

### Extra Examples For Section 4.3, List of important problems from the book

1) A blood test indicates the presence of a particular disease (Positive result) 93% of the time when the disease is actually present. The same test indicates the presence of the disease 0.60% of the time when the disease is not present.

Five percent of the population actually has the disease. Calculate the probability that:

a) a person has the disease (Actually has it), given that the test indicates the presence of the disease (Positive result)

b) the test indicates the person has the disease (positive result), given that the person has the disease (actually has it)

Answer:

a) 89.08% or 89.1%

b) 93%, no work needed

2) Three ordinary quarters and a fake quarter with two heads are placed in a hat. One quarter is selected at random and tossed twice

a) If the outcome is "HH," what is the probability that fake quarter was selected?

b) If the fake was selected, what is the probability that the outcome is "HH"?

3) An unfair coin with  $\Pr[H] = 0.75$ . is flipped. If the flip results in a head, a student is selected at random from a group of 6 boys and 10 girls. Otherwise, a student is selected from a different class containing 5 boys and 8 girls.

a) If the selected student is a girl, What is the probability that the flip resulted in a head?

b) If the flip resulted in a head, What is the probability that a girl is selected?

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Important problems from the book, try and check your answers. Contact me if you have any questions:

**4.1:** #7, 15, 21, 23(important), 25

**4.2:** #3, 5, 7,11, 17, 23, 31(most important)

Some problems from 4.2 will be easier to solve after learning 4.3, because they require tree:

#9, 13, 21, 25 (extremely important)

**4.3:** #1, 3, 5, 9,11,13,21 and #25 from section 4.2

**4.4:** #7, 1, 13

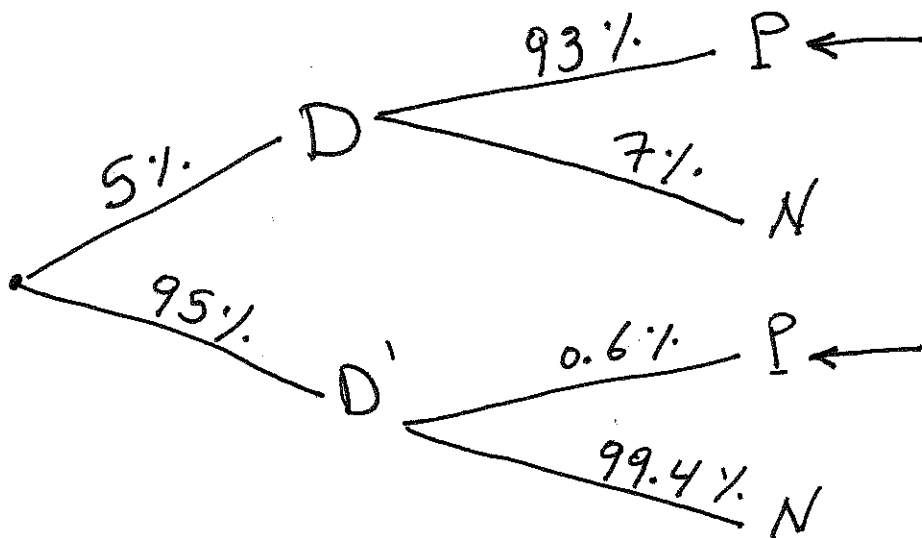
**4.5 (Review):** #3, 7(Important), 9,11,15, 17, 19, 23, 25

①

5% Actually has it

93% Test Positive if they have it

0.6% Test Positive if they have it



D: Actually has it

P: Positive Result, N: Negative Result

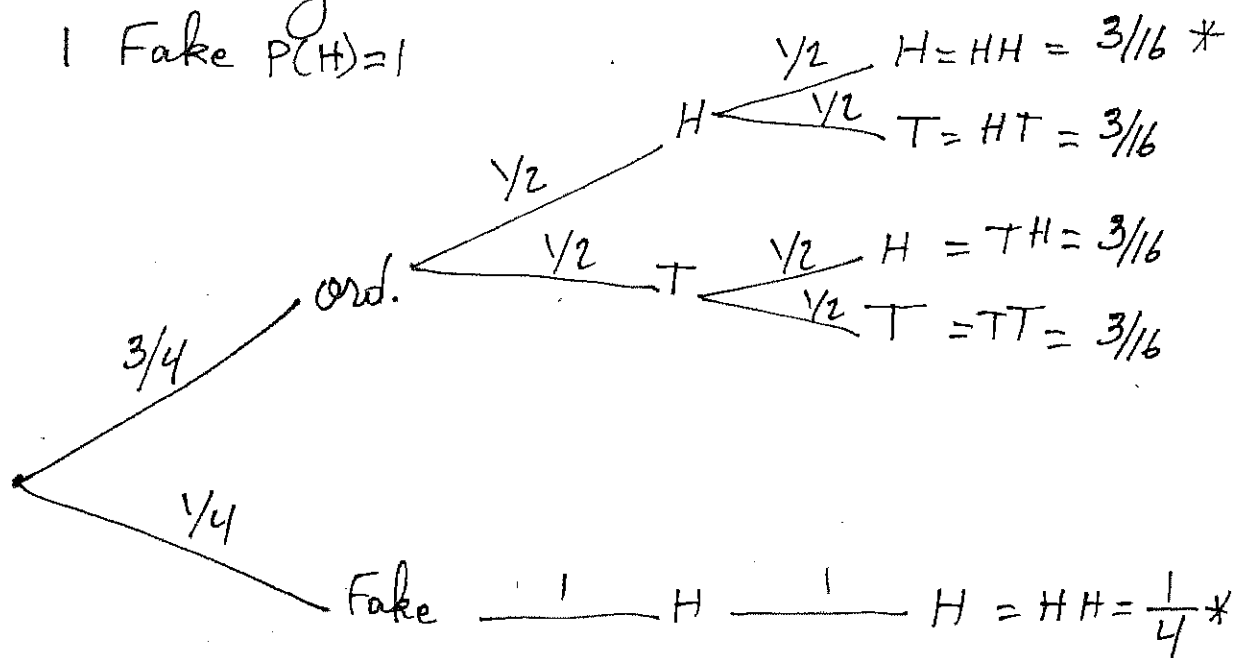
$$a) P(D|P) = \frac{(5)(93)}{(5)(93) + (95)(0.6)}$$

$$b) P(P|D) = 93\% \quad (\text{No work Needed})$$

②

3 ordinary ( $P(H)=1/2, P(T)=1/2$ )

1 Fake  $P(H)=1$



$$a) P(\text{Fake} | HH) = \frac{P(\text{Fake} \cap HH)}{P(HH)}$$

$$= \frac{\frac{1}{4}}{\frac{3}{16} + \frac{1}{4}} = \frac{4}{7}$$

$$b) P(HH | \text{Fake}) = 1 = 100\% \quad (\text{No Work Needed})$$

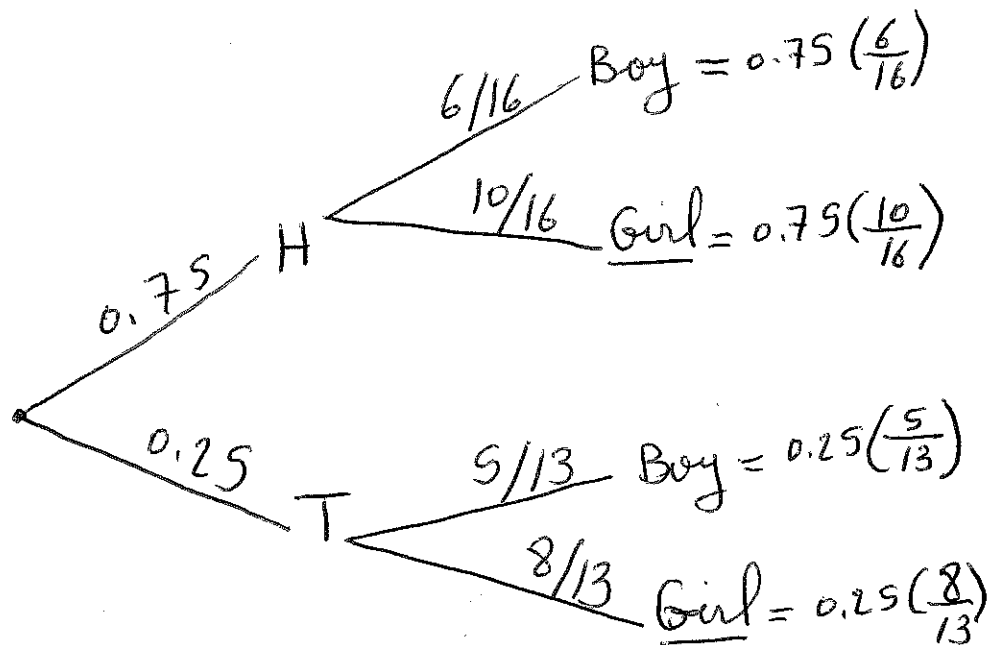
③

$$P(H) = 0.75$$

$$P(T) = 0.25$$

class A: 6B + 10g

class B: 5B + 8g



$$a) P(\text{Girl} | H) = \frac{10}{16} = 0.625 \text{ (No Work Needed)}$$

$$\begin{aligned} b) P(H | \text{Girl}) &= \frac{P(H \cap G)}{P(\text{Girl})} \\ &= \frac{0.75 \left(\frac{10}{16}\right)}{0.75 \left(\frac{10}{16}\right) + 0.25 \left(\frac{8}{13}\right)} \\ &= \frac{0.46875}{0.622596} = 0.75289 \\ &\approx 75.29\% \end{aligned}$$