42. A beam is subjected to an uniform load of $w \sim N(240, 20^2)$ N/m shown in the figure. The beam cantilevered at O has a round cross section with a diameter of $d \sim N(60, 0.1^2)$ mm. If the allowable bending stress is $S_a \sim N(80, 8^2)$ MPa, estimate the probability of failure using the First Order Second Moment Method. Note that w, d and S_a are independent.

Answer: $p_f = 4.33(10^{-5})$