1. If L_1 is a list of CSULB alumni, and L_2 is a list of Long Beach City College alumni, then explain in a few sentences how to efficiently compute $L_1 \cap L_2$ the list of alumni who graduated from both schools.

Let the size of the first list be m and the size of the second list be n. We insert all the elements in the first list to a hashtable this is on average $O(m)$. We then scan through the second list and insert any element that is found in the hashtable into the resulting array. This is on average $O(n)$. We have in total $O(m+n)$.

2. Given hash function $f(x) = \lfloor x \rfloor$, a hash table of size 13. Use quadratic probing with $f(i) = i^2$ to hash the numbers $2.12, 2.31, 6.21, 2.99, 2.56, 11.94, 11.00$.

value	index
2.12	2
2.31	3
6.21	6
2.99	11
2.56	5
11.94	12
11.00	7

3. When indexing the nodes of a binary heap, the root node is assigned index 1, its left child index 2, its right child index 3,etc. For ternary heaps, each node now has three children. Moreover, assume the root is assigned index 0, its left child index 1, its middle index 2,etc. Then for this indexing scheme, if a node has index i, provide formulas for calculating the index of its a) left child, b) middle child, c) right child, and d) parent.

$$\begin{aligned} left\_child &= 3 \cdot i + 1 \\ middle\_child &= 3 \cdot i + 2 \\ right\_child &= 3 \cdot i + 3 \\ parent\_child &= \lfloor \frac{i-1}{3} \rfloor \end{aligned}$$