

Examples of random number generator (LCG), Mersenne Twister, Xorshift, PCG, etc.

In Python:

```
import random  
random.seed(123) # Set seed  
print(random.random())
```

Lab

$$E[X - E[X]] = E[X] - E[E[X]]$$

But $E[X] = \text{a constant} \equiv \lambda$

$$\therefore E[E[X]] = E[\lambda] = \int_{-\infty}^{\infty} dx \lambda P_X(x) = \lambda \cdot 1 = \lambda$$

$$\therefore E[X - E[X]]$$

$$= \lambda - \lambda = 0$$

Let the two variables be X and Y
 Since they are statistically
 independent, $P_{XY}(x, y) = P_X(x)P_Y(y)$

$$\begin{aligned}
 C_{XY} &= E[(X - E[X])(Y - E[Y])] \\
 &= \int_{-\infty}^{\infty} dx \int_{-\infty}^{\infty} dy (x - E[x])(y - E[y]) P_{XY}(x, y) \\
 &= \int_{-\infty}^{\infty} dx \int_{-\infty}^{\infty} dy (x - E[x])(y - E[y]) P_X(x) P_Y(y) \\
 &= \left\{ \int_{-\infty}^{\infty} dx (x - E[x]) P_X(x) \right\} \left\{ \int_{-\infty}^{\infty} dy (y - E[y]) P_Y(y) \right\} \\
 &= E[X - E[X]] \cdot E[Y - E[Y]] \\
 &= 0 \cdot 0 = 0.
 \end{aligned}$$