

HOMEWORK 3

There are two (2) problems in this homework. Although they are not graded, you are encouraged to complete them as they will help you with the problem-based questions in your exams.

The intention of these problems is for you to practice, develop critical thinking and problem-solving skills.

Problem 1:

Better Products, Inc., manufactures three products. Each product has to run through all three machines **sequentially**. In a typical week, 36 hours are available on each machine. The profit contribution and production time in hours per unit are as follows:

<u>Category</u>	<u>Product 1</u>	<u>Product 2</u>	<u>Product 3</u>
Profit/unit	\$30	\$50	\$35
Machine 1 time/unit	1.25	1.75	1
Machine 2 time/unit	1.0	1.0	0.75
Machine 3 time/unit	0.75	0.75	1.25

Only one operator is required for machine 1. Two operators are required for machine 2; thus, 2 hours of labor must be scheduled for each hour of machine 2. The same applies to machine 3 which requires two operators to operate this machine; hence, 2 hours of labor must be scheduled for each hour of machine 3. A maximum of 148 labor-hours is available for assignment to operators to work on the machines during the coming week.

Other production requirements are that product 1 must account for at least 40% of all units produced and product 2 cannot be more than 25% of the units produced from products 1 and 3.

The company is interested in weekly profit. Using **Excel Solver**, develop the optimal product mix and answer the following questions.

From your optimal solution, what is your product mix and its associate projected weekly profit?

From the results of both machine hours used and labor hours used, which one should the company increase in the event they want to increase the production capacity? Give your justifications.

What is the value of an additional hour of labor in terms of its contribution to the total profit? Interpret the results. From the results, do you recommend the company to increase labor and if so by how much?

Better Products management wants to make changes (increase capacity) to the other production requirement for either product 1 or product 2 that will impact the profit. **Using the current optimal solution of production mix**, which product would you recommend the management change and by how much. Give justification for your recommendation.

Note:

-Do not set the decision variables to integer.

Problem 2:

Happy Toys LLC in British Columbia has three distribution centers in William Lakes, Kamloops and Revelstoke. From these centers, products are being shipped to the respective stores located mainly in the southwest of Canada. Each distribution center has its own inventory capacity. William Lakes holds 12,100 units, Kamloops holds 9,000 units and Revelstoke holds 10,000.

Due to the recent change in gasoline prices and market competition, the company is looking into revising their distribution capacity for the distribution centers.

The management provides five months of sales data in units from its customers in the southwest of British Colombia. The data can be found in **HW3 Orders.xlsx**.

To accurately estimate the number of units required in each city, the company takes the average sales from each company from the given five months and adds the values together by city. Using the city as your destination and the shipping costs given below, you are to use **Excel Solver** to develop a model that could save the company money on the shipping cost.

Current shipping cost chart.

City	William Lakes	Kamloops	Revelstoke
Abbotsford	\$ 10.25	\$ 5.25	\$ 6.00
Burnaby	9.75	4.25	5.25
Campbell River	8.25	6.25	8.75
Coquitlam	9.50	4.00	5.00
Courtenay	8.25	6.25	8.75
Kelowna	3.25	1.50	2.00
Langley	9.75	4.25	5.25
Nelson	9.25	4.00	3.25
North Vancouver	9.75	4.25	5.25
Penticton	4.25	1.75	2.25
Prince George	3.25	5.75	5.65
Richmond	10.00	5.00	5.75
Surrey	8.75	4.25	5.25
Valemount	3.50	6.25	5.25
Vancouver	9.75	4.25	5.25
Vernon	7.00	1.75	2.25
Victoria	\$ 12.75	\$ 9.50	\$ 11.00

From your optimal solution, what is the total shipping costs? Give a table showing the number of units shipped to each city from the three distribution centers.

To save shipping costs, which distribution center(s) should be expanded. Provide your recommendations with justification.

Note:

- The total average unit sold from each city will be your demand value for each city (Hint: use PivotTable).
- The scheduled shipment quantity cannot be more than the available quantity in each distribution center.
- At the minimum, the demand units for each city must be met.
- Do not set the decision variables to integer.