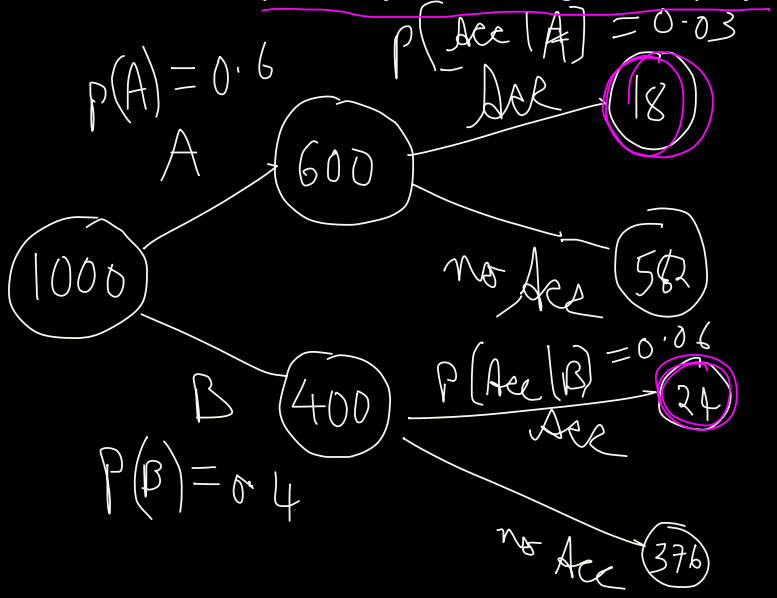
A certain city has two taxi companies, Company A and Company B. Company A has 60% of the taxis in the city, while Company B has 40%. Company A's taxis are involved in accidents 3% of the time, while Company B's taxis are involved in accidents 6% of the time. If a taxi is involved in an accident, what is the probability that it belongs to Company B?



$P(B \mid Acc)$

$$\frac{24}{18+24}$$

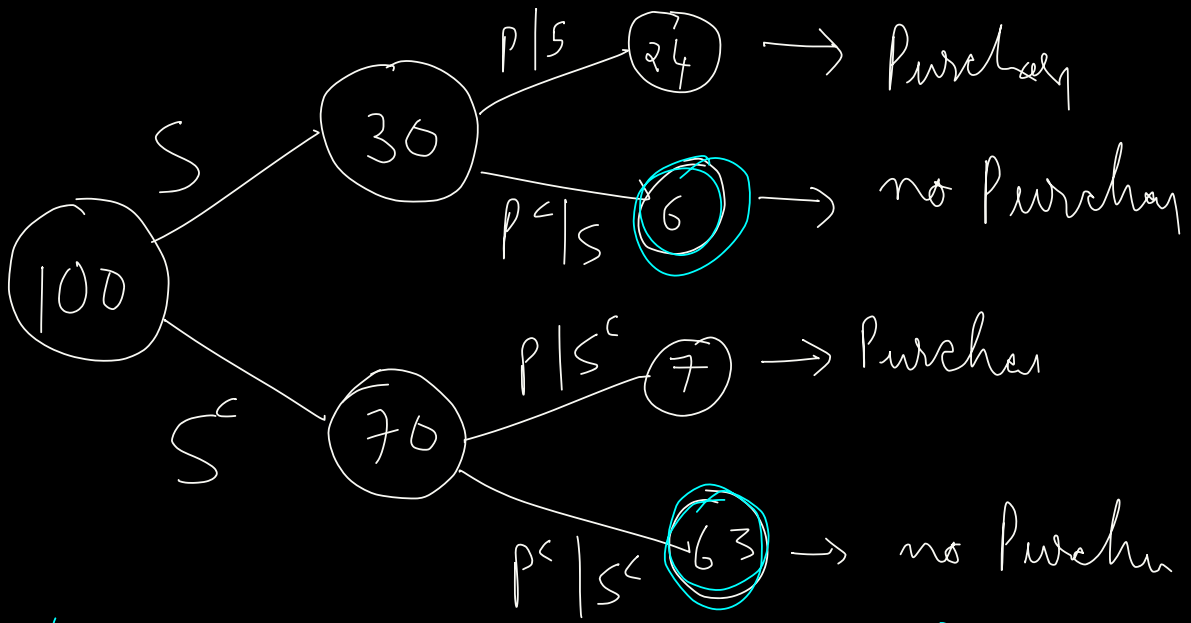
Prob of accident?

$$\frac{18+24}{1000} = 4.2\%$$

$3 \times 0.6 + 6 \times 0.4 = 4.2\%$

$P(Acc \mid A)\,P(A) + P(Acc \mid B)\,P(B)$

It is known that 30% of emails are spam, and 70% are not spam
The word “purchase” occurs in 80% of spam emails.
It also occurs in 10% of non-spam emails
A new mail does not have the word “purchase”. What is the probability that it is spam?



How many emails do not have 'purchase'
6+63 = 69
Among these, how many are spam? → 6
P[S | no Purchase] = $\frac{6}{69}$ = 0.08

It is known that 5% of all LinkedIn users are premium users
10% of premium users are actively seeking new job opportunities.
Only 2% of non-premium users are actively seeking new job opportunities
A randomly chosen person is not actively seeking new jobs. What is the probability that he is a premium user?

$\frac{45}{45+931} = 0.04$

$P[Pr] = 0.05$ $P[J|Pr] = 0.1$ $P[\text{not } J | Pr] = 0.9$

$P[J | \text{no } Pr] = 0.02$ $P[\text{not } J | \text{not } Pr] = 0.98$

$P[\text{not } Pr] = 0.95$ $P[J]$ $P[\text{not } J]$

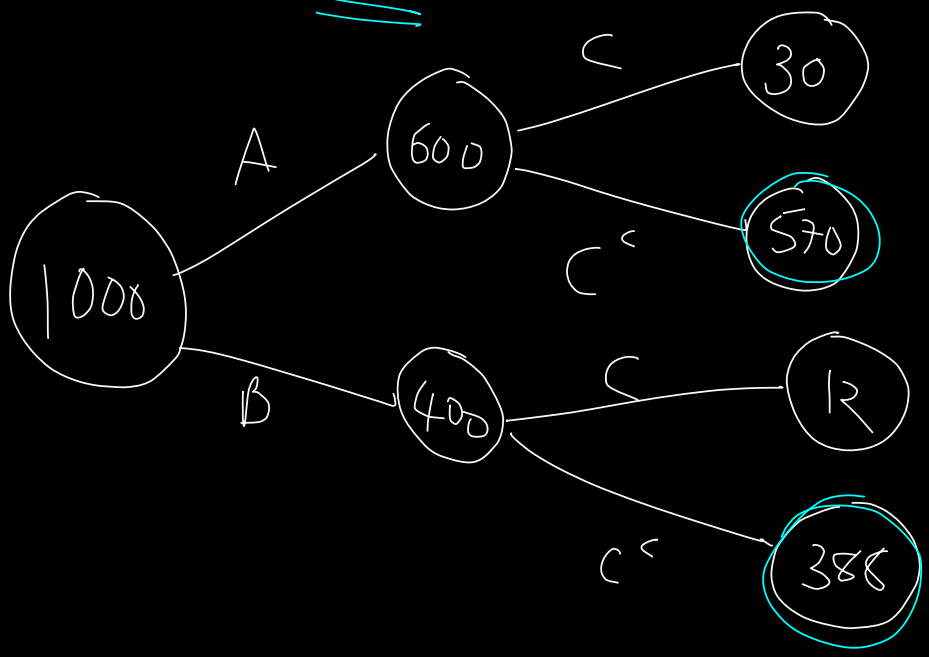
$P[Pr|J]$ $P[Pr|\text{not } J]$ $P[\text{not } Pr | J)$

$P[\text{not } Pr | \text{not } J]$

$$P[Pr|\text{not } J] = \frac{P[\text{not } J | Pr] P(Pr)}{P[\text{not } J]} = \frac{(0.9)(0.05)}{(0.9)(0.05) + (0.98)(0.95)}$$

$$P(\text{not } J) = P[\text{not } J | Pr] P[Pr] + P[\text{not } J | \text{not } Pr] P[\text{not } Pr]$$
$$= (0.9)(0.05) + (0.98)(0.95)$$

An e-commerce website shows two types of ads: Type A and Type B.
60% of the visitors see Type A ads, and 40% visitors see Type B ads
The click-through rate for Type A ads is 5%, while the click-through rate for Type B ads is 3%
A visitor to the website does not click the ad. What is the probability that he saw Type A ad?



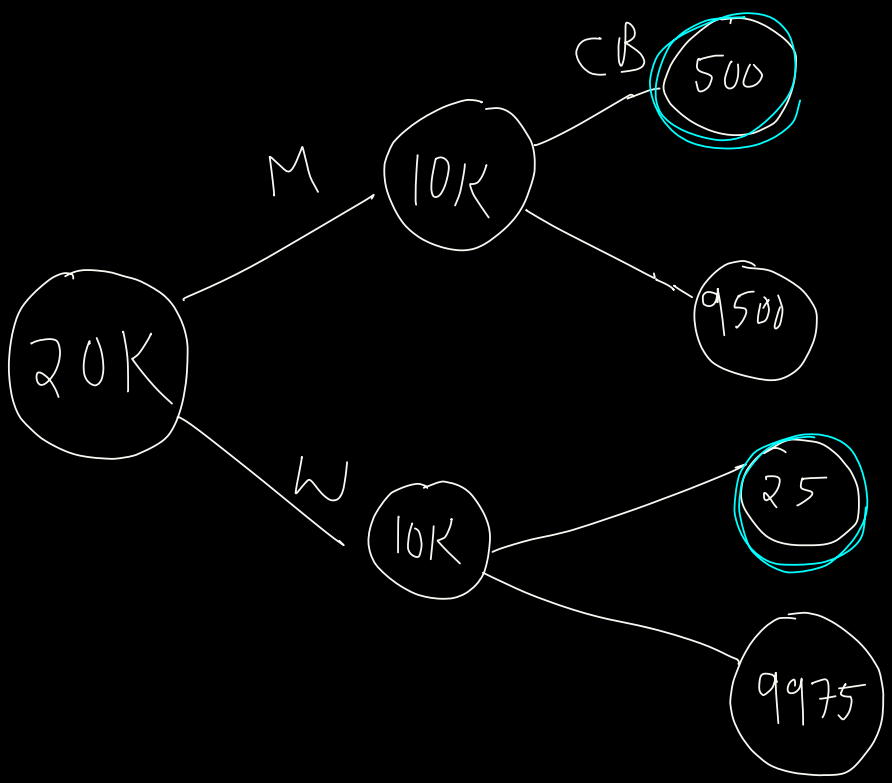
$$\frac{570}{570+388} = 0.59$$

Suppose 5 percent of men and 0.25 percent of the women are color-blind. A random color-blind person is chosen. What is the probability of this person being male? Assume there are equal number of men and women overall.

$$P(M|CB) = \frac{P(CB|M)P(M)}{P(CB|M)P(M) + P(CB|W)P(W)}$$

$$= \frac{(0.05)(0.5)}{(0.05)(0.5) + (0.0025)(0.5)}$$

$$= 0.95$$



$$\frac{500}{500 + 25}$$

A gambler has in his pocket a fair coin and a two-headed coin.

Q1)
He selects one of the coins at random, and flips it.
It lands heads. Compute probability that it is fair coin

F or B

$P(F) = 0.5$

$P(B) = 0.5$

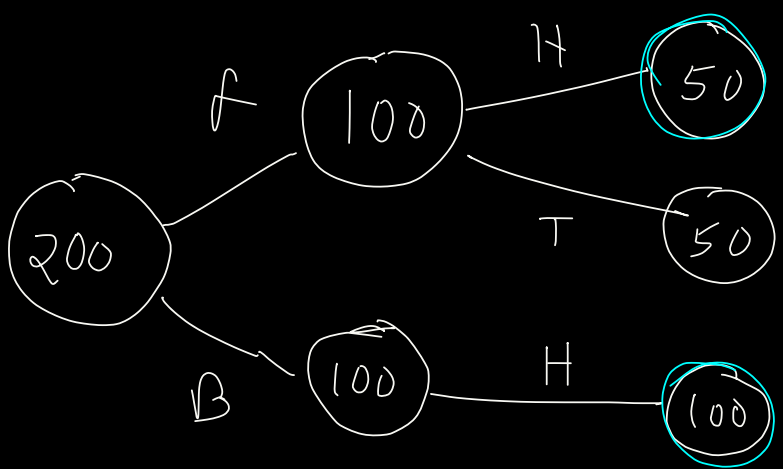
$P(H|F) = 0.5$

$P(H|B) = 1$

$$P(F|H) = \frac{P(H|F)P(F)}{P(H)}$$

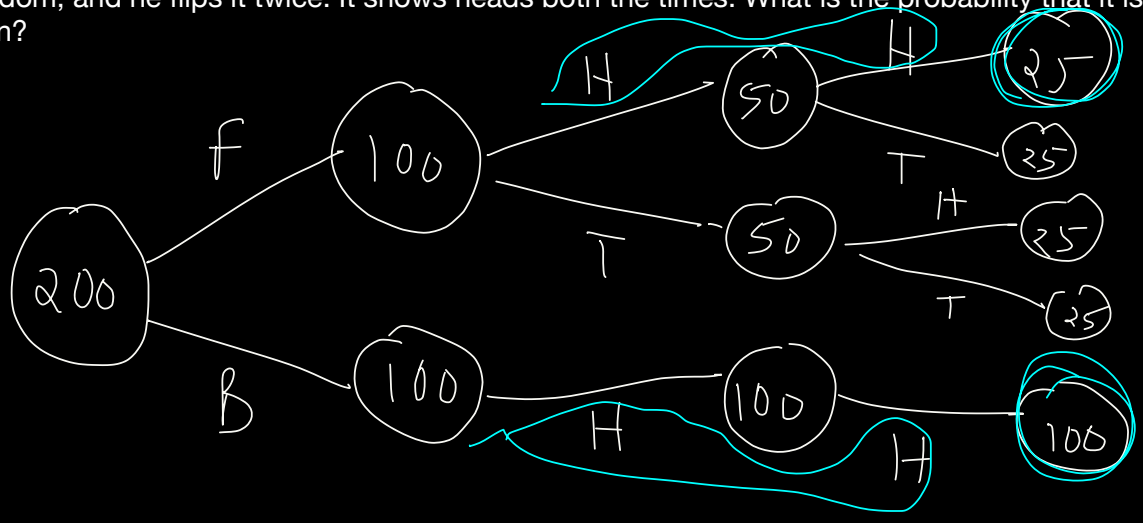
$$= \frac{P(H|F)P(F)}{P(H|F)P(F) + P(H|B)P(B)}$$

$$= \frac{(0.5)(0.5)}{(0.5)(0.5) + (1)(0.5)} = \frac{1}{3}$$



$$\frac{50}{50 + 100}$$

A gambler has in his pocket a fair coin and a two-headed coin. He selects one of the coins at random, and he flips it twice. It shows heads both the times. What is the probability that it is the fair coin?

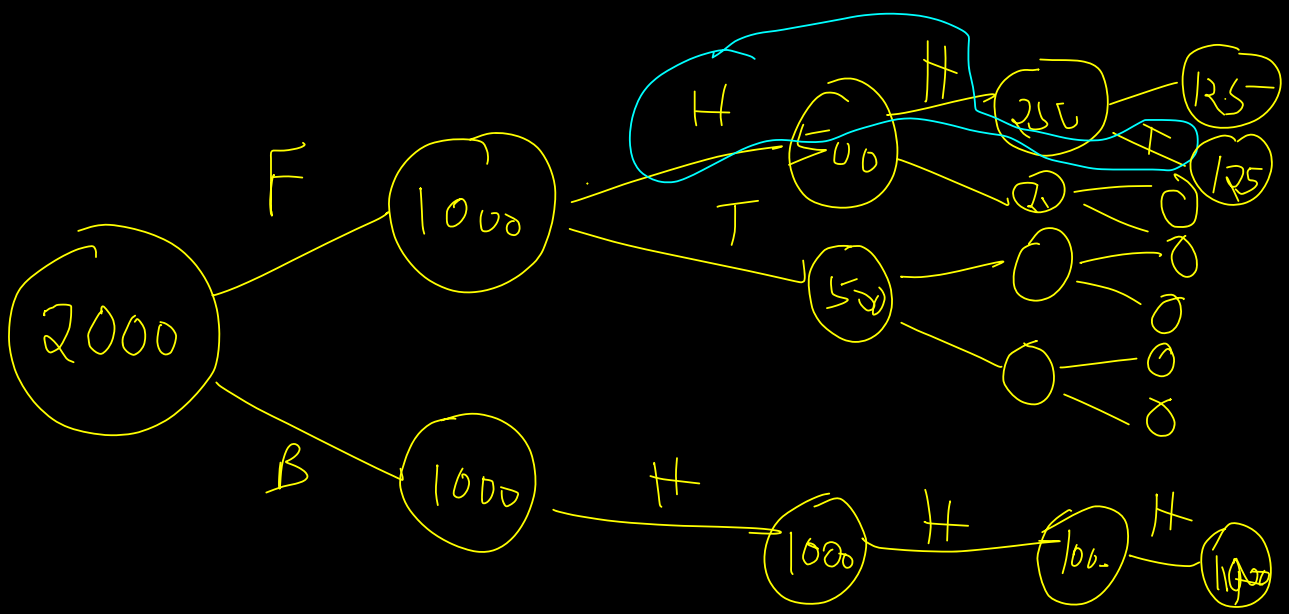


$$P(F|HH) = \frac{P(HH|F)\,P(F)}{P(HH|F)P(F) + P(HH|B)\,P(B)}$$

$$= \frac{(0.5)(0.5)(0.5)}{(0.5)(0.5)(0.5) + (1)(0.5)}$$

$$\frac{25}{25+100}$$

A gambler has in his pocket a fair coin and a two-headed coin. He selects one of the coins at random, and he flips it three times. He gets {HHT}. What is the probability that it is the fair coin?



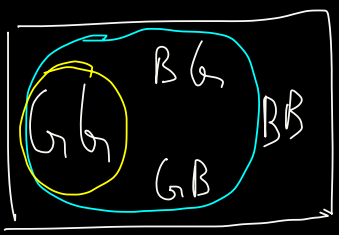
A family has 2 children, at least one of them is a girl. What is the probability that both are girls?

$S = \{BB, BG, GB, GG\}$

A: Both are girls

B: Atleast 1 girl

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



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

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

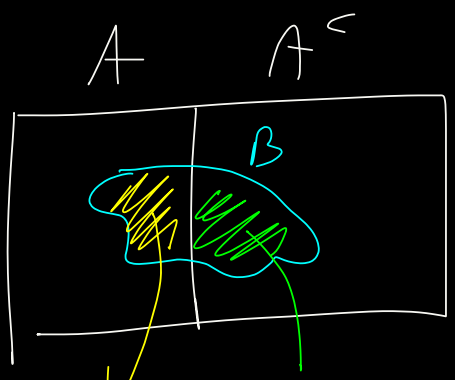
$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{\frac{1}{4}}{\frac{3}{4}} = \frac{1}{3}$$

dice on faces 5 & 6 I

put a stick of 4

$$S = \{1, 2, 3, 4\}$$

$$\frac{1}{6} \quad \frac{1}{6} \quad \frac{1}{6} \quad \frac{3}{6}$$



$$B = (B \cap A) \cup (B \cap A^c)$$

$$P(B) = P(B \cap A) + P(B \cap A^c)$$

$$= P(B|A)P(A) + P(B|A^c)P(A^c)$$

Total Prob

$$P(\text{HHT} \mid \text{F}) = \frac{1}{2}\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)$$