# Quiz #2 CS361 Winter 2017 Name: key

Take home quiz. The quiz is open books, notes, and Internet. The quiz is not open to peers (in or not in in the class now)

1. You are given the input p = <20, 25, 30, 5, 8, 4, 10>, populate the m and s arrays according to the MATRIC-CHAIN-ORDER(p) algorithm given on slide #10 (6 points).

m array s array

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 0 | 15000 | 6250 | 7050 | 5760 | 6560 |
|  | 0 | 3750 | 4750 | 3760 | 4760 |
|  |  | 0 | 1200 | 760 | 1860 |
|  |  |  | 0 | 160 | 360 |
|  |  |  |  | 0 | 320 |
|  |  |  |  |  | 0 |
|  | 1 | 1 | 3 | 1 | 5 |
|  |  | 2 | 2 | 2 | 5 |
|  |  |  | 3 | 3 | 3 |
|  |  |  |  | 4 | 5 |
|  |  |  |  |  | 5 |
|  |  |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 0 | 640 | 2640 | 6040 | 4560 | 5240 |
|  | 0 | 800 | 3960 | 3760 | 4120 |
|  |  | 0 | 3000 | 3600 | 3800 |
|  |  |  | 0 | 3750 | 5000 |
|  |  |  |  | 0 | 1500 |
|  |  |  |  |  | 0 |

1. You are given the input p = <20, 8, 4, 25, 30, 5, 10>, populate the m array according to the Memoized Matrix Chain algorithm given on slide #25 (4 points).

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | 10 |
| **1** | 0 | 0 | 0 | 0 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| **2** | 0 | 0 | 4 | 4 | 6 | 6 | 10 | 10 | 10 | 10 | 10 |
| **3** | 0 | 0 | 4 | 5 | 6 | 9 | 10 | 11 | 11 | 15 | 15 |
| **4** | 0 | 3 | 4 | 7 | 8 | 9 | 12 | 13 | 14 | 15 | 18 |
| **5** | 0 | 3 | 4 | 7 | 8 | 9 | 12 | 13 | 14 | 16 | 18 |
| **6** | 0 | 3 | 4 | 7 | 8 | 10 | 12 | 14 | 15 | 16 | 19 |

1. Following the 0/1 knapsack problem on slide 11 of the greedy algorithms slides to solve the following problem: (4 points). The sack’s weight limit is 10. That is w = 10 (7 points).

|  |  |  |
| --- | --- | --- |
| Item | wi | vi |
| I1 | 4 | 6 |
| I2 | 2 | 4 |
| I3 | 3 | 5 |
| I4 | 1 | 3 |
| I5 | 6 | 9 |
| I6 | 4 | 7 |

1. If the problem described in problem is reclassified as a fractional knapsack one. What is the total value carried out by a sack of capacity 10? Show the problem solving process (3 points).

|  |  |  |  |
| --- | --- | --- | --- |
| Item | wi | vi | vi/wi |
| I1 | 4 | 6 | 1.5 |
| I2 | 2 | 4 | 2 |
| I3 | 3 | 5 | 1.66 |
| I4 | 1 | 3 | 3 |
| I5 | 6 | 9 | 1.5 |
| I6 | 4 | 7 | 1.75 |

I4 weight 1, value 3

I4 + I2 weight 1 + 2 = 3, value 3 + 4 = 7

I4 + I2 + I6 weight 3 + 4 = 7, value 7 + 7 = 14

I4 + I2 + I6 + I3 weight 7 + 3 = 10, value 14 + 5 = 19

The solution is the same as with the 0/1 knapsack problem because the optimal solution happens to exactly fill the capacity without needing to divide any items.