2) Two cards are drawn simultaneously (or successively without replacement) from a well shuffled pack of 52 cards. Find the mean, variance and standard deviation of the number of kings.

$\Rightarrow$ Let X denote the number of kings in a draw of two cards. X is a random variable which can assume the values 0, 1 or 2.

Now $P(X=0) = P(\text{no king})$.

$$= \frac{{}^{48}C_2}{{}^{52}C_2}$$

$$= \frac{\frac{48!}{2!(48-2)!}}{\frac{52!}{2!(52-2)!}}$$

$$= \frac{48\times 47}{52\times 51} = \frac{188}{221}$$

$P(X=1) = P(\text{one king and non-king})$

$$= \frac{{}^{4}C_1\ {}^{48}C_1}{{}^{52}C_1} = \frac{4\times 48\times 2}{52\times 51} =$$

$$= \frac{32}{221}$$

$P(X=2) = P(\text{two kings}) = \frac{{}^{4}C_2}{{}^{52}C_2} = \frac{4\times 3}{52\times 51}$

$$= \frac{1}{221}$$

Thus, the probability distribution of x is

x	0	1	2
$P(x)$	$\frac{188}{221}$	$\frac{32}{221}$	$\frac{1}{221}$

Mean of $x = E(x) = \sum_{i=1}^{n} x_i p(x_i)$

$= 0 \times \frac{188}{221} + 1 \times \frac{32}{221} + 2 \times \frac{1}{221}$

$= \frac{34}{221}$

$E(x^2) = \sum_{i=1}^{n} x_i^2 p(x_i)$

$= 0^2 \times \frac{188}{221} + 1^2 \frac{32}{221} + 2^2 \times \frac{1}{221}$

$= \frac{36}{221}$

$var(x) = E(x^2) - [E(x)]^2$

$= \frac{36}{221} - \left(\frac{34}{221}\right)^2 = \frac{6800}{(221)^2}$

$\sigma_x = \sqrt{var(x)} = \frac{\sqrt{6800}}{221} = 0.37$