52. A cantilevered tube is subjected to a force $F \sim N(3500,\ 350^2)$ N as shown in the figure. The tube has an outside diameter of $d_O = 60$ mm and inside diameter of $d_i$. The lenghth of the tube is $l \sim N(1500,\ 0.1^2)$ mm and the modulus of elasticity is $E = 80$ GPa. Assume that the allowable transverse deflection is $y_a = 120$ mm and the maximum probability of failure is designed to be $p_f = 10^{-5}$, estimate the inside diameter of the tube. Note that the maximum deflection is $y_{\max} = \frac{Fl^3}{3EI}$

**Answer:** $d_i = 30$ mm