

Exercise 1: Company creates 4 types of furniture: tables, chairs, commodes and bookshelves. They want to know, how many of each product should they produce to optimally use their resources and maximalized the income. In production, they use thick and thin planks. They have 1000 meters of thick plants and 1500 meters of thin planks on disposal. They have 800 working hours available. Due to the research and orders they know, that they must create at least 40 tables, 130 chairs, 30 commodes and at most 10 bookshelves. In the following table are needed resources for making the furniture.

	table	chair	commode	bookshelf
Thick planks (m)	5	1	9	12
Thin planks (m)	2	3	4	1
Needed time (h)	3	2	5	10
Income (€)	24	10	30	20

Exercise 2: The shipyard produces three types of ships: L100, L80 and L40. Boat of type L100 will bring profit of 12 million €, the construction of this ship takes 6 months and is able to transport 100 containers. Boat of type L80 will bring profit of 10 million €, the construction of this ship takes 4 months and is able to transport 80 containers. Boat of type L40 will bring profit of 8 million €, the construction of this ship takes 3 months and is able to transport 40 containers. According to the survey, the shipyard has found that they will be able to sell ships capable of transporting up to 320 containers in total, moreover the L80s are quite atypical, and therefore they will sell no more than 4 of them. Design a production plan for the next 20 months to maintain all requirements and profit from boat sales was maximal.

Exercise 3: In the forge is made an alloy, which must contain 30% of lead, 30% of zinc and 40% of tin. Forger can buy materials M1, M2 and M3 with compositions (in %) and with prices (in €/kg of material) given by a table. How much of which material should be used to minimize the cost for 1 kg of this alloy?

Material	M1	M2	M3	Alloy
% lead	10	40	30	30
% zinc	10	50	20	30
% tin	80	10	50	40
Cost (in €)	4,10	5,80	6,30	

Exercise 4: We have 30 pieces of 12m. We need to make 15 pieces of length 5m, 35 pieces of length 3m and 40 pieces of length 4m. Find the optimal solution in such a way, that the waste will be minimal.

Exercise 5: A saw-mill has 300 logs of length 9m and 150 logs of length 8m in storage. The saw can cut smaller logs of lengths 3, 4 and 5m. The saw-mill got order on 120 logs of length 3m, 100 logs of length 4m and 105 logs of length 5m. Logs of length 3, 4 and 5 meters can be sold in this order for 2€, 2,50€ and 3€. Formulate the cutting plan in such a way, that the order will be fulfilled and the waste was minimal.

Question: How would change the solution, if the saw was broken, and could not be set to cutting of 3 meter log?

Exercise 6: Paper company MUNDER DIFFLIN cuts paper of standardized format A2 to smaller formats A3, A4 and A5. Company got order of 100 000 papers of format A5, 150 000 papers of format A4 and 120 000 papers of format A3. In which way is needed to cut the A2 papers to fulfill the order and the number of papers of format A2 would be minimal? Company has for sure enough papers of format A2 in the storage.

Exercise 7: Company Lipo produces two kinds of salad dressings from mayonnaise, yoghurt and cream. Dressing SUPRA contains mayonnaise, yoghurt and cream in proportions 1 : 2 : 2 and its price is 5€ / liter. Dressing EXTRA contains only mayonnaise and yoghurt in proportion 2 : 1 and its price is 4€/liter. The company has currently 10 liters of mayonnaise, 10 liters of yoghurt and 20 liters of cream at its disposal. What quantities of each dressing should company Lipo produce in order to maximize its income?

Question: If it is possible to sold unused mayonnaise, yoghurt and cream for 3, 1.5 and 2.5 €/liter respectively, which problem will company Lipo solve?