1) Let $f(\mathrm{s}, \mathrm{v})$ be the function solving the problem.

$$f(\mathrm{s}, \mathrm{v}) = \min(f(s-1, 270), f(s-1, 270-c_s) + v_s)$$

We can see that this problem is just the minimization variant of the knapsack problem if we restate the algorithm as follows:

Minimize $\sum_{s=1}^{|S|} c_s x_s$

Subject to $\sum_{s=1}^{|S|} v_s x_s \geq 270$ and $x_s \in (0, 1)$

We can prove the correctness using proof by induction.

Base case: $f(\mathrm{s}, 0) = f(0, \mathrm{v}) = 0$

Induction step: When we compute $f(\mathrm{s}', \mathrm{v}')$ where $\mathrm{v}' > \mathrm{v}$ and $\mathrm{s}' > \mathrm{s}$, we already have $f(\mathrm{s}-1, \mathrm{v}')$ and $f(\mathrm{s}'-1, \mathrm{v}'-c_s)$ computed correctly. The algorithm only has to considering the current item s either not added to the knapsack, represented by $f(s-1, 270)$, or added to the knapsack, represented by $f(s-1, 270-c_s) + v_s$. Therefore, the computed value for $f(\mathrm{s}', \mathrm{v}')$ would be correct.