Sum of Subset

Given n distinct positive number, find all combinations of these numbers whose sum are m.

Sol^n in n tuple, index → index of number in weights $x[j]$
value → 1 or 0, 1 for considering that weight else not.

Assumption $w[1] \le m$ and $\sum_{i=1}^{n} w[i] \ge m$

Explaination
Two conditions → for each weight in array
i) case-1 ⇒ that value is considered for sum
ii) case-2 ⇒ not considered

let s ⇒ current sum $\{ s = \sum_{j=1}^{k-1} w[j] * x[j] \}$
k ⇒ current index
r ⇒ total value left $\{ r = \sum_{j=k}^{n} w[j] \}$
in short for weights array (w)

$\{ w[1], w[2], w[3], w[4], \ldots\ w[n-1], w[n] \}$

→ to be considered? x: 1, 0, 1 (calculating) (to be calculated)

$\longleftarrow s \longrightarrow w[k] \longleftarrow r \longrightarrow$

Steps

① f^n SumOfSub(s, k, r) initially $s=0$, $k=0$, $r = \underbrace{\sum_{j=1}^{n} w[j]}_{\text{all sum}}$

from 2 conditions

1) #leftchild, considering the value hence $(x[k]=1)$
- $x[k]=1$
- if previous sum (s) + this value ($w[k]$) = m, we got answer so print this
- if not above then
  if previous sum + $w[k]$ + next value $w[k+1] \le m$, ie still does not reach m, we add current sum with $w[k]$ and remove $w[k]$ from total left value (r).

2) #Right child $(x[k]=0)$
- $x[k]=0$
- don't add $w[k]$ in s but remove $w[k]$ from r.

x [..., ..., ...] ← 1,s & 0's

w [..., ..., ...] ← values of weights

SumOfSub(s, k, r)

{

left child

x[k] ← 1

if (s+w[k] = m) then write (x[1:n])

else if (s+ w[k]+w[k+1] ≤ m)

then SumOfSub(s+w[k] , k+1 , r- w[k])

if I include w[k], it should not happen that, w[k+1] leads to value greater than m, if it does don't add to s

right child

if ((s+ r - w[k] ≥ m) and (s+w[k+1] ≤ m))

then do {

x[k] ← 0

SumOfSub(s, k+1, r-w[k])

}

};

① for $(s + r - w[k] \geq m)$

If I ignore w[k] , then the remaining elements in array w , must atleast be able to reach a sum of m (greater than is also acceptable)

② for $(s + w[k+1] \leq m)$

If I ignore w[k] , then the next element should not lead to sum being greater than m.