Name: Solutions

Answer the question. You may use your HW on this quiz. There is no need to simplify your answers. Be sure to justify and explain your answers.

1) [Additional Problem 2] A certain communication system consists of lining up 5 nearly identical antennas. When you receive the antennas you realize that 3 are working and 2 are broken. Fortunately your communication system is functional if no two broken antennas are next to each other.

a) (2 points) What are all possible ways to arrange these 5 antennas?

Let 1 = Working antenna, 0 = Broken antenna

\[
\begin{align*}
11100 & \quad 01110 \\
11010 & \quad 01101 \\
11001 & \quad 01011 \\
10110 & \quad 00111 \\
10101 & \\
10011 &
\end{align*}
\]

(5) = 10 possible arrangements

b) (2 points) How many of these arrangements will be functional?

6
2a) (1 point) [#1a] How many different 7-place license plates are possible if the first 2 places are for letters and the other 5 for numbers?

\[
26 \cdot 26 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 26^2 \cdot 10^5
\]

2b) (2 points) [#1b] Repeat part (a) under the assumption that no letter or number can be repeated in a single license place.

\[
26 \cdot 25 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6
\]

3) For years, telephone area codes in the United States consisted of sequences of three digits. The first digit was an integer between 2 and 9, the second was a 0 or 1, and the third was any integer from 1 to 9.

a) (1 point) [#5a] How many area codes were possible?

\[
8 \cdot 2 \cdot 9 = 144
\]

b) (2 points) [#5b] How many area codes starting with 4 were possible?

\[
1 \cdot 2 \cdot 9 = 18
\]