Theorem If $X_1, X_2, \ldots, X_n$ are mutually independent and identically distributed $U(0,1)$ random variables, then $Y = \max\{X_1, X_2, \ldots, X_n\}$ has the standard power distribution.

Proof Let the mutually independent random variables $X_1, X_2, \ldots, X_n$ each have the $U(0,1)$ distribution. Let $Y = \max\{X_1, X_2, \ldots, X_n\}$. Using an order statistic result, the probability density function of $Y$ is

$$f_Y(y) = \frac{n!}{(n-1)!(n-n)!} F(y)^{n-1} f(y)[1 - F(y)]^{n-n}$$

$$= \frac{n!}{(n-1)!} y^{n-1}$$

$$= ny^{n-1} \quad 0 < y < 1,$$

which is the probability density function of the standard power distribution with $\beta = n$.

**APPL verification:** The APPL statements

```appl
X := StandardUniformRV();
Y := OrderStat(X, n, n);
```

yield the probability density function of a standard power($n$) random variable.