

Define how Knapsack Problem is Solved by dynamic programming.

Consider  $n=3$ ,  $(w_1, w_2, w_3)=(2, 3, 3)$ ,  $(P_1, P_2, P_3)=(1,2,4)$  and  $W=6$ . Find optimal solution.

$n = 3$  (number of items)

$w_1 = 2, w_2 = 3, w_3 = 3$  (weights of the items)

$P_1 = 1, P_2 = 2, P_3 = 4$  (values of the items)

$W = 6$  (maximum weight capacity)

### Step 01:

Create table.

	0	1	2	3	4	5	6
0	0	0	0	0	0	0	0
1	0						
2	0						
3	0						

### Step 02:

Fill in the table:

For item 1 ( $w_1 = 2, P_1 = 1$ ):

	0	1	2	3	4	5	6

0	0	0	0	0	0	0	0	0
1	0	0	1	1	1	1	1	1
2	0							
3	0							

### Step 03:

For item 2

( $w_2 = 3, P_2 = 2$ ):

	0	1	2	3	4	5	6
0	0	0	0	0	0	0	0
1	0	0	1	1	1	1	1
2	0	0	1	2	2	2	2
3	0						

### Step 04:

For item 3

( $w_3 = 3, P_3 = 4$ ):

	0	1	2	3	4	5	6
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0	0	0	0	0	0	0	0	0
1	0	0	1	1	1	1	1	1
2	0	0	1	2	2	2	2	2
3	0	0	1	4	4	4	6	6

The optimal solution is the value in the bottom-right corner of the table, which is  $dp[3][6] = 6$ . Therefore, the maximum value that can be achieved without exceeding the weight capacity of 6 is 6.