01/06/2022 – Exercise 3

The 2Sea S.p.A. operates in Italy and manufactures two products: Product "W" and Product "Y". A review of the company's accounting records revealed the following operational and financial data for last period:

	Product "W"	Product "Y"	Whole Company
Sales volume (units)	25,000	10,000	
Average net selling price	$ 14 per unit	$ 40 per unit	
Variable cost	$ 7 per unit	$ 12 per unit	
Fixed direct costs	€ 39,000	€ 76,000	
Sundry revenues			$ 32,500
Fixed overheads			$ 370.000
Financial Interests			$ 80,350

Required:

Based on the above information, determine:

1. The **contribution margin** for the two products and the whole company.
2. The **EBIT** for the company
3. The **break-even point in dollars** for the company
4. The level of sales revenue that would allow the company to achieve an after-tax result (EAT) of $100,000 (the tax rate is 30 %).

Answers not adequately explained will not be evaluated. To provide answers to the questions (1) and (2), the preparation of a profit and loss statement is required.

Please note that in order to make the results more interesting, some basic numerical data (mainly relating to the variable unit costs of the two products) have been slightly modified from the version provided in the original assignment. This in no way affects the effectiveness of the explanation here provided with respect to the questions posed in the test.

SOLUTIONS:

As specified in the text, the first two questions required the preparation of an income statement (a profit and loss account). In particular, the need to identify the contribution margin of the two products, as well as the overall contribution margin, leads to the presentation of this statement in segmented form. This income statement is shown on the following page. Please note that the numbers in it are expressed in thousands of dollars. Also, as the diagram is copied from an excel sheet prepared using the convention in force in Italy, in it the dots act as separators of the thousands, while commas separate the units from the decimals.

	Product "W"	Product "Y"	Whole company
Units sold	25,00	10,00	35,00
+ Sales Revenue	**$ 350,00**	**$ 400,00**	**$ 750,00**
- COGS (@ variable)	$ 175,00	$ 120,00	$ 295,00
= Contribution Margin	**$ 175,00**	**$ 280,00**	**$ 455,00**
-Direct Fixed Costs	$ 39,00	$ 76,00	$ 115,00
= Second Margin	**$ 136,00**	**$ 204,00**	**$ 340,00**
+ Fixed Revenues			$ 32,50
- Fixed Costs			$ 370,00
= EBIT			**$ 2,50**
- Financial Expenses			$ 80,35
= EBT			**$ -77,85**

Contribution margin ratio	*50,00%*	*70,00%*	*60,67%*
Second margin ratio	*38,86%*	*51,00%*	*45,33%*
EBIT ratio			*0,33%*
EBT ratio			*-10,38%*

Question 1

The contribution margin for Product 'W' is equal to **$ 175,000** while that of Product 'Y' is equal to **$ 280,000.** Consequently, the contribution margin for the entire company is equal to **$ 455,000.**

Question 2

EBIT is **$ 2,500**

Question 3

To calculate the BEP one must divide the residual fixed costs (taken in absolute value) by the value of the contribution margin rate.
To calculate the BEP one must divide the residual fixed costs (taken in absolute value) by the value of the percentage contribution margin. The value of fixed costs is equal to $ 485,000 (given by the sum of the total direct fixed costs and the indirect fixed costs), while that of fixed revenue is equal to $ 32,500. The absolute value of residual fixed costs is therefore $ 452,500.
The contribution margin ratio is equal to 60.67%.
Thus, the break-even point in dollars for the company, is equal to **$ 745,838.14**
It should be noted that the correctness of the result obtained in this way is quite evident because the value thus determined is only slightly lower than the turnover achieved by the company, a turnover that resulted in an operating result slightly above zero.

Question 4

To calculate the level of sales revenue that would allow the company to achieve an after-tax result of $100,000 if the tax rate is 30%, we can use the following

$$\text{Target Sales Revenue} = \frac{Residual\ Fixed\ Costs + Financial\ Expenses + \frac{Target\ EAT}{(1 - tax\ rate)}}{Contribution\ Margin\ Ratio}$$

In the specific case, assuming the same level of fixed revenues and costs and the invariance of interest expenses we will therefore have that

$$\text{Target Sales Revenue} = \frac{\$\,452{,}500 + \$\,80{,}350 + \frac{\$\,100{,}000}{(1 - 30\%)}}{60.67\%} = \frac{\$\,452{,}500 + \$\,80{,}350 + \$\,142{,}857}{60.67\%} = \frac{\$\,675{,}707}{60.67\%}$$

The level of sales revenue that enables the company to achieve its income target is, therefore, equal to **$ 1,113,741.55**

01/06/2022 – Exercise 4

This exercise is related to the previous one. All information provided in the previous exercise must consequently be considered to the exclusion of that superseded by information provided here,

In order to increase its profitability, the company is considering several options. The first contemplates a possible shift in the sales mix in favor of the most profitable product in terms of percentage contribution margin (Product "Y").

Question 1) If the company were to succeed in shifting the sales mix from the current ratio (5:2) to a new ratio of 5:3 what would be the effect on the level of sales revenues that must be achieved in order to attain the result referred to in point 4 above?

Another option is to replace Product "Y" with a new product which, although it is characterized by a contribution margin per unit lower than that of the replaced product by almost 43 per cent, would allow for a significant increase in volume. The figures for the new product are as follows

	Product "Z"
Sales volume (units)	19,500
Average net selling price	$ 26 per unit
Variable cost	$ 10 per unit
Fixed direct costs	$ 44,000

Question 2) Does this seem a correct idea to you? What are the potential effects of this decision on

1. The **contribution margins**
2. The **EAT**
3. The **break-even point in dollar**

for the Company?
To provide answers to the above questions, the preparation of a profit and loss statement showing the potential profitability situation resulting from product substitution is required.

Again, in order to make the results more interesting, some basic numerical data have been slightly modified from the version provided in the original assignment. This in no way affects the effectiveness of the explanation here provided with respect to the questions posed in the test.

SOLUTIONS:

Question 1

The answer to this question does not require much work. In the equation used above, the only term that is affected by the hypothesis of a change in the sales mix proposed by the text is, in fact, the contribution margin ratio placed at the denominator of the formula.

The new structure of the sales mix is, in fact, as follows:

	# of units	Sales Revenue	Variable Cost	Contribution Margin
Product "W	5	$ 70	$ 35	$ 35
Product "T"	3	$ 120	$ 36	$ 84
		--------	--------	--------
Total		**$ 190**	**$ 71**	**$ 119**

The company contribution margin ratio determined by this new product mix is thus 62.63% and is clearly higher because the weight of the richest product has increased. Previously it weighed 53.33% of sales revenue, now it weighs 63.15%, again of sales revenue.
Putting the thus determined value of the contribution margin ratio into the above formula we have that:

$$\text{Target Sales Revenue} = \frac{\$\,452{,}500 + \$\,80{,}350 + \frac{\$\,100{,}000}{(1-30\%)}}{62.63\%} = \frac{\$\,452{,}500 + \$\,80{,}350 + \$\,142{,}857}{62.63\%} = \frac{\$\,675{,}707}{62.63\%}$$

and therefore, that the new level of turnover which allows the achievement of the revenue target set by management is equal to **$ 1,078,909.08**, lower than previously determined due to the improvement in profitability at contribution margin level.

Question 2

To answer the question correctly, a profit and loss account similar to the one prepared with reference to Exercise No. 1 must be prepared.
The observations already made apply:

1) the numbers in it are expressed in thousands of dollars.
2) since the diagram is copied from an excel sheet prepared using the convention in force in Italy, in it the dots act as separators of the thousands, while commas separate the units from the decimals.

	Product "W"	Product "Z"	Whole company
Units sold	25,00	19,50	44,50
+ Sales Revenue	**$ 350,00**	**$ 507,00**	**$ 857,00**
- COGS (@ variable)	$ 175,00	$ 195,00	$ 370,00
= Contribution Margin	**$ 175,00**	**$ 312,00**	**$ 487,00**
-Direct Fixed Costs	$ 39,00	$ 44,00	$ 83,00
= Second Margin	**$ 136,00**	**$ 268,00**	**$ 404,00**
+ Fixed Revenues			$ 32,50
- Fixed Costs			$ 446,00
= EBIT			**$ -9,50**
- Financial Expenses			$ 80,35
= EBT			**$ -89,85**

Contribution margin ratio	*50,00%*	*61,54%*	*56,83%*
Second margin ratio	*38,86%*	*52,86%*	*47,14%*
EBIT ratio			*-1,11%*
EBT ratio			*-10,48%*

Please note that:

- the increase in turnover made possible by the expansion in quantities sold is largely neutralized by the reduction in the contribution margin ratio caused by product substitution.
- indirect fixed costs increase because the fixed costs related to the substituted product do not disappear, they are in fact most likely committed fixed costs

All this leads to an overall worse income situation (EAT lower than before) although the overall contribution margin partially improves. The proposal put forward by management therefore seems wrong and should be rejected

The new break-even point in dollar is:

$$\text{Break-even point in dollar} = \frac{Residual\ Fixed\ Costs}{Contribution\ Margin\ Ratio} = \frac{\$\ 496{,}500}{56.83\%} = \mathbf{\$\ 873{,}658.28}$$

22/06/2022 - Exercise 3

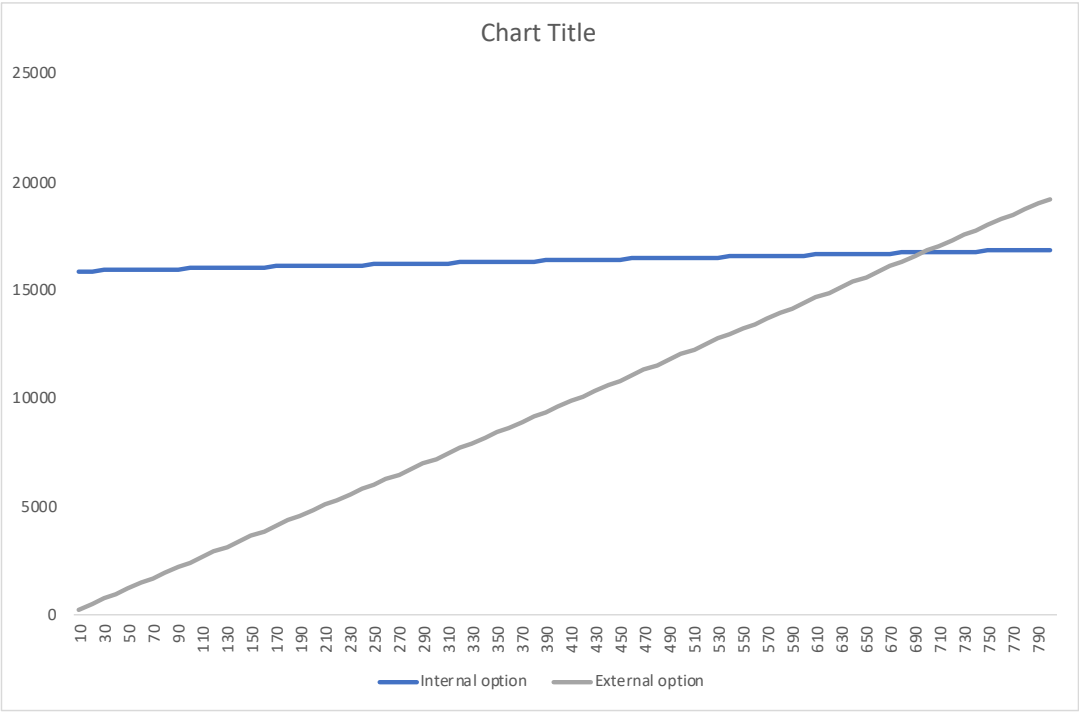
As the manager of a metalworking company, you have to decide whether or not to outsource the design/drawing activity necessary for the realization of your product. The choice has no strategic implications, as there is no reason to consider this activity essential for the creation of your competitive advantage. The activity is now carried out in-house by 5 designers providing a production capacity of 800 hours per month. The fixed monthly costs associated with this activity are $15,850 while the variable costs (mainly related to the material used for drawing) are $1.25 per hour. Technical drawings of the same quality can be purchased on the market for an average of $24 per hour.

Required:

Can you calculate the capacity utilization rate that makes the two solutions indifferent?

SOLUTIONS:

This exercise requires the comparison of two cost structures: one internal, which is more "rigid" as it is characterized by the prevalence of fixed costs (those related to the remuneration of designers), and the other which is entirely variable as it involves the use of external designers. With the help of an Excel sheet, it is easy to obtain an effective graphical representation, which could of course also be sketched freehand. The x-axis shows the hours of work performed, while the y-axis shows the costs incurred.



The point where the two cost functions intersect is the point of indifference, where the two alternatives are equivalent. Before this point the cost of the in-house solution is higher than the “outsourcing” alternative, after it the opposite naturally occurs.

One can, of course, also find the point of indifference algebraically (this was implicitly required by the text) by equating the two cost functions with each other and finding the number of hours that makes them equivalent.
The problem, therefore, is set out as follows:

Cost of the internal option = Cost of the external option

$ 15,850 + 1.25 $/hours * hours = 24 $/hours * hours

$ 15,850 = (24 – 1.25) $/hours * hours

whereby the solution will be:

Indifference point = $\frac{\$\ 15{,}850}{22.75\ \$/hours}$ = 696.70 hours

The text actually requires “capacity utilization rate that makes the two solutions indifferent”. We must therefore transform the solution thus obtained in terms of the degree of occupation of the productive capacity (constituted, as the text shows, by a total of 800 hours of available labor). Which, of course, is very simple:

Degree of capacity utilization = $\frac{696.70\ hours}{800\ hours} = \mathbf{87{,}08\%}$

The figure thus expressed is interesting because it suggests that the internal cost structure is probably wrong: it becomes, in fact, cheaper than the one associated with the choice of outsourcing only if the production capacity is utilized for more than eighty-seven per cent, which is quite unlikely. The company has probably hired at least one more designer than is really needed.

22/06/2022 - Exercise 4

The net operating capital of NLS Inco. consists of the following items:

Inventory	$ 5,000
Operating Debtors	$ 4,500
Operating Creditors	$ 2,000
Fixed assets	$ 32,000

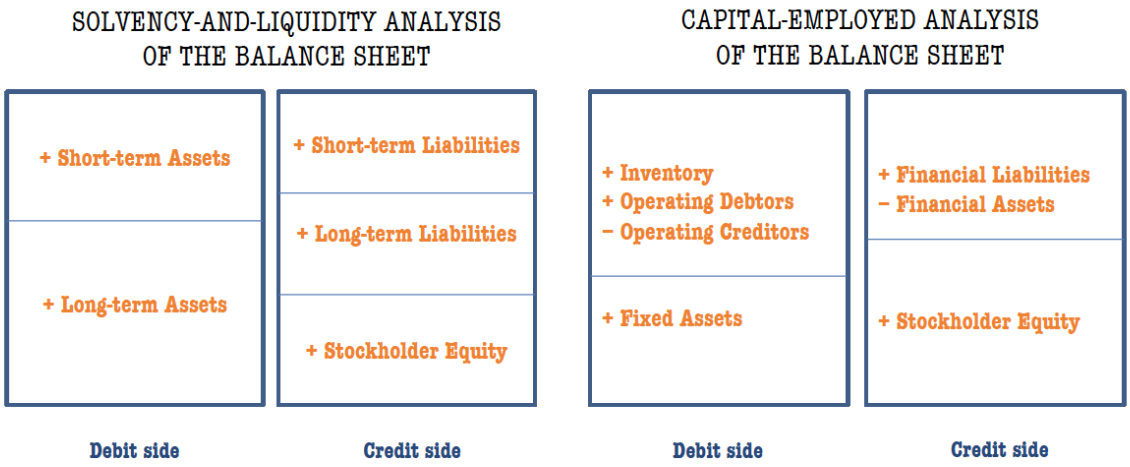
and enables the company to yield a profitability of 20%. The company's mark-up at the operating level is 24%.

Using this information appropriately, answer the following questions:

1) How much is it the return on sales?
2) How much is it the capital employed turnover ratio?
3) How much is the level of sales revenue?
4) How long is the Net Working Capital Cycle (days of Net Working Capital outstanding)?

SOLUTIONS:

The first information provided in the text concerns the macro-classes that make up the net operating capital of which we are given the overall profitability figure (20%).
We can, first of all, determine the level of capital using the structure of the balance sheet consistent with the so-called "capital-employed analysis".



We thus have that:

+ Inventory	$ 5,500
+ Operating Debtors	$ 4,500

= Gross Working Capital	**$ 10,000**
–Operating Creditors	$ 2,000

= Net Working Capital	**$ 8,000**
+ Fixed assets	$ 32,000

= Net Employed Capital	**$ 40,000**

Thus, net employed capital or, which is the same, net operating capital, is equal to $ 40,000. If it guarantees a profitability of 20%, this means that:

$$\text{r.o.c.e.} = \frac{EBIT}{\$\ 40{,}000} = 20\%$$

which means that the EBIT for the period can only be $8,000. we are now ready to answer all the questions in the text.

Question 1

The text informs us that the company's mark-up at the operating level is 24%. remembering what we saw in class (and which can be derived anyway with a minimum of numeracy):

$$\frac{O_\$ - I_\$}{I_\$} = x \qquad \frac{O_\$ - I_\$}{O_\$} = ? \Rightarrow$$

$$O_\$ - I_\$ = x^* I_\$ \Rightarrow O_\$ = I_\$ + x^* I_\$ = I_\$ * (1+x)$$

$$\frac{O_\$ - I_\$}{O_\$} = \frac{x^* I_\$}{I_\$ * (1+x)} = \frac{x}{(1+x)}$$

we have that

$$\text{r.o.s.} = \frac{24\%}{(1+24\%)} = \mathbf{19.35\%}$$

Question 2

Again, recalling what we saw in class (also in the financial statement analysis module):

ASSET TURNOVER RATIO

$$\text{ROCE} = \frac{\text{EBIT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Capital Employed}}$$

we can set up the following simple equation:

20% = 19.35% * *Assets Turnover Ratio*.

Therefore:

$$\textit{Assets Turnover Ratio} = \frac{20.00\%}{19{,}35\%} = \mathbf{1.03}$$

Question 3

There are two ways of answering this question.

The first:

Since

$$\text{r.o.s.} = \frac{EBIT}{Sales\ Revenue} = \frac{\$\ 8{,}000}{Sales\ Revenue} = \mathbf{19.35\%}$$

then it must be that:

Sales Revenues = **$ 41,434,66**

The second:

Since

$$\textit{Assets Turnover Ratio} = \frac{Sales\ Revenues}{Capital\ Employed} = \frac{Sales\ Revenues}{\$\ 40{,}000} = \mathbf{1.03}$$

then it must be that:

Sales Revenues = **$ 41,200.00**

The difference between the two values is clearly due to rounding problems encountered in the process.

Question 4

Knowing that:

$$Net\ Working\ Capital\ Cycle = \frac{Net\ Working\ Capital}{Sales\ Revenue} * 360 = \frac{\$\ 8{,}000}{\$\ 41{,}200} * 360$$

We have that:

Net Working Capital Cycle = **69.90 days**

22/06/2022 - Exercise 5

The company Mosee S.p.A. markets three very different goods: boxes of mint chewing gum of 400 grams each, packages containing 10 tubes of liquorice toothpaste, and five-litters containers of olive oil.
In the last period, the following quantities were sold at the following average prices and variable costs:

	# of units	price per unit	cost per unit
▪ Boxes of mint chewing gum:	3,500	$ 15	$ 9
▪ Packages of liquorice toothpaste:	2,800	$ 80	$ 40
▪ Five-liters containers of olive oil	700	$ 60	$ 48

Required:

1. Calculate the percentage contribution margin for the company.
2. If the residual fixed costs are $ 93.700 what is the actual **percentage margin of safety** for the company?
3. How much is the sales revenue of **one** bundle of goods. (In answering this question, please define how you consider a bundle to be composed, knowing that it is representative of sales that have historically occurred).
4. Define how many **units** of the three goods you have to sell to cover an incremental investment in advertising of $18,000

SOLUTIONS:

Question 1

The simplest way to determine the contribution margin rate for the company is to develop the following scheme in which the unit contribution margin (unit selling price minus unit variable cost) the sales revenue (quantities sold times unit selling price) and the contribution margin (quantities sold times unit contribution margin) are calculated from the basic data provided in the text. (Please note: the diagram is copied from an excel sheet prepared using the convention in force in Italy, in it the dots act as separators of the thousands, while commas separate the units from the decimals)

	# of unit sold	Average net price per unit	Variable cost per unit	Contribution margin per unit	Sales Revenue	Contribution margin
Boxes of mint chewing gum:	3.500	$ 15,00	$ 9,00	$ 6,00	$ 52.500	$ 21.000
Packages of liquorice toothpaste:	2.800	$ 80,00	$ 40,00	$ 40,00	$ 224.000	$ 112.000
Five-liters containers of olive oil	700	$ 60,00	$ 48,00	$ 12,00	$ 42.000	$ 8.400
Total					**$ 318.500**	**$ 141.400**

The contribution margin rate for the company is therefore equal to: $\frac{\$\ 141{,}400}{\$\ 318{,}500} = \mathbf{44{,}40\%}$

Question 2

Knowing the percentage contribution margin and the level of residual fixed costs, one can calculate the break-even point in dollars:

$$\text{B.E.P. (\$)} = \frac{\$93.700}{44.40\%} = = \$\ 211{,}036$$

Recalling the definition of the percentage safety margin we then have that:

$$\textit{Percentage safety margin} = \frac{\$\ 318{,}500 - \$\ 211{,}036}{\$\ 318{,}500} = \mathbf{33{,}74\%}$$

Question 3

To determine how one bundle of goods is composed we must find the greatest common divisor between the quantities sold of the different goods sold, in this case that number is 700. We therefore have that one bundle of goods is make up as follows:

	# of unit sold	Average net price per unit	Variable cost per unit	Contribution margin per unit	Sales Revenue	Contribution margin
Boxes of mint chewing gum:	5	$ 15,00	$ 9,00	$ 6,00	$ 75	$ 30
Packages of liquorice toothpaste:	4	$ 80,00	$ 40,00	$ 40,00	$ 320	$ 160
Five-liters containers of olive oil	1	$ 60,00	$ 48,00	$ 12,00	$ 60	$ 12
Total					**$ 455**	**$ 202**

As you can see the sales revenue of **one** bundle of goods is equal to $ 455.

Question 4

To determine the level of incremental sales revenue that must be generated to cover the cost of the advertising campaign, simply divide this cost by the contribution margin rate.

$$\textit{Incremental Sales Revenue needed} = \frac{\$\ 18{,}000}{44.40\%} = \$\ 40{,}540$$

To calculate the number of bundles that must be sold to generate this incremental sales revenue, we can proceed as follows:

$$\textit{\# of bundles needed} = \frac{\$\ 40{,}540}{\$\ 455} \approx \mathbf{90}$$

The number of units of the three goods you have to sell to cover an incremental investment in advertising is:

- Boxes of mint chewing gum: 90 * 5 = **450**
- Packages of liquorice toothpaste: 90 * 4 = **360**
- Five-liters containers of olive oil: 90 * 1 = **90**