VE477 HW1

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1 EX.1

1.1

2 EX.2

Algorithm 1: Determine the minimum spanning tree

input : the decreased edge (u,v), minimum spanning tree T of graph G
output: new minimum spanning tree T'

```
1 T' ← T;
2 for vertex x in G that is connected with u or v by edges do
3     if edge(x, u) ∈ T and edge(x, v) ∈ T then
4         if w(u, v)<the maximum of w(x,u) and w(x,v) then
5             Delete from T' the one between the two edges edge(x,u),edge(x,v) with the
               larger weight
6             Add edge(u,v) to T'
```

3 EX.3

3.1

Skipped.

3.2

Algorithm 2: Mult(x,y)

input : two numbers to multiply x,y
output: result n

```
1 if x=0 or y=0 then
2     return 0
3 return Mult(2x, ⌊y/2⌋) + x × (y mod 2)
```

4 EX.4

The minimum number is 8.

Divide the 25 horses into 5 groups of 5. Each group hold one race. Record the first, second, third fastest, noted as h_{11}, h_{12}, h_{13} for the first, second, third of group 1, for example. Current race number is 5.

Hold a race between $h_{11}, h_{21}, h_{31}, h_{41}, h_{51}$, record the first, second,third as h_{61}, h_{62}, h_{63}. h_{11} is the fastest. Current race number is 6.

Suppose that h_{63} is h_{n1}. Hold a race between h_{62} and all of the $h_{x2}(x \in [1,5], x \neq n)$. Record the first, second, third as h_{71}, h_{72}, h_{73}. h_{71} is the second fastest. Current number is 7.

Suppose that h_{72} is h_{i2}, h_{73} is h_{j2}. Hold a race between all of the $h_{x3}(x \in [1,7], x \neq i, j)$. The first in this race is the third fastest. Current number is 8.

5 EX.5

5.1

Fit the knapsack with the largest items first solves the problem.

5.2

Skipped.

5.3

Problem: Use at least as possible coins to give out a combination of \$51. You have coins with value \$40, \$25, \$7, \$2, \$1.

According to greedy algorithm, locally optimal is given by \$40,\$7,\$2,\$2, four coins.

But actually the globally optimal is given by \$25,\$25,\$1, three coins.