Pepys Problem

Binomial distribution

One 6 appears from 6 dice, $1 - p(\text{no successes})$ $k=0$

$$1 - \sum_{k=0}^{0} \left(1-(1/6)\right)^{6-0} (1/6)^{0} \approx .6651$$

Two 6's appears from 12 dice, $1 - p(\text{1 success and no successes})$ $k=1$ $k=0$

$$1 - \sum_{k=0}^{1} \binom{12}{k} (1/6)^{k} \left(1-(1/6)\right)^{12-k} \approx .6187$$

Three 6's appears from 18 dice, $1 - p(\text{2 successes, 1 success and no successes})$ $k=2$ $k=1$ $k=0$

$$1 - \sum_{k=0}^{2} \binom{18}{k} (1/6)^{k} \left(1-(1/6)\right)^{18-k} \approx .5973$$

The first proposition has the greatest chance of success.

Geomtric Urn

$E[\text{draw} \mid \text{red}] = 20 = 1/p \Rightarrow p = 1/20$

probability of drawing a red ball = 1/20

therefore in an Urn of 100 balls we would reasonably expect 5 red balls and 95 black balls