

SubsetSum Problem $S = \{4, 2, 5, 6\}$, $k = 7$

$$s_0 = 4, s_1 = 2, s_2 = 5, s_3 = 6$$

	0	1	2	3	4	5	6	7
{ }								
0								
1								
2								
3								$T_{3,7}$

Seeking a subset $T_{3,7}$ of $S_3 = \{4, 2, 5, 6\}$ whose sum is 7.

Such a subset $T_{3,7}$ can be found if and only if either a subset of $S_2 = \{4, 2, 5\}$ sums to 7, or a subset of $S_2 = \{4, 2, 5\}$ sums to $7-6 = 1$.

SubsetSum Problem $S = \{4, 2, 5, 6\}$, $k = 7$

$$s_0 = 4, s_1 = 2, s_2 = 5, s_3 = 6$$

	0	1	2	3	4	5	6	7
{ }								
0								
1								
2		$T_{2,1}$						$T_{2,7}$
3								$T_{3,7}$

Seeking a subset $T_{2,7}$ of $S_2 = \{4, 2, 5\}$ whose sum is 7 OR

a subset $T_{2,1}$ of $S_2 = \{4, 2, 5\}$ whose sum is $7-6=1$.

Can find $T_{2,7}$ iff a subset of $S_1 = \{4, 2\}$ has sum 7 or a subset of $S_1 = \{4, 2\}$ has sum $7-5=2$.

Can find $T_{2,1}$ iff a subset of $S_1 = \{4, 2\}$ has sum 1

(don't consider the possibility of sum $1-5$)

SubsetSum Problem $S = \{4, 2, 5, 6\}$, $k = 7$

$$s_0 = 4, s_1 = 2, s_2 = 5, s_3 = 6$$

	0	1	2	3	4	5	6	7
{ }								
0								
1			$T_{1,2}$					$T_{1,7}$
2		$T_{2,1}$						$T_{2,7}$
3								$T_{3,7}$

Starting from $T_{2,7} \subseteq S_2 = \{4, 2, 5\}$ with $k = 7$, we seek

- a subset $T_{1,7}$ of $S_1 = \{4, 2\}$ whose sum is 7 OR
- a subset $T_{1,2}$ of $S_1 = \{4, 2\}$ whose sum is $7-5=2$.

Can find $T_{1,7}$ iff a subset of $S_0 = \{4\}$ has sum 7 or a subset of $S_0 = \{4\}$ has sum $7-2=5$.

Can find $T_{1,2}$ iff a subset of $S_0 = \{4\}$ has sum 2 or a subset of $S_0 = \{4\}$ has sum $2-2 = 0$.

SubsetSum Problem $S = \{4, 2, 5, 6\}$, $k = 7$

$$s_0 = 4, s_1 = 2, s_2 = 5, s_3 = 6$$

	0	1	2	3	4	5	6	7
{ }								
0								
1		$T_{1,1}$	$T_{1,2}$					$T_{1,7}$
2		$T_{2,1}$						$T_{2,7}$
3								$T_{3,7}$

Starting from $T_{2,1} \subseteq S_2 = \{4, 2, 5\}$ with $k = 1$, we seek

- a subset $T_{1,1}$ of $S_1 = \{4, 2\}$ whose sum is 1

Can find $T_{1,1}$ iff a subset of $S_0 = \{4\}$ has sum 1

(don't consider the possibility of sum = 1 - 2)

SubsetSum Problem $S = \{4, 2, 5, 6\}$, $k = 7$

$$s_0 = 4, s_1 = 2, s_2 = 5, s_3 = 6$$

	0	1	2	3	4	5	6	7
{ }								
0						$T_{0,5}$		$T_{0,7}$
1		$T_{1,1}$	$T_{1,2}$					$T_{1,7}$
2		$T_{2,1}$						$T_{2,7}$
3								$T_{3,7}$

Starting from $T_{1,7} \subseteq S_1 = \{4, 2\}$ with $k = 7$, we seek

- a subset $T_{0,7}$ of $S_0 = \{4\}$ whose sum is 7 OR
- a subset $T_{0,5}$ of $S_0 = \{4\}$ whose sum is $7-2=5$.

SubsetSum Problem $S = \{4, 2, 5, 6\}$, $k = 7$

$$s_0 = 4, s_1 = 2, s_2 = 5, s_3 = 6$$

	0	1	2	3	4	5	6	7
{ }	$T_{\{\},0}$							
0	$T_{0,0}$	$T_{0,1}$	$T_{0,2}$			$T_{0,5}$		$T_{0,7}$
1		$T_{1,1}$	$T_{1,2}$					$T_{1,7}$
2		$T_{2,1}$						$T_{2,7}$
3								$T_{3,7}$

The subproblem $(\{\}, 0)$ has “true” as its solution. This is the base case.

SubsetSum Problem $S = \{4, 2, 5, 6\}$, $k = 7$

$s_0 = 4, s_1 = 2, s_2 = 5, s_3 = 6$

	0	1	2	3	4	5	6	7
{}	true							
0								
1								
2								
3								

SubsetSum Problem $S = \{4, 2, 5, 6\}$, $k = 7$

$s_0 = 4, s_1 = 2, s_2 = 5, s_3 = 6$

	0	1	2	3	4	5	6	7
{}	true							
0	true							
1								
2								
3								

SubsetSum Problem $S = \{4, 2, 5, 6\}$, $k = 7$

$s_0 = 4, s_1 = 2, s_2 = 5, s_3 = 6$

	0	1	2	3	4	5	6	7
{}	true							
0	true							
1			true					
2								
3								

SubsetSum Problem $S = \{4, 2, 5, 6\}$, $k = 7$

$s_0 = 4, s_1 = 2, s_2 = 5, s_3 = 6$

	0	1	2	3	4	5	6	7
{}	true							
0	true							
1			true					
2								true
3								

SubsetSum Problem $S = \{4, 2, 5, 6\}$, $k = 7$

$s_0 = 4, s_1 = 2, s_2 = 5, s_3 = 6$

	0	1	2	3	4	5	6	7
{}	true							
0	true							
1			true					
2								true
3								true