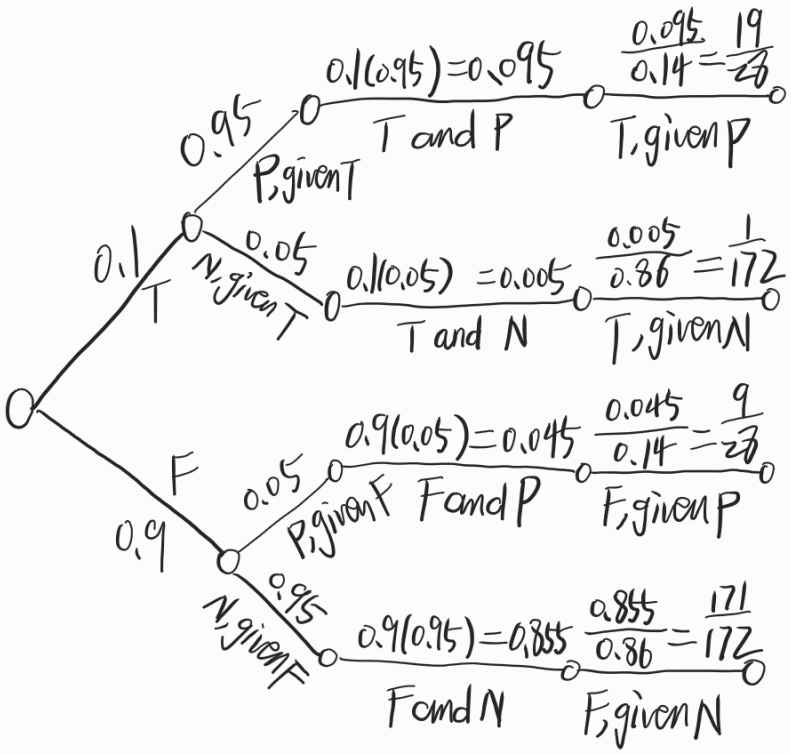
16.3-10. An athletic league does drug testing of its athletes, 10 percent of whom use drugs. This test, however, is only 95 percent reliable. That is, a drug user will test positive with probability 0.95 and negative with probability 0.05, and a nonuser will test negative with probability 0.95 and positive with probability 0.05.

Develop a probability tree diagram to determine the posterior probability of each of the following outcomes of testing an athlete.

(a) The athlete is a drug user, given that the test is positive.
(b) The athlete is not a drug user, given that the test is positive.
(c) The athlete is a drug user, given that the test is negative.
(d) The athlete is not a drug user, given that the test is negative.
T **(e)** Use the Excel template for posterior probabilities to check your answers in the preceding parts.

Use T、F danotes "use" and "not use" drugs respectively and P、N danotes test positive and negative respectively.



Unconditional probabilities: P(finding)
$P(P) = 0.095 + 0.045 = 0.14$
$P(N) = 0.005 + 0.855 = 0.86$

(a) $P(T|P) = \frac{19}{28}$ (b) $P(F|P) = \frac{9}{28}$

(c) $P(T|N) = \frac{1}{172}$ (d) $P(F|N) = \frac{171}{172}$

16.4-6 On Monday, a certain stock closed at \$10 per share. On Tuesday, you expect the stock to close at \$9, \$10, or \$11 per share, with respective probabilities 0.3, 0.3, and 0.4. On Wednesday, you expect the stock to close 10 percent lower, unchanged, or 10 percent higher than Tuesday's close, with the following probabilities:

Today's Close	10% Lower	Unchanged	10% Higher
\$ 9	0.4	0.3	0.3
\$10	0.2	0.2	0.6
\$11	0.1	0.2	0.7

On Tuesday, you are directed to buy 100 shares of the stock before Thursday. All purchases are made at the end of the day, at the known closing price for that day, so your only options are to buy at the end of Tuesday or at the end of Wednesday. You wish to determine the optimal strategy for whether to buy on Tuesday or defer the purchase until Wednesday, given the Tuesday closing price, to minimize the expected purchase price. Develop and evaluate a decision tree by hand for determining the optimal strategy.

From the decision tree we know if the stock closes at \$9 on Tuesday, the optimal strategy is to wait to buy on Wednesday; if at \$10 or \$11 then the optimal decision is buying on Tuesday.