

P12 - 2.10 - Lie Detector Test Notes

	L: Lied	\bar{L} : Did Not Lie	Total
P: Positive	42	18	60
N: Negative	10	30	40
Total	52	48	100

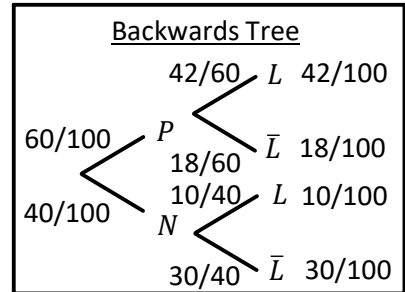
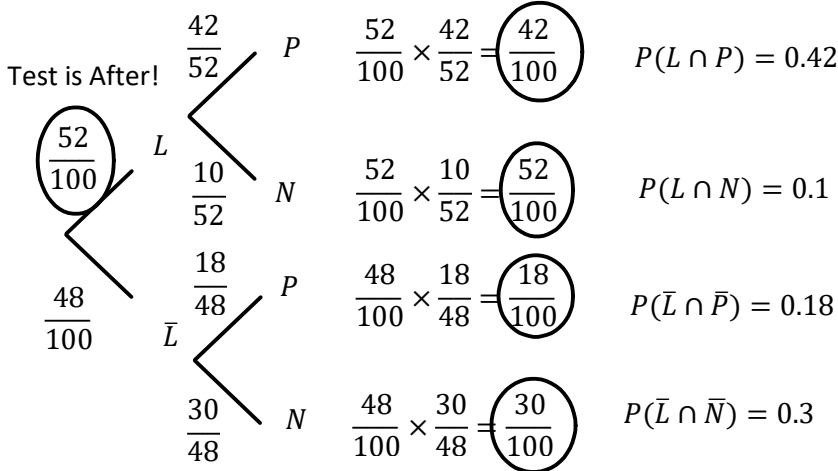
P: Indicated a lie
N: Indicated did not lie

Probability select 2 liars in a row.

$$p(L, L) = \frac{52}{100} \times \frac{51}{99} = 0.268$$

Given*

$$P(L) = \frac{52}{100} \quad P(\bar{L}) = \frac{48}{100} \quad P(P|L) = \frac{42}{52} \quad P(P|\bar{L}) = \frac{18}{48} \quad P(P) = \frac{60}{100} \quad P(N) = \frac{40}{100}$$



$P(P|L) = \frac{P(L \cap P)}{P(L)} = \frac{42}{52} = 0.808$
 L: Lied

42
10
52

 Given the subject lied there is a 0.808 probability of getting a positive test result
 A correct result

$P(\bar{L}|P) = \frac{P(P \cap \bar{L})}{P(P)} = \frac{18}{60} = 0.3$
 False Positive

P: Positive	42	18	60
-------------	----	----	----

$P(N|\bar{L}) = \frac{P(N \cap \bar{L})}{P(\bar{L})} = \frac{30}{48} = 0.625$

\bar{L} : Did not Lie
18
30
48

 A correct Result

$P(L|N) = \frac{P(N \cap L)}{P(N)} = \frac{10}{40} = 0.25$
 False Negative

N: Negative	10	30	40
-------------	----	----	----

$P(L|P) = \frac{P(P \cap L)}{P(P)} = \frac{42}{60} = 0.7$
 Given the subject tested positive there is a 0.7 probability that they lied.

Backwards

$$P(L|P) = \frac{P(P \cap L)}{P(P)} = \frac{P(P|L) \times P(L)}{P(P|L) \times P(L) + P(P|\bar{L}) \times P(\bar{L})}$$

$$P(L|P) = \frac{\frac{42}{52} \times \frac{52}{100}}{\frac{42}{52} \times \frac{52}{100} + \frac{18}{48} \times \frac{48}{100}} = \frac{42}{60} = 0.7$$