IGOR

Dr. Frankenstein has tasked his assistant Igor to dig up graves and collect various body parts he has denoted on a list. Each grave contains an assortment of body parts and rubbish. Each buried item has a corresponding weight. Due to the circumstances of the midnight task, Igor must hastily choose a selection of graves to dig up before dawn, and in the darkness, he will have no time to sort through the remains. He must collect ALL body parts from each grave he digs up and place them upon his corpse wagon. Further, his wagon has a weight capacity which shall not be exceeded.

Prove that it is NP-hard to decide whether Igor can collect the required body parts for Dr. Frankenstein. The input for the IGOR problem consists of a set S of items found within graves, a list L (duplicates allowed) of required body parts, and a list of graves $G = \{g_1, g_2, \ldots, g_n\}$, each of which is a list of elements chosen from S. Each item in S has a weight defined by $\mathrm{w}(s_i) = w_i, \quad w_i > 0$. Finally, a wagon capacity $K > 0$. The output is either TRUE or FALSE.
Example:

$S = \{\text{skull}, \text{torso}, \text{brain}, \text{pocketwatch}\}$
$L = \{\text{skull}, \text{torso}, \text{brain}^*, \text{brain}^*, \text{brain}^*\}$
$G = \{g_1 = (\text{skull}, \text{brain}),\ g_2 = (\text{skull}, \text{torso}, \text{brain}, \text{brain}),\ g_3 = (\text{torso}, \text{pocketwatch})\}$
$w(\text{skull}) = w(\text{torso}) = w(\text{brain}) = w(\text{pocketwatch}) = 1$
$K = 7$

The example input returns TRUE since Igor may choose graves g_1 and g_2. Igor places 6 items totaling 6 weight $\leq (K = 7)$ into the wagon, fulfilling the requisition L.
**Dr. Frankenstein understands the importance of finding a good brain.*