

Math 1180 - Mathematics for Life Scientists

Computer Assignment 7 - Joint Distribution

Due Tuesday, March 28, 2006

Problems

1. Consider the following joint probability distribution.

	$S_1 = 1$	$S_1 = 2$
$S_2 = 2$	0.4	0.0
$S_2 = 4$	0.1	0.5

We can enter it into Maple with the commands

```
> v2 := [[1,2],[1,4],[2,2],[2,4]];
> p2 := [0.4,0.1,0.0,0.5];
```

The values are hidden as follows: $v2[1][2]$ is the second component of the first entry in the list $v2$ i.e. the value 2. Experiment with this until it makes sense. Use the `sum` command to find the following. As an example, to find the mean of S_1 , you would type,

```
> mean_s1 := sum(v2[k][1]*p2[k],k=1..4);
```

Convince yourself why this is the correct command and do the remaining exercise using the same reasoning.

- (a) Find the means of S_1 and S_2 .
 - (b) Find the variances of S_1 and S_2 .
 - (c) Find the covariance of S_1 and S_2 .
 - (d) Find the correlation of S_1 and S_2 .
2. Suppose we have two random variable X and Y where

$$Y = 5 - X + B$$

where B is a Bernoulli random variable taking on the value 1 with probability 0.5. Suppose that X takes on the values 1, 2, 3 and 4 each with probability 0.25.

- (a) Find the mean and standard deviation of X .
- (b) What values can Y take on if $X = 1$?
- (c) What values can Y take on? If necessary, draw a table listing the possible X and B values to help you.
- (d) Find the marginal distribution for Y and use Maple to find its mean and standard deviation.
- (e) Find the joint distribution and use Maple to find the covariance of X and Y .
- (f) Find the correlation of X and Y .