1. a   (1,0), (1,2), (1,128)

(1,128)

(1,2)   (1,0)

h
1
2
3
4
5
6
7

b

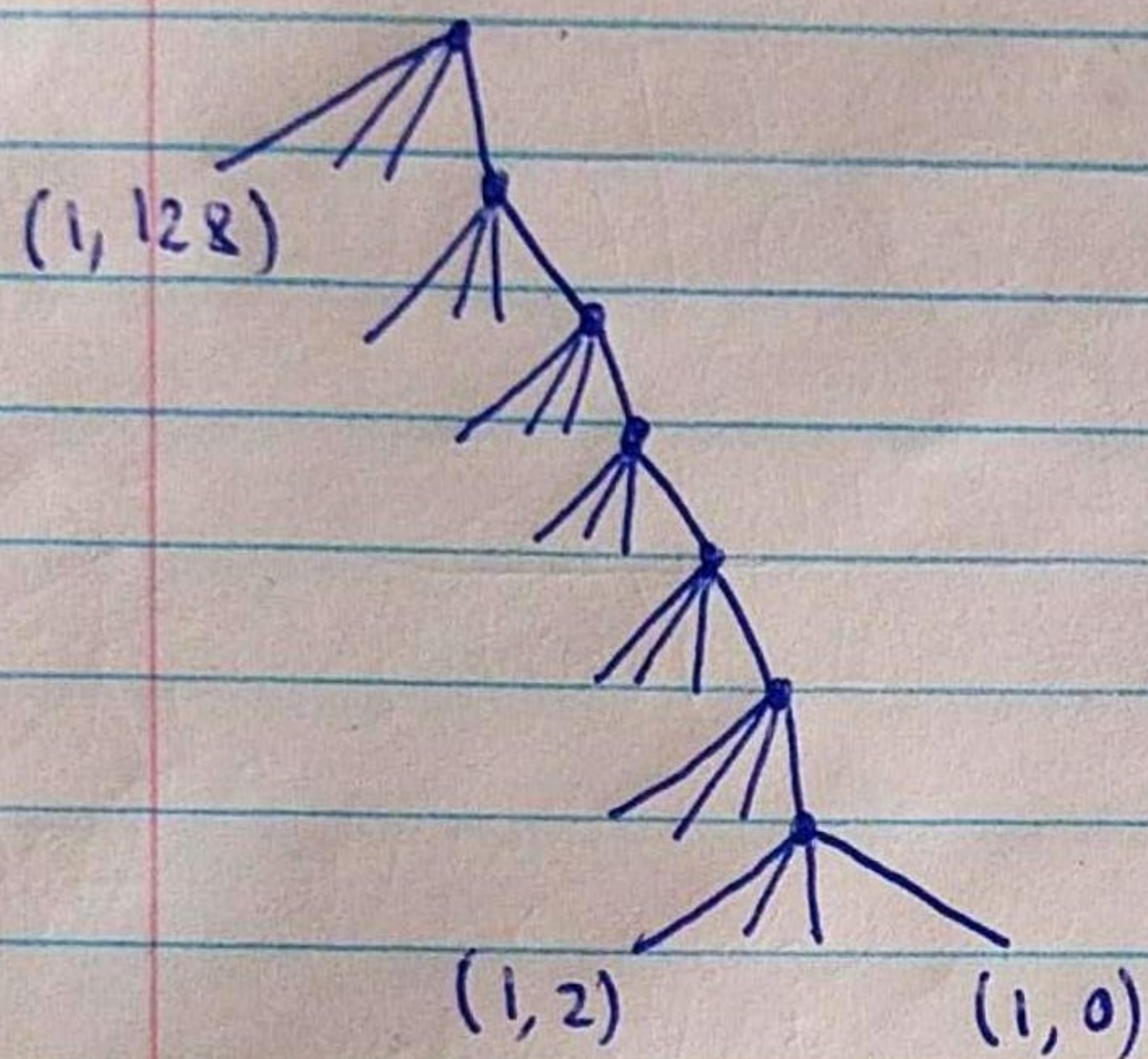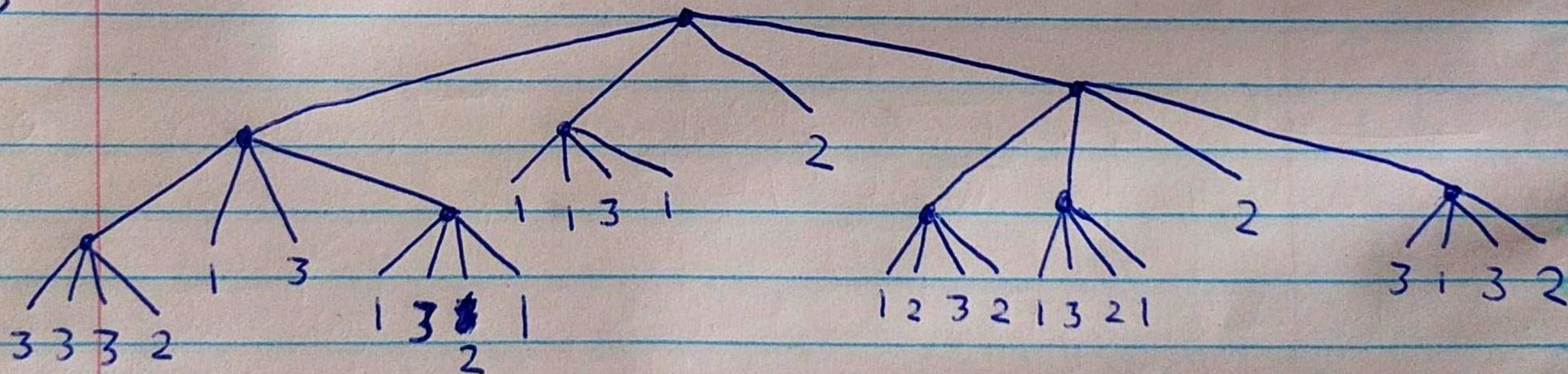3 3 3 2   1   3   1 3 1   1 1 3 1   2   1 2 3 2 1 3 2 1   2   3 1 3 2
                           2

(c)

i)

```
QTreeUnion(P, Q)
P, Q: Quadtrees of two images
 1. if P is null and Q is null then
 2.      return null
 3. else if (P is a leaf or Q is a leaf) and (P.color = 1 or Q.color = 1)
then
 4.      return node(1)
 5. else if (P is a leaf and Q is a leaf) and (P.color = Q.color = 0) then
 6.      return node(0)
 7. A1, A2, A3, A4 = P, P, P, P
 8. B1, B2, B3, B4 = Q, Q, Q, Q
 9. if P is not a leaf then
10.      A1, A2, A3, A4 = P.NW, P.NE, P.SE, P.SW
11. if Q is not a leaf then
12.      B1, B2, B3, B4 = B.NW, B.NE, B.SE, B.SW
13. R = node()
14. R.NW = QTreeUnion(A1, B1)
15. R.NE = QTreeUnion(A2, B2)
16. R.SE = QTreeUnion(A3, B3)
17. R.SW = QTreeUnion(A4, B4)
18. return R
```

ii)

```
QTreeIntersection(P, Q)
P, Q: Quadtrees of two images
 1. if P is null and Q is null then
 2.     return null
 3. else if (P is a leaf or Q is a leaf) and (P.color = 0 or Q.color = 0)
then
 4.     return node(0)
 5. else if (P is a leaf and Q is a leaf) and (P.color = Q.color = 1) then
 6.     return node(1)
 7. A1, A2, A3, A4 = P, P, P, P
 8. B1, B2, B3, B4 = Q, Q, Q, Q
 9. if P is not a leaf then
10.     A1, A2, A3, A4 = P.NW, P.NE, P.SE, P.SW
11. if Q is not a leaf then
12.     B1, B2, B3, B4 = B.NW, B.NE, B.SE, B.SW
13. R = node()
14. R.NW = QTreeIntersection(A1, B1)
15. R.NE = QTreeIntersection(A2, B2)
16. R.SE = QTreeIntersection(A3, B3)
17. R.SW = QTreeIntersection(A4, B4)
18. return R
```