

1. In an organization with n employees the average phone utilization is 20%. Assume that we wish to have a blocking probability for a call of 0.01. Find the number of lines required to serve the n employees for $n=10, 100, 1000, 4000$. You need to use Erlang B formula, but use it in excel to compute m =number of lines. For $n=1,000$ and $n=4,000$ you need to use the approximations given in the notes.

2. X and Y are random variables taking values and probabilities as follows:

$$P\{X=k \text{ and } Y=m\} = (0.2)\exp(-|m-2k|), \text{ for } k=0,1, 2, 3, \text{ and for } m=0,2,4,6$$

$$P\{X=4 \text{ and } Y=6\} = 0.022$$

$$P\{X=4 \text{ and } Y=m\} = 0, \text{ for } m=0,2,4$$

- Find the means, variances, and correlation for X and Y .
 - Find regressions for estimating X from Y and Y from X .
 - Find the resulting error variances for the two regressions.
3. For the following two pairs of random variables find the means, variances, and correlation coefficients. The tables show the joint probability mass functions of the two variables.

- a.

$P(X=m, Y=n)$	$Y = -2$	$Y = -1$	$Y = 1$	$Y = 2$
$X = -1$	1/8	0	0	0
$X = -0.5$	0	1/4	0	0
$X = 0.5$	0	0	1/2	0
$X = 1$	0	0	0	1/8

- b.

$P(X=m, Y=n)$	$m = -2$	$m = -1$	$m = 0$	$m = 1$	$m = 2$
$n = 0$	0	0	0.25	0	0
$n = 1$	0	0.125	0	0.125	0
$n = 4$	0.25	0	0	0	0.25

For this case show that the random variables are dependent but uncorrelated.

4. In the attached "[correlation4_un.xls](#)" file we have data of 40 samples of four variables X, Y, Z, and W. X represents the message transmission times and ranges from 0 to 2. The random variables Y, Z, and W represent observations that are dependent on the message transmission times.

Consider the following pairs: (X,Y); (X,Z); and (X,W)

For each pair find the sample averages, sample variances, and correlation. Also for each pair find a regression for estimating X from one of the other variables (Y, Z, and W) and find the sample variance of the residual.

For each pair plot a scatter diagram and on it show the regression line.