**Problem 3:**

**(a) Given that there are n observations, the probability of selecting any of the n observations is same. the probability that the jth observation is selected as the first bootstrap observation is 1/n.**

**The probability of first bootstrap observation not being the jth observation from the original sample will be given as 1 – 1/n**

**(b) Since we draw with replacement. The probability that the second observation is not the jth observation from the original sample is same as the above i.e (a)**

**(c) The probability of first bootstrap observation not being the jth observation from the original sample will be given as 1 – 1/n. The total bootstrap sample size is n. So we need to pick n different observations and none of them should be the jth one. As we draw with replacement, the probabilities of each observation are independent of one another. The probability that the jth observation is not in the bootstrap sample will be given as**

**The probability that the jth observation is in the bootstrap sample will be given as**

**(d) How will the probability in (b) change when the number of observations increases? Justify your answer.**

**When n= 10**

**1-1/n = 1-1/10 = 0.9**

**When n = 100**

**1-1/n = 1-1/100 = 0.99**

**When n = 1000**

**1-/n = 1-1/100 = 0.999**

**The probability increases when the number of observation increases.**

**(e) Bootstrap tests must use a finite number of bootstrap samples. This means that the outcome of the test will depend on the sequence of random numbers used to generate the bootstrap sample.**