

**Question #15222** Over a three year period in Smallsville, Judge Adams saw 37% of the cases, Judge Brown saw 39% of the cases and Judge Carter saw the remainder of the cases. Nine percent of Judge Adams' cases were appealed, 8% of Judge Browns's cases were appealed, and 6% of Judge Carters cases were appealed.

Given a randomly selected case from this three year period was not appealed, what is the probability the judge in the case was not Judge Carter?

**Solution.** Denote by  $A, B, C$  respectively respectively the events that random case was seen by Adams, Brown, Carter and by  $NA$  the randomly selected case was not appealed. The condition implies that  $P(A) = 0.37, P(B) = 0.39, P(C) = 0.24$  and  $P(NA|A) = 0.91, P(NA|B) = 0.92, P(NA|C) = 0.94$ . We are to calculate  $P(\bar{C}|NA) = 1 - P(C|NA)$ , using Bayesian formula one can get the last equals  $1 - \frac{P(NA|C)P(C)}{P(NA|A)P(A) + P(NA|B)P(B) + P(NA|C)P(C)} = 1 - \frac{0.94 \cdot 0.24}{0.91 \cdot 0.37 + 0.92 \cdot 0.39 + 0.94 \cdot 0.24} \approx$

$1 - 0.245 = 0.755$ .

**Answer** Approximately 0.76.