* Sum of Subset Problem

$r = \sum_{i=1}^{n} w_i$

```
1   Algorithm SumOfSub(s, k, r)
2   // Find all subsets of w[1 : n] that sum to m. The values of x[j],
3   // 1 ≤ j < k, have already been determined. s = Σ_{j=1}^{k-1} w[j] * x[j]
4   // and r = Σ_{j=k}^{n} w[j]. The w[j]'s are in nondecreasing order.
5   // It is assumed that w[1] ≤ m and Σ_{i=1}^{n} w[i] ≥ m.
6   {
7       // Generate left child. Note: s + w[k] ≤ m since B_{k-1} is true.
8       x[k] := 1;
9       if (s + w[k] = m) then write (x[1 : k]); // Subset found
10          // There is no recursive call here as w[j] > 0, 1 ≤ j ≤ n.
11      else if (s + w[k] + w[k + 1] ≤ m)
12          then SumOfSub(s + w[k], k + 1, r - w[k]);
13      // Generate right child and evaluate B_k.
14      if ((s + r - w[k] ≥ m) and (s + w[k + 1] ≤ m)) then
15      {
16          x[k] := 0;
17          SumOfSub(s, k + 1, r - w[k]);
18      }
19  }
```

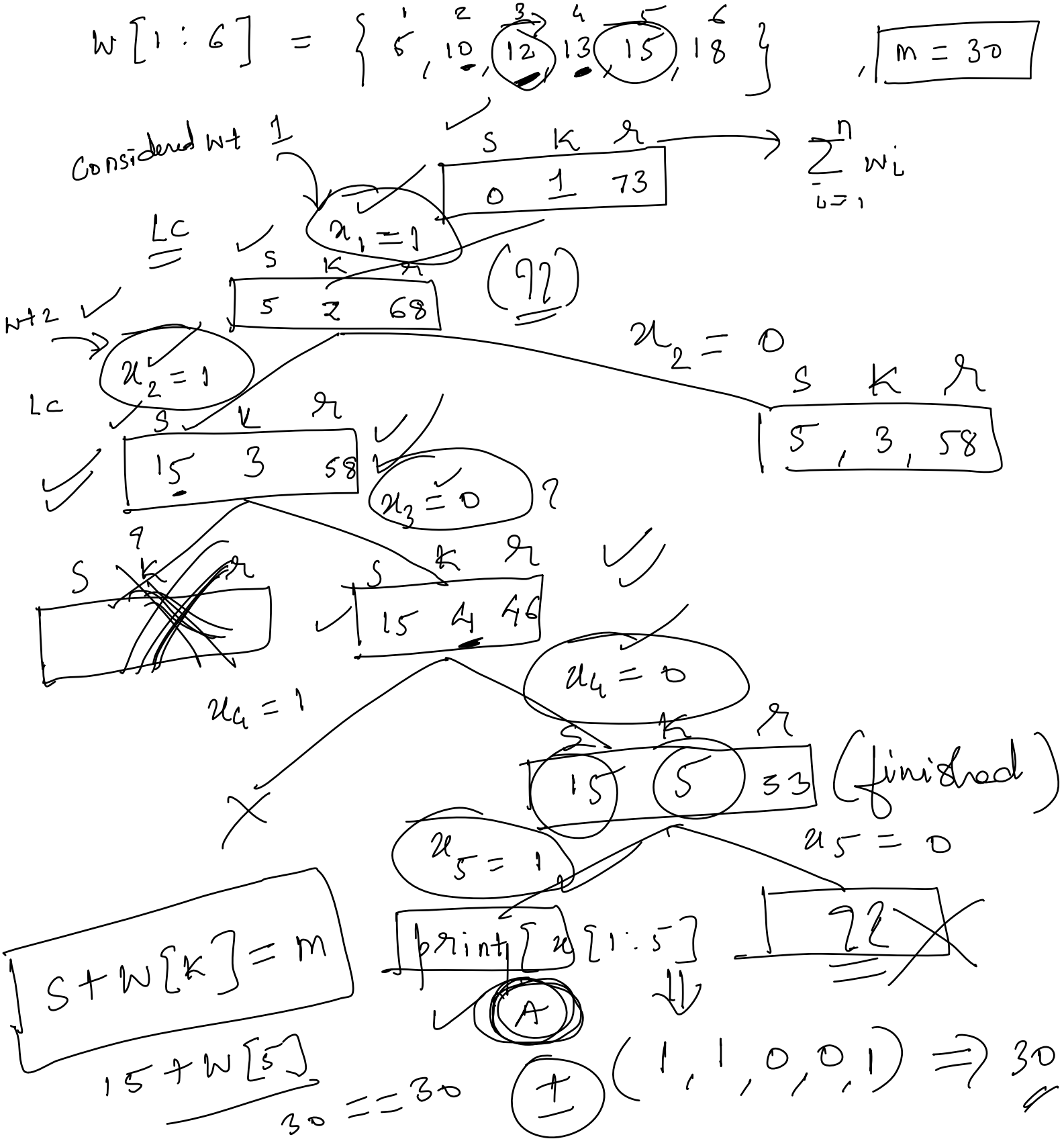
print the answer

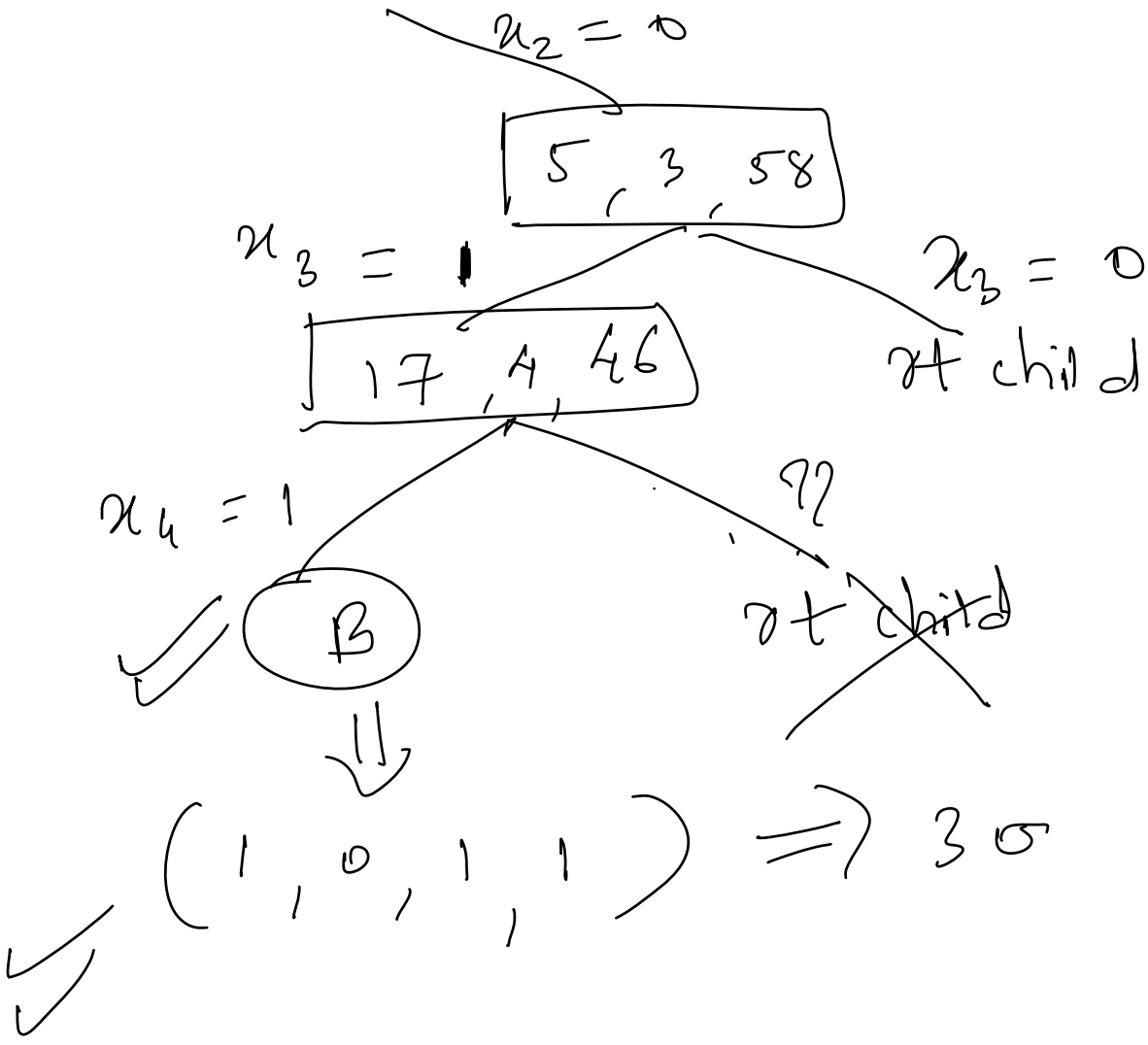
$s + w[3] + w[3+1] \leq m$

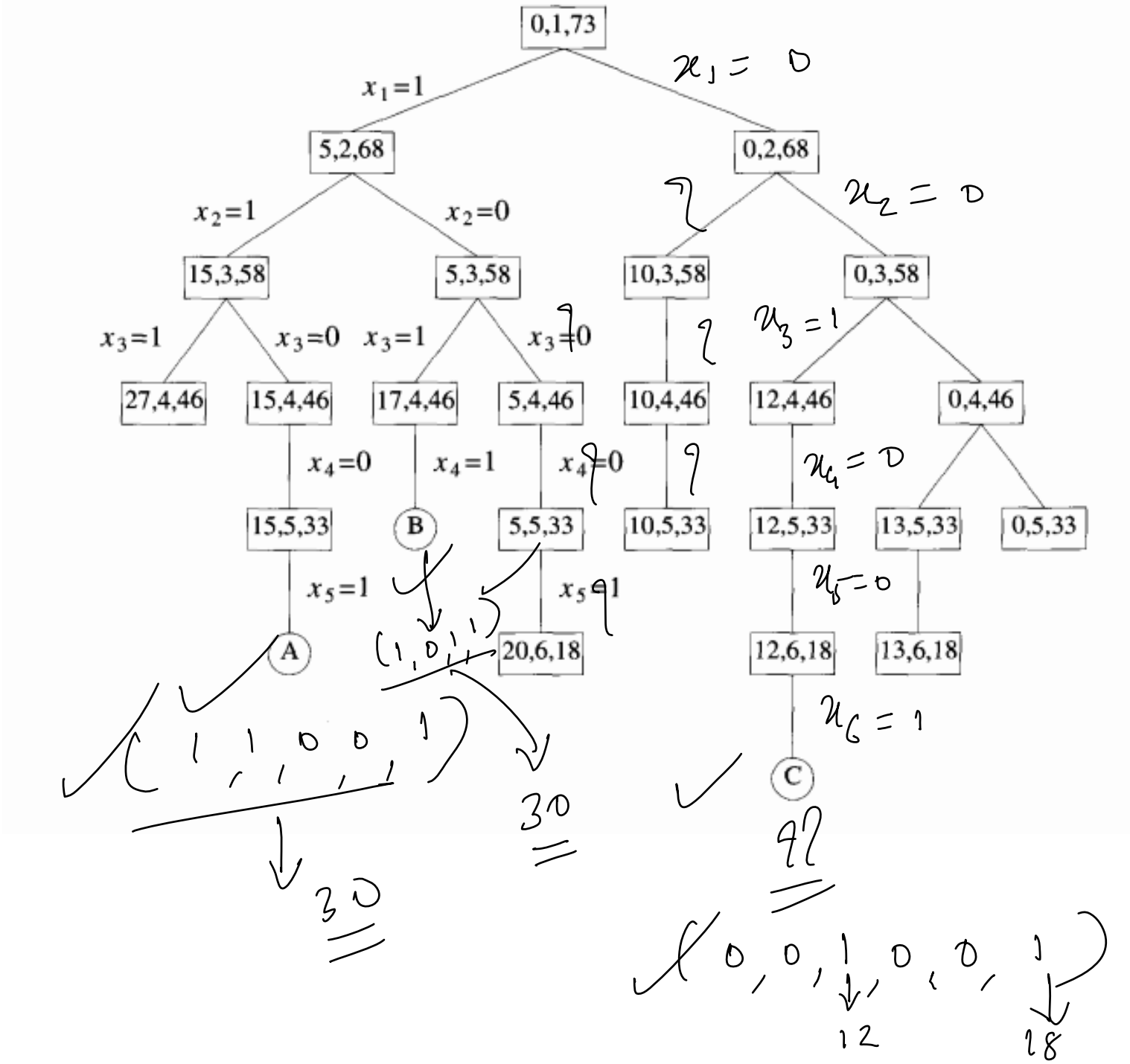
$15 + 12 + w[4]$

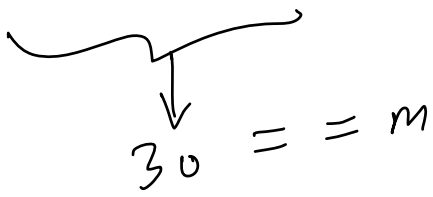
$15 + 12 + 13 \leq 30$

$40 \not\leq 30$


w[1:6] = { 5, 10, 12, 13, 15, 18 }
m = 30
Considered wt 1
s k r
0 1 73
$\sum_{i=1}^{n} w_i$
LC
$x_1 = 1$
s k r
5 2 68
(77)
wt 2
$x_2 = 1$
$x_2 = 0$
s k r
5, 3, 58
LC
s k r
15 3 58
$x_3 = 0$?
s k r
15 4 46
$x_4 = 1$
$x_4 = 0$
s k r
15 5 33
(finished)
$x_5 = 1$
$x_5 = 0$
print[x[1:5]]
77
A
$s + w[k] = m$
$15 + w[5]$
$30 == 30$
T
(1, 1, 0, 0, 1) ⇒ 30


$x_2 = 0$
5, 3, 58
$x_3 = 1$
$x_3 = 0$
17, 4, 46
$x_4 = 1$
??
B
$x_4 = 0$
(1, 0, 1, 1) ⇒ 30


0,1,73
$x_1=1$
$x_1=0$
5,2,68
0,2,68
$x_2=1$
$x_2=0$
$x_2=0$
15,3,58
5,3,58
10,3,58
0,3,58
$x_3=1$
$x_3=0$
$x_3=1$
$x_3=0$
$x_3=1$
27,4,46
15,4,46
17,4,46
5,4,46
10,4,46
12,4,46
0,4,46
$x_4=0$
$x_4=1$
$x_4=0$
$x_4=0$
$x_4=0$
15,5,33
B
5,5,33
10,5,33
12,5,33
13,5,33
0,5,33
$x_5=1$
$x_5=1$
$x_5=0$
A
(1,0,1)
20,6,18
12,6,18
13,6,18
$x_6=1$
C
(1,1,0,0,1)
30
30
(0,0,1,0,0,1)
12
18


30 == m