}$

7.



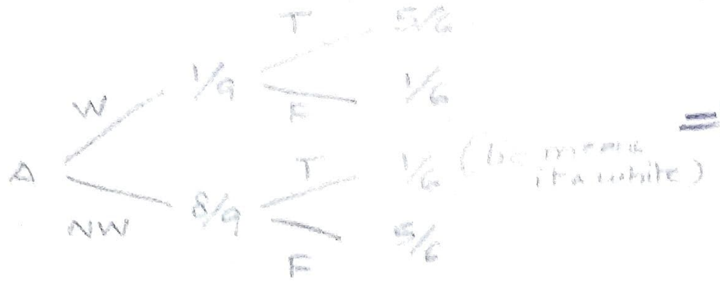
$P(\text{coffee}/\text{cake}) = ?$

$\Rightarrow \dfrac{P(\text{coffee} \cap \text{cake})}{P(\text{cake})}$

$\Rightarrow \dfrac{0.2}{0.4} \Rightarrow \frac{1}{2}$

8. Person A tells truth 5/6 times.

$P(W) = 1/9$ $\qquad$ $P(W/T) = ?$

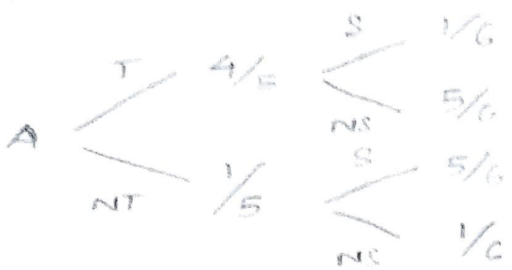


$$\Rightarrow \frac{P(W \cap T)}{P(T)}$$

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

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

9.



$$= \frac{1/6 \times 4/5}{1/6 \times 4/5 + 5/6 \times 1/5}$$

$$\Rightarrow 4/9$$

10. $P(\text{Science}) = 0.6$

$P(\text{Math} \cap \text{Science}) = 0.4$

$$P(\text{Science}/\text{Math}) = \frac{0.4}{0.6} = 0.66$$

11. 1) Joint probability. It is not conditional as it is asking if it is a male graduate.

~~2)~~ $P(M \cap G) = 19/100$

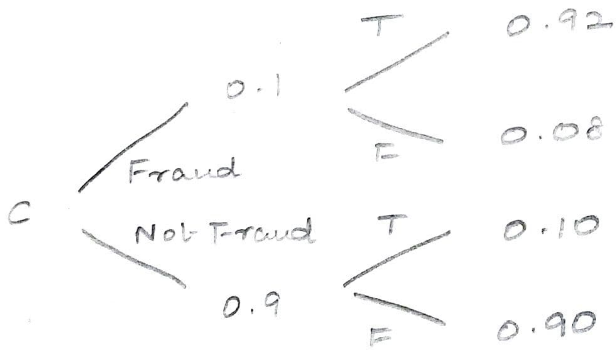
2) $P(M) = 60/100$

3) It is marginal as it is asking about graduates, which would refer either male/female.

$\therefore$ $31/100$

4) Conditional probability, selected PG students, find if female. $\Rightarrow$ $28/69$

12.



$$P\left(\text{Fraud}/\text{True}\right) = \frac{P\left(\text{True}/\text{Fraud}\right) \times P(\text{Fraud})}{P(\text{True})}$$

$$= \frac{0.92 \times 0.1}{0.92 \times 0.1 + 0.9 \times 0.10}$$

$\Rightarrow$ 0.50

$\therefore$ 50% companies did fraud in their filings.

13. 321 out of 1000 people died of renal failure.

460 out of 1000 people had one parent with renal failure.

115 out of this 460 died of renal failure.

$(321 - 115) = 206$ out of 1000 died of renal failure, even though the parent didn't have it.

Find $P\left(\text{Renal Failure} / \text{Parent didn't have}\right)$

$$\Rightarrow \quad \frac{P(RF \cap PNRF)}{P(PNRF)}$$

Since 460 had renal failure, 540 failure didn't have.

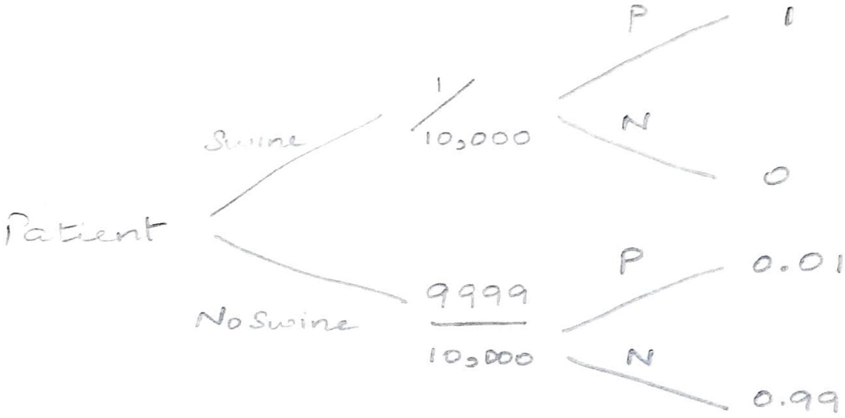
$\therefore \quad P(PNRF) = 540/1000$

We know, $206/1000$ died of renal failure even though the parent didn't have.

$$\Rightarrow \quad \frac{206/1000}{540/1000} = \frac{206}{540} = 0.38$$

38% died of renal failure, when parent didn't have renal failure

14.



Find $P\left(\text{Swine flu}/\text{positive}\right)$

$$\Rightarrow \quad \frac{1 \times 0.0001}{1 \times 0.0001 + 0.01 \times 0.9999} \simeq 0.099$$

∴ approx 1% of having swine flu.