# HW 14 - Gene Sequencing & Knapsack

1)

| | | A | T | G | C | C |
|---|---|---|---|---|---|---|
| | 0 | 5 | 10 | 15 | 20 | 25 |
| T | 5 | 1 | 2 | 7 | 12 | 17 |
| A | 10 | 2 | 2 | 3 | 8 | 13 |
| C | 15 | 7 | 3 | 3 | 0 | 5 |
| G | 20 | 12 | 8 | 0 | 4 | 1 |
| C | 25 | 17 | 13 | 5 | -3 | -1 |
| A | 30 | 22 | 18 | 10 | 2 | -2 |

$C_{indel} = 5$ → ↓ indel
$C_{sub} = 1$ ↘ sub/match
$C_{match} = -3$

| - | A | T | G | C | C |
|---|---|---|---|---|---|
| T | A | C | G | C | A |

2)

If weights(j) > w then $K[w,j] \leftarrow K[w,j-1]$
else:
$K[w,j] \leftarrow \max\{K[w,j-1], K[w-\text{weights}(j), j-1] + \text{value}(j)\}$

| Item | weight | value |
|---|---|---|
| 1 | 1 | 1 |
| 2 | 2 | 7 |
| 3 | 5 | 11 |
| 4 | 6 | 21 |
| 5 | 7 | 31 |

W = 10

| w | value | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 7 | 0 | 1 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 5 | 11 | 0 | 1 | 7 | 8 | 8 | 11 | 12 | 18 | 19 | 19 | 19 |
| 6 | 21 | 0 | 1 | 7 | 8 | 8 | 11 | 21 | 22 | 29 | 30 | 30 |
| 7 | 31 | 0 | 1 | 7 | 8 | 8 | 11 | 21 | 31 | 32 | 38 | 39 |

Items 1, 2, 5 is optimal load. value = 39
weight: 1 + 2 + 7 = 9
value: 1 + 7 + 31 = 39