Problem 1: Suppose a firm produces a certain product. The demand for this product varies through out the year. Let $\mathbf{d} \in \mathbb{R}^n$ denote the demand vector, where n is the number of divisions of a full year (when $n = 12$ the year is broken up into months, when $n = 26$ the year is broke up biweekly, ect.).

The full year is broken up into n equal time blocks. The employees of the firm can produce at most r tons of this product, the cost for production is k dollars/ton. It is possible to overwork the employees so that they will produce beyond what they normally do. However, the cost for additional production is K dollars/ton (in applications this is always a bigger number than k) and the employees can only product up to a extra tons.

There is a storage cost of s dollars/ton where any unsold product can be carried into the next time block.

The goal of the firm is to sell off its entire product by the end of the year with no remaining surplus, meet the demand for each time block, and minimize the total cost of production.

Write the following code in R.

`optimal.production(d,r,k,a,K,s)` = computes the ideal production model to minimize the cost.

Test your code: Suppose that,

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d = c(400,200,500,300,400,100)
r = 300; k = 35; a = 200; K = 60; s = 15
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Then the optimal production plan is to produce 300 tons in the first 5 time periods, and 100 tons in the 6th time period. Furthermore, you will need to use additional production of 100 tons in the 1st, 3rd, and 5th time period.