X5: RESTRICTION MAPPING ALGORITHMS – TASK 1 - 2

TASK 1 – b

The function "multiset" takes a list X of *length n* as an input and performs $\binom{n}{2}$ computations, in order to come up with the final result, which is multiset ΔX. If we expand the aforementioned formula, we get: $\binom{n}{2} = \frac{n!}{(n-2)!2!} = \frac{n(n-1)}{2}$. As a result, the time complexity of "multiset" is $O(n^2)$.

TASK 2

Initially,

L = {1, 1, 1, 2, 2, 3, 3, 3, 4, 4, 5, 5, 6, 6, 6, 9, 9, 10, 11, 12, 15}

width = 15

L = {1, 1, 1, 2, 2, 3, 3, 3, 4, 4, 5, 5, 6, 6, 6, 9, 9, 10, 11, 12}

X = {0, 15}

- **1st run:** y = 12, Δ(12, X) = {3, 12}, L = {1, 1, 1, 2, 2, 3, 3, 4, 4, 5, 5, 6, 6, 6, 9, 9, 10, 11}, X = {0, 12, 15}

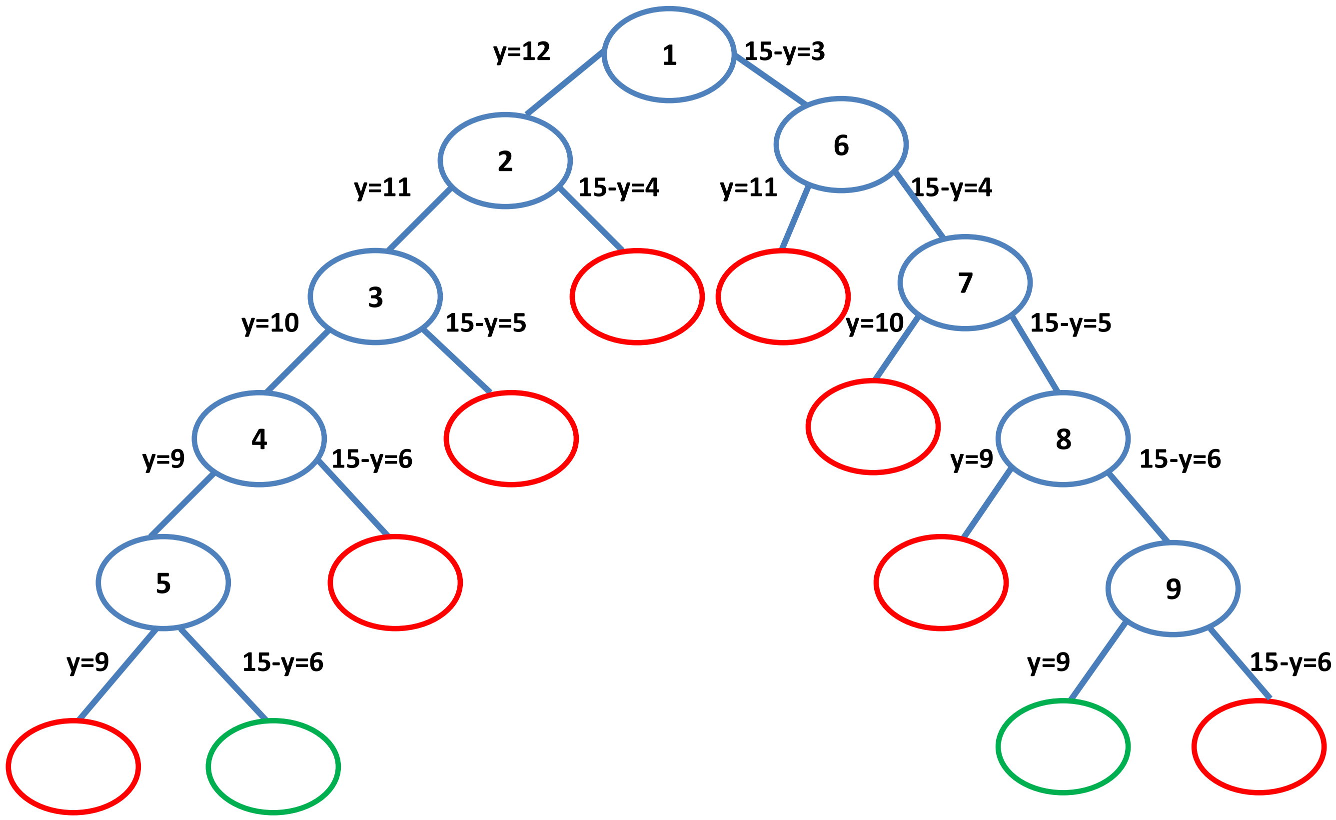
- **2nd run:** y = 11, Δ(11, X) = {1, 4, 11}, L = {1, 1, 2, 2, 3, 3, 4, 5, 5, 6, 6, 6, 9, 9, 10}, X = {0, 11, 12, 15}

- **3rd run:** y = 10, Δ(10, X) = {1, 2, 5, 10}, L = {1, 2, 3, 3, 4, 5, 6, 6, 6, 9, 9}, X = {0, 10, 11, 12, 15}

- **4th run:** y = 9, Δ(9, X) = {1, 2, 3, 6, 9}, L = {3, 4, 5, 6, 6, 9}, X = {0, 9, 10, 11, 12, 15}

- **5th run:** y = 9, Δ(9, X) = {0, 1, 2, 3, 6, 9}, **Δ(width - 9, X) = {3, 4, 5, 6, 6, 9}, L = {}, X = {0, 6, 9, 10, 11, 12, 15}**

The recursive calls of the *PartialDigest* algorithm can be illustrated by the following recursion tree:


1
y=12
15-y=3
2
6
y=11
15-y=4
y=11
15-y=4
3
7
y=10
15-y=5
y=10
15-y=5
4
8
y=9
15-y=6
y=9
15-y=6
5
9
y=9
15-y=6
y=9
15-y=6