Example 2.9

flood height $X_i \sim Exp(\lambda)$, $\lambda^{-1} = 10$, X_i i.i.d.

$$P\left(\max_{i=1,\dots,100} X_i > h\right) = 1 - P(\max X_i \leq h)$$

↑ height of dike

$$= 1 - F_{100}(h) = 1 - (F_X(h))^{100}$$

$$= 1 - \left(1 - \exp(-h/10)\right)^{100} \overset{!}{\leq} 0{,}5$$

Solve for h:

$$0{,}5 = \left(1 - \exp(-h/10)\right)^{100}$$

$$\sqrt[100]{0{,}5} = 1 - \exp(-h/10)$$

$$-h/10 = \log\left(1 - \sqrt[100]{0{,}5}\right)$$

$$h = -10 \log\left(1 - \sqrt[100]{0{,}5}\right) \approx 49{,}8.$$

So the dike needs to be approximately 5 times the average flood height.