Introduction to Probability, Statistics and Data Handling	**Moments, joint distribution**
Tutorial 4	

1. A sample consists of results: 2; 3; 3; 4; 4; 4; 5; 5; 5; 6; 6; 7. Compute the mean value and variance. Hint: assume that all results occur with the same probability.
2. A RV X has a mean value $E(X)$ and variance $V(X)$. Determine the expected value and variance of a new random variable $Z = \frac{X-E(X)}{\sigma}$.
3. A discrete random variable X has the probability function given in the table.

x_i	-2	-1	2	5
$P(X = x_i)$	0.3	0.1	0.2	0.4

   a) sketch the cumulative distribution of X
   b) calculate the mean and variance for two new random variables: $U = 2X - 3$ and $V = 2X^2$. Do you need to have PDF of the variables?

4. In the table below, the number of the people (per 100 000 population, per year) that smoked cigarettes and had lungs cancer is presented. The random variable ***X*** is one (not smoking) or zero (smoking) and variable ***Y*** is 1 (healthy) and 0 (ill). What are the joint distribution and marginal functions? Calculate:

	smoking	**not smoking**
ill	80	8
not ill	44920	54992

   a) the probability that if a person is ill it was caused by cigarettes,
   b) is he/she smokes that has lungs cancer,
   c) correlation between X and Y,
   d) probability that the smoking person will have cancer in: i) five, i) fifty years.
5. Let X and Y be jointly continuous random variable with joint pdf:

$$f_{X,Y}(x,y) = \begin{cases} 6e^{-(2x+3y)}, & x,y > 0 \\ 0, & otherwise \end{cases}$$

   a) Are X and Y idependent?
   b) Calculate the correlation between X and Y.
   b) Find marginal distribution of X and Y.
   c) Find $P(X > 2)$ and $P(Y < 1)$.
   d) Find $P(Y/X > 1)$.