Quiz 8

What is used?

1) In the lecture you saw the following *subproblem* for solving the *subset sum* problem:

$$T(i, s) = \text{is } s \text{ a subset sum of the array } A[1 \ldots i]?$$

True or false: the runtime of the dynamic programming algorithm to solve the subset sum problem that uses this subproblem depends on the size of the entries of A?

Select one:

True

False

2) In the lecture you saw the following *subproblem* for solving the *subset sum* problem:

$$T(i, s) = \text{is } s \text{ a subset sum of the array } A[1 \ldots i]?$$

Consider the following dynamic programming table that was made for an array $A[1 \ldots 3]$ based on this subproblem:

$T(i,s)$	$s=0$	$s=1$	$s=2$	$s=3$	$s=4$
$i=0$	True	False	False	False	False
$i=1$	True	False	True	False	False
$i=2$	True	False	True	True	False
$i=3$	True	False	True	True	True

Based on this table, which of the following statements are correct? *(Pay attention to the bounds of the arrays!)*

Select one or more:

a. 1 is a subset sum of $A[1 \ldots 3]$

b. 2 is a subset sum of $A[1 \ldots 3]$

c. 3 is a subset sum of $A[1 \ldots 2]$

d. 4 is a subset sum of $A[1 \ldots 2]$

3) In the lecture you saw the following subproblem for solving the *Knapsack* problem:

$$M(i, w) = \text{ maximum profit that can be achieved using items in } A[1 \ldots i] \text{ of total weight at most } w.$$

Which of the following recursion formulas correctly computes the value of $M(i, w)$?

(Below, p_i is the profit of item i, and w_i is the weight of item i.)

Select one:

a. $M(i, w) = \max\{M(i-1, w), \quad p_i + M(i, w - w_i)\}$

b. $M(i, w) = \max\{M(i-1, w - w_i), \quad p_i + M(i-1, w - w_i)\}$

c. $M(i, w) = \max\{M(i-1, w), \quad p_i + M(i-1, w - w_i)\}$

4) Let $A[1 \ldots 10]$ be an array of 10 unique integers.

True or false: A longest increasing subsequence in $A[1 \ldots 5]$ always ends in a strictly smaller number than a longest increasing subsequence in $A[1 \ldots 10]$.

Select one:

True

False

5) In the lecture you saw the following *subproblem* for solving the *longest increasing subsequence* problem:

$$M(i, \ell) = \text{smallest possible ending of an increasing subsequence of length } \ell \text{ in } A[1 \ldots i].$$

Consider the following dynamic programming table that was made for an array $A[1 \ldots 3]$ based on this subproblem:

$M(i,\ell)$	$\ell=1$	$\ell=2$	$\ell=3$
$i=1$	4	∞	∞
$i=2$	4	7	∞
$i=3$	4	8	8

True or false: the table above must contain a mistake.

Select one:

True

False