

## Exercise 8 - Multi-item lot sizing

### Inventory Management

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### Economic lot scheduling

In a chemical plant, a batch production process with 8 different products exists. All products are extruded on the same machine with different speeds. The following table contains the relevant product specific parameters.

	1	2	3	4	5	6	7	8
$c_i^{sh}$	0.310	0.210	0.020	0.600	0.740	0.070	0.17	0.430
$c_i^{or}$	465.000	966.000	904.000	28.000	963.000	474.000	672.00	107.000
$y_i$	50.000	43.000	94.000	66.000	45.000	56.000	27.00	52.000
$p_i$	1087.000	1063.000	2096.000	1651.000	983.000	1608.000	148.00	312.000
$s_i$	0.097	0.114	0.012	0.049	0.003	0.164	0.19	0.172

1. Determine the product-specific utilization rate and the total utilization of the machine. Can a feasible schedule be found?
2. Determine the independent and common cycle solution. What are the associated total costs? Is the independent solution feasible?
3. Try to find a better solution by the power-of-2 heuristic.

### Joint replenishment problem

An automobile manufacturer is supplied with 8 materials from a particular supplier. The supplier charges fixed transport and handling cost of 3000 Euro every time an order for at least one of the 8 offered materials is issued. Beyond that the, each material has a fixed demand rate, holding cost rate and handling cost summarized in the following table.

	1	2	3	4	5	6	7	8
$c_i^{sh}$	0.28	0.02	0.01	0.33	0.23	0.08	0.13	0.18
$c_i^{or}$	329.00	688.00	284.00	485.00	895.00	121.00	328.00	105.00
$y_i$	66.00	17.00	35.00	56.00	97.00	87.00	37.00	39.00

1. Calculate the holding cost multipliers and individual optimal cycle times for each material. Order the products increasingly w.r.t. cycle time.
2. Use the basic period heuristic to find a solution for the replenishment problem (round to integers). Determine also the order quantities of each product.
3. Try to find another solution by rounding ordering frequencies to powers of 2 (instead of integers). Can the solution from 2. be improved?