Problem

Given two random variables X and Y over uniform distribution $U(0,1)$. Find the PDF of $Z = \min(X,Y)$.

This post (for $U(0,1)$), this post (for $U(a,b)$), this post (with extended references) and this post give the solution for n-variable case:

$$F_Z(z) = P(\min_i X_i \leqslant z) = 1 - (1 - P(X_i \leqslant z))^n \tag{1}$$

for any i.
Since X_i has uniform distribution, $P(X_i \leqslant z) = z$ and

$$F_Z(z) = 1 - (1-z)^n \textit{ and } f_Z(z) = n(1-z)^{n-1} \tag{2}$$

The expected value is

$$\mathbb{E}(Z) = \int_0^1 t f_Z(t)dt = n\int_0^1 t(1-t)^{n-1} = \frac{1}{n+1} \tag{3}$$

Similarly, see this post, if $W = \max_i X_i$, then

$$F_W(w) = w^n \textit{ and } f_W(w) = nw^{n-1} \tag{4}$$

The expected value is

$$\mathbb{E}(W) = \int_0^1 t f_W(t)dt = n\int_0^1 tt^{n-1}dt = n\int_0^1 t^n dt = \frac{n}{n+1} \tag{5}$$

This post discusses the expectation of $max - min$.
This post initiates a thought on spectrum of n.
This post discusses sums of k smallest (out of n variables).