57. A force $F \sim N(800,\ 80^2)$ lbf is applied to a simply-supported beam shown in the figure. The modulus of elasticity is $E = 12$ Mpsi and the length of the beam is $l \sim N60,\ 0.1^2)$ in and. If the allowable deflection is $\delta_a = 0.3$ in and the maximum probability of failure is designed to be $p_f = 10^{-5}$, determine the minimum diameter of the beam using $y_{\max} = \frac{Fl^3}{48EI}$. Assume that F and l are independent.

Answer: $d = 2.322$ in, $d_{preferred} = 2.4$ in