Question #157
Key: D

The posterior density function is proportional to the product of the likelihood function and prior density. That is, $\pi(q\,|\,1,0) \propto f(1\,|\,q)\,f(0\,|\,q)\pi(q) \propto q(1-q)q^3 = q^4 - q^5$. To get the exact posterior density, integrate this function over its range:

$\int_{0.6}^{0.8} q^4 - q^5 dq = \frac{q^5}{5} - \frac{q^6}{6}\Big|_{0.6}^{0.8} = 0.014069$ and so $\pi(q\,|\,1,0) = \frac{q^4 - q^5}{0.014069}$. Then,

$$\Pr(0.7 < q < 0.8\,|\,1,0) = \int_{0.7}^{0.8} \frac{q^4 - q^5}{0.014069} dq = 0.5572.$$