5) E → Drawing some balls from an urn containing n balls.

A → drawing an even number of balls.

$P(A) = P(\text{drawing 2 balls}) + \cdots$

$$= \frac{{}^nC_2 + {}^nC_4 + \cdots + {}^nC_n}{{}^nC_1 + {}^nC_2 + \cdots + {}^nC_n}$$

$$= \frac{2^{n-1} - 1}{2^n - 1}$$

$$(1+x)^n = 1 + {}^nC_1 x + {}^nC_2 x^2 + \cdots {}^nC_n x^n$$

$$+ \quad (1-x)^n = 1 - {}^nC_1 x + {}^nC_2 x^2 + \cdots {}^nC_n x^n$$

Put $x = 1$

$$2^n = 2 + 2({}^nC_2 + {}^nC_4 + \cdots {}^nC_n)$$

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6) E → drawing even number of cards from a full pack.

A → Drawn cards consist of half red and half black card.

$$P(A) = \frac{{}^{26}C_1 \, {}^{26}C_1 + {}^{26}C_2 \, {}^{26}C_2 + \cdots + ({}^{26}C_{26})^2}{{}^{52}C_2 + {}^{52}C_4 + {}^{52}C_6 + \cdots + {}^{52}C_{52}}$$

$$= \frac{({}^{26}C_1)^2 + ({}^{26}C_2)^2 + \cdots + ({}^{26}C_{26})^2}{2^{51} - 1}$$

$$= \frac{{}^{52}C_{26} - 1}{2^{51} - 1}$$

$$(1+x)^n = {}^nC_0 + {}^nC_1 x + {}^nC_2 x^2 + {}^nC_n x^n$$

$$(x+1)^n = {}^nC_0 x^n + {}^nC_1 x^{n-1} + {}^nC_2 x^{n-2} + \cdots + {}^nC_n$$

$$(1+x)^{2n} = (\quad) \times (\quad)$$

coeff. of x^n

$${}^{2n}C_n = ({}^nC_0)^2 + ({}^nC_1)^2 + \cdots + ({}^nC_n)^2$$

$$= {}^{2n}C_n - 1$$

Q7)

RE : Die is thrown.

Event A : No 6.

$$P(A \neq 6) < 1/2$$

Let die be thrown n times

$$\left(\frac{5}{6}\right)^n < 1/2$$

Note: $\left(\frac{5}{6}\right)^n$ as our experiment is random

$$n(\ln 5 - \ln 6) < -\ln 2$$

$$n(\ln 6 - \ln 5) > \ln 2$$

$$n = \frac{\ln 2}{\ln 6 - \ln 5}$$