1. A company uses a hydraulic transmission in one of its products. The company wants the transmission to pass a series of tests on a test stand before they will use the transmission in their product. Time is short and they can only test 8 transmissions selected at random from the incoming shipment of 100. For this probability exercise assume that 5 of the transmissions in the shipment are defective and will not pass the tests.

   a. If the 8 transmissions to be tested are sampled without replacement (a reasonable approach), what is the probability that all of the 8 pass the tests? One of the 8 fails? 5 of the 8 fail?

   b. If the 8 transmissions to be tested are sampled with replacement (not a reasonable approach but one that leads to easier probability calculations), what is the probability that all of the 8 pass the tests? One of the 8 fails? 5 of the 8 fail?

   c. How do the probabilities in a) and b) compare?

2. A supplier ships parts in lots of 1000. Your acceptance sampling scheme is to accept the lot if there are 0 or 1 defective parts in a random sample of 10, sampling without replacement.

   a. If there are 25 defective parts in a lot, what is the chance that the lot is rejected? Hint: It may be easier to compute the chance that the lot is accepted and use the rule of complements that states: \( \Pr(\text{Lot is rejected}) = 1 - \Pr(\text{Lot is accepted}) \).

   b. Below is a table giving various different values for the number of defective parts and the corresponding probability of accepting such a lot based on the scheme described above. According to the table what is 91.5% upper bound on the number of defective parts in a lot?

<table>
<thead>
<tr>
<th>number of defective parts in lot</th>
<th>50</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>350</th>
<th>400</th>
</tr>
</thead>
<tbody>
<tr>
<td>probability of accepting lot</td>
<td>0.915</td>
<td>0.736</td>
<td>0.544</td>
<td>0.375</td>
<td>0.243</td>
<td>0.148</td>
<td>0.085</td>
<td>0.046</td>
</tr>
</tbody>
</table>

3. You receive a shipment of 100,000 microchips that are programmed for keyless entry systems for vehicles. Some of the microchips may be defective and you do not want to accept the shipment unless you are sure that there is only a small proportion of defective chips. You select 1000 microchips at random and discover that 11 are defective.

   a. Construct a 95% confidence interval on the true proportion of defective microchips in the shipment given sampling was done without replacement.

   b. Construct a 95% confidence interval on the true proportion of defective microchips in the shipment given sampling was done with replacement.

   c. How do the two confidence intervals compare?