(1). (Here we go again) In a given semester UF must process about 49,000×4 grades. Assume that in the past, 0.1% of all grades are erroneously reported.

(a) If you are taking four courses, what is the probability that all of your grades are reported correctly?
(b) Assuming that every student takes four courses, what is the probability that someone has an incorrectly reported grade?

(2). The Wilcoxon rank-sum test is a common statistical test for comparing two groups. It is based on the random variable \( X = \) sum of the ranks in Group 1, when the observations in both groups are ranked

We want to analyze the following data:

The paper “Histamine content in sputum from allergic and non-allergic individuals” (J. Appl. Physiology 1969, 535-539) reports data for sputum histamine levels for allergic and non-allergic individuals. Here is a subset of the data:

<table>
<thead>
<tr>
<th></th>
<th>Allergies</th>
<th>67.3</th>
<th>39.6</th>
<th>165.0</th>
<th>100.0</th>
<th>65.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-allergies</td>
<td>34.3</td>
<td>27.3</td>
<td>48.1</td>
<td>35.4</td>
<td>5.2</td>
<td></td>
</tr>
</tbody>
</table>

(a) Verify that the sum of the ranks in the Allergies group is 39, and in the Non-allergies group is 16.
(b) If there is no difference in the groups, then the ranks 1−10 would be equally likely to appear in either group. How many different sets of ranks could appear in the Allergies group?
(c) Assuming that there is no difference in groups, find the distribution of \( X^1 \).
(d) Make a histogram of the distribution of \( X^1 \).

\(^1\)This problem is too big to do by hand. In class you will see \texttt{R} code to solve this. If you do not want to use \texttt{R}, you can drop one observation from each group making a problem that is reasonable to do by hand.
(e) Denote the value of $X$ for the observed data by $x_{obs}$. Find the probability $P(X > x_{obs})$. This is a measure of how likely the data are under the assumption of no group difference, known as the $p$-value.

(3). From the book: 1.46, 1.47, 1.49, 1.52, 2.2, 2.4, 2.6, 2.7