Supplementary exercise for Unit 4

The purpose of this exercise is to firm up your understanding of the link between relative frequencies and probabilties.

Please do not look at the solutions at the end before doing the exercise.

Consider a variable with values 1,2,3,4 with probabilities of .3, .2, .1 and .4

Imagine that these variables come from a very huge population say 1 million.

a) How many of these 1 million would you think have the values 1,2,3,4 respectively?

b) Using the values in a), what is the mean you would calculate for the variable?

c) How does this compare with the value you would calculate as the expected value of this probabilistic variable ?

SOLUTION:

a) We can think of a probablity as the RELATIVE FREQUENCY in a very large or even infinite population. So we say .3million, .2 million, .1 million and .4 million would have the values 1,2,3,4 respectively.

b) We can calculate the mean as ( .3million times 1, plus .2 million times 2 plus .1 million times 3 plus .4million times 4) / 1 million = 2.6

We are multiplying the relative frequencies of each value, .3 million / million, .2 million / million …..and adding them up.

c) We can see that the formula for expected value of a probabilistic variable as the sum of each of the values multiplied by its probability is the same. In effect, we treat the probability as the relative frequency in a very large indefinite sized population.

Here, we do not assume any specific size for the population. Whether we assume it to be 1 million or 2 million or whatever, we can see the result will be the sum of the values each multiplied by the probability.