Problem Set 3

Problem 1

The octet looks like:

$$\begin{array}{ccccc}
 & 1 & & 1 & \\
1 & & 2 & & 1 \\
 & 1 & & 1 &
\end{array}$$

Adding an octet around each element would give:

$$\begin{array}{ccccccccc}
 & & 1 & & 2 & & 1 & & \\
 & 2 & & 6 & & 6 & & 2 & \\
1 & & 6 & & 10 & & 6 & & 1 \\
 & 2 & & 6 & & 6 & & 2 & \\
 & & 1 & & 2 & & 1 & &
\end{array}$$

The biggest configuration that is included in here is the **27** which is:

$$\begin{array}{ccccccccc}
 & & 1 & & 1 & & 1 & & \\
 & 1 & & 2 & & 2 & & 1 & \\
1 & & 2 & & 3 & & 2 & & 1 \\
 & 1 & & 2 & & 2 & & 1 & \\
 & & 1 & & 1 & & 1 & &
\end{array}$$

Removing this leaves:

$$\begin{array}{ccccccccc}
 & & & & 1 & & & & \\
 & 1 & & 4 & & 4 & & 1 & \\
 & & 4 & & 7 & & 4 & & \\
 & 1 & & 4 & & 4 & & 1 & \\
 & & & & 1 & & & &
\end{array}$$

To me there appears to be a **10** and $\overline{\mathbf{10}}$ in this configuration. Removing them leaves:

$$\begin{array}{ccccc} & 2 & & 2 & \\ 2 & & 5 & & 2 \\ & 2 & & 2 & \end{array}$$

This is the configuration of two octets and a singlet. Thus

$$8 \otimes 8 = 27 \oplus 10 \oplus \overline{10} \oplus 8 \oplus 8 \oplus 1$$