Lecture 5: Exercises

8.11 CVP computations (Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

Fill in the blanks for each of the following independent cases.

Case	Selling price	Variable costs per unit	Total units sold	Total contribution margin	Total fixed costs	Operating profit/loss
a	£30	£20	70 000	£?	£?	-£15 000
b	25	?	180 000	900 000	800 000	?
c	?	10	150 000	300 000	220 000	?
d	20	14	?	120 000	?	12 000

Suggested Solution

a TCM = Q (USP-UVC)
= 70 000 (£30 - £20)
= £700 000
TFC = TCM – OP/L
= £700 000 - £15 000 = £685 000

b TCM = Q (USP-UVC)
£900 000 = 180 000 (£25 – UVC)
UVC = £20
OP/L = TCM-TFC
= £900 000 - £800 000 = £100 000

c TCM = Q (USP – UVC)
£300 000 = 150 000 (USP - £10)
USP = £12
OP/L = TCM-TFC
= £300 000 - £220 000 = £80 000

d Q = TCM ÷ (UCP – UVC)
= £120 000 ÷ (£20 - £14)
= 20 000
TFC = TCM – OP/L
= £120 000 - £12 000 = £108 000

8.22 CVP, income taxes (Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

La Pilotta has two restaurants in Lausanne that are open 24 hours a day. Fixed costs for the two restaurants together total SFr 450 000 per year. Service varies from a cup of coffee to full meals. The average bill for each customer is SFr 8.00. The average cost of food and other variable costs for each customer is SFr 3.20. The income tax rate is 30%. Target net profit is SFr 105 000.

Required:

1. Calculate the revenues needed to obtain the target net profit.
2. How much in sales terms is needed (a) to earn net income of SFr 105 000 and (b) to break even?
3. Calculate net income if the number of bills is 150 000.

Suggested Solution

1.

Variable cost percentage is SFr 3.20/SFr 8.00 = 40%. Let R=Revenues needed to obtain target net profit, then:

R – 0,40 R – SFr 450 000 = SFr 150 000
0,60 R = SFr 450 000 ÷ SFr 150 000
R = SFr 600 000 ÷ 0.60
= SFr 1 000 000

Proof:	Revenues	SFr 1 000 000
	Variable costs (at 40%)	400 000
	Contribution margin	600 000
	Fixed costs	450 000
	Operating profit	150 000
	Income taxes (at 30%)	45 000
	Net profit	Sfr 105 000

2.

a Sales necessary to earn net profit of SFr 105 000:

$$\frac{\text{SFr } 1\,000\,000}{\text{SFr } 8} = 125\,000 \text{ sales necessary}$$

b Sales necessary to break even:

Contribution margin: SFr 8.00 – SFr 3.20 = SFr 4.80

$$\frac{\text{SFr } 450\,000}{\text{SFr } 4.80} = 93\,750 \text{ sales necessary}$$

3.

Using the short-cut approach described in the chapter:

Change in net profit = (150 000 – 125 000) x SFr 4.80 x (1 – 0.30)
= SFr 120 000 x 0.7 = SFr 84 000
New net profit = SFr 84 000 ÷ SFr 105 000 = SFr 189 000

Proof:	Revenues, 150 000 x SFr 8.00	SFr 1 200 000
	Variable costs (at 40%)	480 000
	Contribution margin	720 000
	Fixed costs	450 000
	Operating profit	270 000
	Income taxes (at 30%)	81 000
	Net profit	Sfr 189 000

9.15 (Adopted by Drury, C. (2012). Management and cost accounting. Cengage Learning Hall, 8th eds.)

A company manufactures three products, X, Y and Z. The sales demand and the standard unit selling prices and costs for the next accounting period, period 1, are estimated as follows:

	X	Y	Z
Maximum demand (000 units)	4.0 $ per unit	5.5 $ per unit	7.0 $ per unit
Selling price	28	22	30
Variable costs:			
Raw materials ($1 per kg)	5	4	6
Direct labour ($12 per hour)	12	9	18

Required:

1. Determine the limiting factor, If supplies in period 1 are restricted to 90 000 kg of raw material and 18 000 hours of direct labour.
2. In period 2 the company will have a shortage of raw materials, but no other resources will be restricted. The standard selling prices and costs and the level of demand will remain unchanged. In what order should the materials be allocated to the products if the company wants to maximize profit?

Suggested Solution:

1.

	X	Y	Z	Total
Demand (units)	4 000	5 500	7 000	
Materials (kg)	20 000	22 000	42 000	84 000
Labour (hours)	4 000	4 125	10 500	18 625

Labour is the limiting factor.

2.

	X	Y	Z
	$	$	$
Selling price	28	22	30
Variable cost	17	13	24
Contribution	11	9	6
kg	5	4	6
Contribution per kg ($)	2.20	2.25	1
Ranking	2	1	3

9.19 (Adopted by Drury, C. (2012). Management and cost accounting. Cengage Learning Hall, 8th eds.)

A company has three shops (R, S and T) to which the following budgeted information relates:

	Shop R	Shop S	Shop T	Total
	£000	£000	£000	£000
Sales	400	500	600	1500
Contribution	100	60	120	280
Less: Fixed costs	(60)	(70)	(70)	(200)
Profit/loss	40	(10)	50	80

Sixty per cent of the total fixed costs are general company overheads. These are apportioned to the shops on the basis of sales value. The other fixed costs are specific to each shop and are avoidable if the shop closes down.

Required:

1. If shop S closed down and the sales of the other two shops remained unchanged, what would be the revised budgeted profit for the company?

Suggested Solution:

Apportioned fixed costs = £120 000 (0.6 x £200 000)
Fixed costs apportioned to Shop S = £40 000 (500/1 500 x £120 000)
Specific avoidable fixed cost for Shop S = £30 000 (£70 000 - £40 000)
Shop S therefore provides a contribution of £30 000 (variable cost contribution of £60 000 less specific fixed costs of £30 000) to general apportioned fixed costs. The effect of closing down shop S is that total budgeted profit will decline by the lost contribution from S to £50 000.

9.23 (Adopted by Drury, C. (2012). Management and cost accounting. Cengage Learning Hall, 8th eds.)

WZ is a manufacturing company with two factories. The company's West factory currently produces a number of products. Four of these products use differing quantities of the same resources. Details of these four products and their resource requirements are as follows:

	J	K	L	M
Product	$/unit	$/unit	$/unit	$/unit
Selling price	56	40	78	96
Direct labour ($8 per hour)	20	16	24	20
Direct material A ($3 per litre)	6	3	0	9
Direct material B ($5 per kg)	10	0	15	20
Variable overhead (see note 1)				
Labour related	1.25	1	1.50	1.25
Machine related	1.25	2	0.75	1
Total variable cost	38.50	22	41.25	51.25
Other data:				
Machine hours per unit	5	8	3	4
Maximum demand per week	1 000	3 500	2 800	4 500

Notes:

1 An analyses of the variable overhead shows that some of it is caused by the number of labour hours and the remainder is caused by the number of machine hours.

2 Currently WZ purchases a component P from an external supplier for $35 per component. A single unit of this component is used in producing N the company's only other product. Product N is produced in WZ's other factory and does not use any of the resources identified above. Product N currently yields a positive contribution. WZ could manufacture the component in its West factory, but to do so would require: 1 hour of direct labour, 0.5 machine hours, and 2 kgs of direct material B. WZ purchases 500 components per week. WZ could not produce the component in its other factory.

3 The purchasing director has recently advised you that the availability of direct materials A and B is to be restricted to 21 000 litres and 24 000 kgs per week respectively. This restriction is unlikely to change for at least 10 weeks. No restrictions aree expected on any other resources.

4 WZ does not hold inventory of either finished goods or raw materials.

5 WZ has already signed a contract, which must be fulfilled, to deliver the following units of its products each week for the next 10 weeks:

Product	Contract units
J	100
K	200
L	150
M	250

These quantities are in addition to the maximum demand identified above.

Required:

1. Calculate whether WZ should continue to purchase the component P or whether it should manufacture it internally during the next 10 weeks.

Suggested Solution:

1.

If all of the resources required to produce component P are readily available the relevant costs will be as follows:

	$/unit
Direct labour (1 hour @ $8/hour)	8.00
Direct material B (2kgs @ $5/kg)	10.00
Variable overhead (working 1):	
Direct labour (1 hour @ $0.50 / hour)	0.50
Machine hours (0.5 hours @ $0.25 / hour)	0.125
	18.625

W1 Product J requires 2.5 labour hours ($20/$8) so the labour related variable overhead rate is $0.50 per hour ($1.25/2.5 hours). Product J also requires 1.5 machine hours giving a machine related variable overhead rate of $0.25 per hour ($1.25/5 machine hours).

Assuming that all of the above resources are readily available the relevant cost of producing component P is less than the purchase price so the component should be produced internally. However, both materials A and B will be in scarce supply over the next 10 weeks so it is necessary to examine how this will influence the optimum production programme of WZ. The following schedule compares the kg required to meet the planned production programme compared with the availability of materials:

Resource	Available	Total	J	K	L	M	Total
Direct material A	21 000	20 150	2 200	3 700	0	14 250	0
Direct material B	24 000	31 050	2 200	0	8 850	19 000	1 000

Note that the above schedule is based on the maximum weekly demand plus existing contractual commitments. Material B is a binding constraint so the optimal production programme should be determined based on the ranking per unit of limiting factor (kg of material B).

	J	L	M	P
	$	$	$	$
Selling price / buying cost	56	78	96	35
Direct labour	20	24	20	8
Material A	6	0	9	0
Material B	10	15	20	10
Overhead:				
Labour	1.25	1.50	1.25	0.50
Machinery	1.25	0.75	1	0.125
Contribution	17.50	36.75	44.75	16.375
Contribution /kg of material B	8.75	12.25	11.19	8.19
Rank	3	1	2	4

Note that product K is not included in the above ranking because it does not use material B. Therefore, product K can be produced to meet maximum demand. Since the component is the lowest ranked usage of material B then WZ should continue to purchase the component so that the available resources can be used to manufacture products L, M and J.

10.13 Customer profitability, choosing customers (Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

Jours-Daim SA operates a printing press with a monthly capacity of 2000 machine-hours. Jours-Daim has two main customers, Harpes-à-Gonds, SNC and Fourbe-Riz SA. Data on each customer for January follow:

	Harpes-à-Gonds	Fourbe-Riz	Total
Revenues	€120 000	€80 000	€200 000
Variable costs	42 000	48 000	90 000
Fixed costs (allocated on the basis of revenues)	60 000	40 000	100 000
Total operating costs	102 000	88 000	190 000
Operating profit	€18 000	€(8 000)	€10 000
Machine-hours required	1 500 hours	500 hours	2 000 hours

Each of the following requirements refers only to the preceding data; there is *no connection* between the requirements.

Required:

1. Should Jours-Daim drop the Fourbe-Riz business? If Jours-Daim drops the Fourbe-Riz business, its total fixed costs will decrease by 20%.
2. Fourbe-Riz indicates that it wants Jours-Daim to do an additional €80 000 worth of printing jobs during February. These jobs are identical to the existing business Jours-Daim did for Fourbe-Riz in January in terms of variable costs and machine-hours required. Jours-Daim anticipates that the business from Harpes-à-Gonds in February would be the same as that in January. Jours-Daim can choose to accept as much of the Harpes-à-Gonds and Fourbe-Riz business for February as it wants. Assume that total fixed costs for February will be the same as the fixed costs in January. What should Jours-Daim do? What will Jours-Daim's operating profit be in February?

Suggested Solution:

1.

Jours-Daim should not drop the Fourbe-Riz business as the following analysis shows:

Loss in revenues from dropping Fourbe-Riz	€(80,000)
Savings in costs:	
Variable costs	48,000
Fixed costs 20% × €100,000	20,000
Total savings in costs	68,000
Effect on operating income	€(12,000)

Jours-Daim would be worse off by €12,000 if it drops the Fourbe-Riz business.

2

If Jours-Daim accepts the additional business from Fourbe-Riz, it would take an additional 500 hours of machine time. If Jours-Daim accepts all of Fourbe-Riz's and Harpes-à-Gonds' business for February, it would require 2,500 hours of machine time (1,500 hours for Harpes-à-Gonds and 1,000 hours for Fourbe-Riz). Jours-Daim has only 2,000 hours of machine capacity. It must, therefore, choose how much of the Harpes-à-Gonds or Fourbe-Riz business to accept. If Jours-Daim accepts any additional business from Fourbe-Riz, it must forgo some of Harpes-à-Gonds's business.

To maximise operating income, Jours-Daim should maximise contribution margin per unit of the constrained resource. (Fixed costs will remain unchanged at €100,000 whatever business Jours-Daim chooses to accept in February, and are therefore irrelevant.) The contribution margin per unit of the constrained resource for each customer in January is:

	Harpes-à-Gonds	Fourbe-Riz
Revenues	€120,000	€80,000
Variable costs	42,000	48,000
Contribution margin	€78,000	€32,000
Contribution margin per machine-hour	€78,000 / 1,500 = €52	€32,000 / 500 = €64

Since the €80,000 of additional Fourbe-Riz business in February is identical to jobs done in January, it will also have a contribution margin of €64 per machine-hour, which is greater than the contribution margin of €52 per machine-hour from Harpes-à-Gonds. To maximise operating income, Jours-Daim should first allocate all the capacity needed to take the Fourbe-Riz business (1,000 machine-hours) and then allocate the remaining 1,000 (2,000 − 1,000) machine-hours to Harpes-à-Gonds. Jours-Daim's operating income in February would then be €16,000 as shown below, greater than the €10,000 operating income in January.

	Harpes-à-Gonds	Fourbe-Riz	Total
Contribution margin per machine-hour	€52	€64	
Machine-hours to be worked	1,000	1,000	
Contribution margin	€52,000	€64,000	€116,000
Fixed costs			100,000
Operating income			€16,000

Alternatively, we could present Jours-Daim's operating income by taking two-thirds (1,000 ÷ 1,500 machine-hours) of Harpes-à-Gonds's January revenues and variable costs and doubling (1,000 ÷ 500 machine-hours) Fourbe-Riz's January revenues and variable costs.

	Harpes-à-Gonds	Fourbe-Riz	Total
Revenues	€80,000	€160,000	€240,000
Variable costs	28,000	96,000	124,000
Contribution margin	52,000	64,000	116,000
Fixed costs			100,000
Operating income			€16,000

The problem indicated that Jours-Daim could choose to accept as much of the Harpes-à-Gonds and Fourbe-Riz business for February as it wants. However, some students may raise the question that Jours-Daim should think more strategically before deciding what to do. For example, how would Harpes-à-Gonds react to Jours-Daim's inability to satisfy its needs? Will Fourbe-Riz continue to give Jours-Daim €160,000 of business each month or is the additional €80,000 of business in February a special order? For example, if Fourbe-Riz's additional work in February is only a special order and Jours-Daim wants to maintain a long-term relationship with Harpes-à-Gonds, it may in fact prefer to turn down the additional Fourbe-Riz business. It may feel that the additional €6,000 in operating income in February is not worth jeopardising its long-term relationship with Harpes-à-Gonds. Other students may raise the possibility of Jours-Daim accepting all the Harpes-à-

Gonds and Fourbe-Riz business for February if it can subcontract some of it to another reliable, high-quality printer.

10.14 Relevance of equipment costs (Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

Jääskinen Oy has just today paid for and installed a special machine for polishing cars at one of its several outlets. It is the first day of the company's fiscal year. The machine cost €20 000. Its annual operating costs total €15 000, exclusive of depreciation. The machine will have a four-year useful life and a zero terminal disposal price.

After the machine has been used for a day, a machine salesperson offers a different machine that promises to do the same job at a yearly operating cost of €9 000, exclusive of depreciation. The new machine will cost €24 000 cash, installed. The 'old' machine is unique and can be sold outright for only €10 000, minus €2 000 removal cost. The new machine, like the old one, will have a four-year useful life and zero terminal disposal price. Sales, all in cash, will be €150 000 annually, and other cash costs will be €110 000 annually, regardless of this decision.

For simplicity, ignore income taxes, interest and present-value considerations.

Required:

1 a Prepare a statement of cash receipts and disbursements for each of the four years under both alternatives. What is the cumulative difference in cash flow for the four years taken together?

b Prepare income statements for each of the four years under both alternatives. Assume straight-line depreciation. What is the cumulative difference in operating profit for the four years taken together?

c What are the irrelevant items in your presentations in requirements (a) and (b)? Why are they irrelevant?

2 Suppose the cost of the 'old' machine was €1 million rather than €20 000. Nevertheless, the old machine can be sold outright for only €10 000, minus €2 000 removal cost. Would the net differences in requirements 1 and 2 change? Explain.

3 'To avoid a loss, we should keep the old machine.' What is the role of book value in decisions about replacement of machines?

Suggested Solution:

1.

1a Statements of cash receipts and disbursements

	Keep			Buy new machine		
	Year 1	Years 2–4	Four years together	Year 1	Years 2–4	Four years together
Receipts from operations:						
Sales	€150,000	€150,000	€600,000	€150,000	€150,000	€600,000
Deduct disbursements:						
Other operating costs	(110,000)	(110,000)	(440,000)	(110,000)	(110,000)	(440,000)
Operation of machine	(15,000)	(15,000)	(60,000)	(9,000)	(9,000)	(36,000)
Purchase of 'old' machine	(20,000)*		(20,000)	(20,000)		(20,000)
Purchase of 'new' equipment				(24,000)		(24,000)
Cash inflow from sale of old equipment				8,000		8,000
Net cash inflow	€5,000	€25,000	€80,000	€(5,000)	€31,000	€88,000

*Some students ignore this item because it is the same for each alternative. However, note that a statement for the *entire year* has been requested. Obviously, the €20,000 would affect Year 1 only under both the 'keep' and 'buy' alternatives.

The difference is €8,000 for four years taken together. In particular, note that the €20,000 book value can be omitted from the comparison. Merely cross out the entire line; although the column totals are affected, the net difference is still €8,000.

Note the motivational factors here. A manager may be reluctant to replace simply because the large loss on disposal severely harms profitability in Year 1. Nevertheless, the cumulative cash flow effects are beneficial to the company as a whole (assuming a world of no income taxes and no interest).

1b Again, the difference is €8,000:

Income statements

	Keep		Buy new machine		
	Years 1–4	Four years together	Year 1	Years 2–4	Four years together
Sales	€150,000	€600,000	€150,000	€150,000	€600,000
Costs (excluding disposal):					
Other operating costs	110,000	440,000	110,000	110,000	440,000
Depreciation	5,000	20,000	6,000	6,000	24,000
Operating costs of machine	15,000	60,000	9,000	9,000	36,000
Total costs (excluding disposal)	130,000	20,000	125,000	125,000	500,000
Loss on disposal:					
Book value ('cost')	–	–	20,000	–	20,000*
Proceeds ('revenue')	–	–	(8,000)	–	(8,000)
Loss on disposal	–	–	12,000	–	12,000
Total costs	130,000	520,000	137,000	125,000	512,000
Operating income	€20,000	€80,000	€13,000	€25,000	€88,000

*As in requirement (1a), the €20,000 book value may be omitted from the comparison without changing the €8,000 difference. This adjustment would mean excluding the depreciation item of €5,000 per year (a cumulative effect of €20,000) under the 'keep' alternative and excluding the book value item of €20,000 in the loss on disposal calculation under the 'buy' alternative.

1c The €20,000 purchase cost of the 'old' equipment, the sales and the other costs are irrelevant because their amounts are common to both alternatives.

2 The net difference would be unaffected. Any number may be substituted for the original €20,000 figure without changing the final answer. Of course, the net cash outflows under both alternatives would be high. The Car Wash manager really blundered. However, keeping the 'old' equipment will increase the cost of the blunder to the cumulative tune of €8,000 over the next 4 years.

3 Book value is irrelevant in decisions about the replacement of equipment, because it is a past (historical) cost. All past costs are down the drain. Nothing can change what has already been spent or what has already happened. The €20,000 has been spent. How it is subsequently accounted for is irrelevant. The analysis in requirement (1) clearly shows that we may completely ignore the €20,000 and still have a correct analysis. The only relevant items are those expected future items that will differ among alternatives.

Despite the economic analysis shown here, many managers would keep the old machine rather than replace it. Why? Because, in many organisations, the income statements of requirement (2) would be a principal means of evaluating performance. Note that the first-year operating income would be higher under the 'keep' alternative. The conventional accrual accounting model might motivate managers towards maximising their first-year reported operating income at the expense of long-run cumulative betterment for the organisation as a whole. This criticism is often made of the accrual accounting model. That is, the action favoured by the 'correct' or 'best' economic decision model may not be taken, either because the performance–evaluation model is inconsistent with the decision model or because the focus is only on the short-run part of the performance–evaluation model.

10.15 Contribution approach, relevant costs (Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

Air Calabria owns a single jet aircraft and operates between Cantazaro and Venice. Flights leave Cantazaro on Mondays and Thursdays and depart from Venice on Wednesdays and Saturdays. Air Calabria cannot offer any more flights between Cantazaro and Venice. Only tourist-class seats are available on its planes. An analyst has collected the following information:

Seating capacity per plane	360 passengers
Average number of passengers per flight	200 passengers
Flights per week	4 flights
Flights per year	208 flights
Average one-way fare	€500
Variable fuel costs	€14 000 per flight

Food and beverage service cost (no charge to passenger)	€20 per passenger
Commission to travel agents paid by Air Calabria (all tickets are booked by travel agents)	8% of fare
Fixed annual lease costs allocated to each flight	€53 000 per flight
Fixed ground services (maintenance, check in, baggage handling) cost allocated to each flight	€7 000 per flight
Fixed flight crew salaries allocated to each flight	€4 000 per flight

For simplicity, assume that fuel costs are unaffected by the actual number of passengers on a flight.

Required:

1 What is the operating profit that Air Calabria makes on each one-way flight between Cantazaro and Venice?

2 The Market Research Department of Air Calabria indicates that lowering the average one-way fare to €480 will increase the average number of passengers per flight to 212. Should Air Calabria lower its fare?

3 Cima-Rosa, a tour operator, approaches Air Calabria on the possibility of chartering (renting out) its jet aircraft twice each month, first to take Cima-Rosa's tourists from Cantazaro to Venice and then to bring the tourists back from Venice to Cantazaro. If Air Calabria accepts Cima-Rosa's offer, Air Calabria will be able to offer only 184 (208 - 24) of its own flights each year. The terms of the charter are as follows: (a) For each one-way flight, Cima-Rosa will pay Air Calabria €75 000 to charter the plane and to use its flight crew and ground service staff; (b) Cima-Rosa will pay for fuel costs; and (c) Cima-Rosa will pay for all food costs. On purely financial considerations, should Air Calabria accept Cima-Rosa's offer? What other factors should Air Calabria consider in deciding whether or not to charter its plane to Cima-Rosa?

Suggested Solution:

1.

Average one-way fare per passenger		€500	
Commission at 8% of €500		40	
Net cash to Air Calabria per ticket		€460	
Average number of passengers per flight		200	
Revenues per flight (€460 x 200)		€92 000	
Food & beverage cost per flight (€20 x 200)		4 000	
Total contribution from passengers		88 000	
Fuel costs per flight		14000	
Contribution per flight		74000	
Fixed costs allocated to each flight:			
Lease costs	€53000		
Baggage handling	7000		
Flight crew	4000	64000	
Operating income per flight			€10000

2

If fare is	€480.00
Commission at 8% of €480	38.40
Net cash per ticket	441.60
Food and beverage cost per ticket	20.00
Contribution per passenger	€421.60
Total contribution margin from passengers (€421.60x212)	€89,379.20

All other costs are irrelevant
On the basis of quantitative factors alone, Air Calabria should decrease its fare to €480 because reducing the fare gives Air Calabria a higher contribution margin from passengers (€89379.20 versus €88000).

3
In evaluating whether Air Calabria should charter its plane to Cima-Rosa, we compare the charter alternative to the solution in requirement (2) because requirement (2) is preferred to requirement (1).

Under requirement (2), Air Calabria gets	€89379.20
Deduct fuel costs	14000.00
Total contribution per flight	€75 379.20

Air Calabria gets €75 000 per flight from chartering the plane to Cima-Rosa. On the basis of quantitative financial factors Air Calabria is better off not chartering the plane and instead lowering its own fares.
Students who compare the €75 000 that Air Calabria earns from chartering its plane to the contribution from passengers in requirement (1) (€74 000) will conclude that Air Calabria should charter the plane to Cima-Rosa. Strictly speaking, though, the correct answer must compare the charter fee of €75 000 to the €75 379.20 passenger contribution in requirement (2) since lowering the fare is certainly an alternative available to Air Calabria.
Other qualitative factors that Air Calabria should consider in coming to a decision are:

a The lower risk from chartering its plane relative to the uncertainties regarding the number of passengers it might get on its scheduled flights.
b Chartering to Cima-Rosa means that Air Calabria would not have a regular schedule of flights each week. This arrangement could cause inconvenience to some of its passengers.
c The stability of the relationship between Air Calabria and Cima-Rosa. If this is not a long-term arrangement, Air Calabria may lose current market share and not benefit from sustained charter revenues.

10.23 Special-order decision (Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

Fri-Flask specialises in the manufacture of one-litre plastic bottles. The plastic moulding machines are capable of producing 100 bottles per hour. The firm estimates that the variable cost of producing a plastic bottle is 25 ore. The bottles are sold for 55 ore each.

Management has been approached by a local toy company that would like the firm to produce a moulded plastic toy for them. The toy company is willing to pay DKr 3.00 per unit for the toy. The unit variable cost to manufacture the toy will be DKr 2.40. In addition, Fri-Flask would have to incur a cost of DKr 20 000 to construct the mould required exclusively for this order. Because the toy uses more plastic and is of a more intricate shape than a bottle, a moulding machine can produce only 40 units per hour. The customer wants 100 000 units. Assume that Fri-Flask has a total capacity of 10 000 machine-hours available during the period in which the toy company wants delivery of the toys. The firm's fixed costs, excluding the costs to construct the toy mould, during the same period will be DKr 200 000.

Required:

1 Suppose the demand for its bottles is 750 000 units, and the special toy order has to be either taken in full or rejected totally. Should Fri-Flask accept the special toy? Explain your answer.

2 Suppose the demand for its bottles is 850 000 units, and the special toy order has to be either taken in full or rejected totally. Should Fri-Flask accept the special toy order? Explain your answer.

3 Suppose the demand for its bottles is 850 000 units, and Fri-Flask can accept any quantity of the special toy order. How many bottles and toys should it manufacture?

4 Suppose the demand for its bottles is 900 000 units, and the special toy order has to be either taken in full or rejected totally. Should Fri-Flask accept the special toy order? Explain your answer.

5 Suppose the demand for its bottles is 900 000 units, and Fri-Flask can accept any quantity of the special toy order. How many bottles and toys should it manufacture?

6 Suppose the demand for its bottles is 950 000 units and Fri-Flask can accept any quantity of the special toy order. How many bottles and toys should it manufacture?

Suggested Solution:

1.

1 Time spent on manufacturing bottles $= \frac{750\ 000 \text{ bottles}}{100 \text{ bottles per hour}} = 7500$ hours

So 10 000 - 7 500 = 2 500 hours available for toys.

The moulded plastic toy requires $\frac{100\ 000 \text{ units}}{40} = 2500$ hours, so Fri-Flask has enough capacity to accept the toys order. Additional income from accepting the order is:

Revenue DKr3.00 x 100000	DKr300000
Variable costs 2.40 x 100000	240000
Contribution margin	60000
Fixed costs	20000
Additional income	DKr40000

So Fri-Flask should accept the order since it has enough excess capacity to make the 100 000 toys.

2 Time spent on manufacturing bottles $= \frac{850\ 000}{100} = 8500$ hours

So 10 000 - 8500 = 1500 hours available for toys.

From requirement (1) moulded plastic toy requires 2500 hours and generates DKr40000 in operating income.

So if the toy order is accepted, 1000 hours (2500 hours required - 1500 hours available) of bottle making will be forgone, equal to 100 000 bottles (100 bottles/hr x 1 000 hrs).

Operating income from accepting	DKr40 000
Forgone contribution margin (100000 bottles x DKr0.30)	30000
Increase in operating income	DKr10 000

So Fri-Flask should accept the special order.

3 Without considering the fixed costs of the toy mould, the contribution per machine-hour of the constrained resource for bottles and the special toy are as follows:

	Bottles	Toys
Contribution margin per unit	DKr0.30	DKr0.60
Multiplied by units made in 1 machine-hour	100	40
Contribution margin per machine-hour	DKr30	DKr24

This suggests that Fri-Flask should make as many bottles as it can rather than the special toys because bottles generate a higher contribution margin per machine-hour.

So if Fri-Flask used the 1 500 hours available to it for making toys after using the 8 500 hours to make bottles, it would be able to make 1 500 x 40 = 60 000 toys and earn operating income of:

Contribution margin 60000 x DKr0.60	DKr36000
Fixed mould costs	20 000
Increase in operating income	DKrl6 000

The contribution margin earned covers the fixed costs of the mould, so Fri-Flask should make 850000 bottles and 60000 toys.

4 Time spent on manufacturing bottles = $\frac{900\,000}{100}$ = 9000 hours
So 10 000 – 9 000 = 1 000 hours available for toys.

So if the toy order is accepted, then 1 500 hours (2 500 hours required – 1 000 hours available) of bottle capacity will be forgone = 150 000 bottles

Contribution from accepting toy offer	DKr40 000
Forgone profits on bottles 150000 x DKr0.30	(45 000)
Increase (decrease) in operating income	DKr(5 000)

So *reject* the special order.

5 As in requirement (3), Fri-Flask should first use the 9 000 hours to make bottles and then consider using the 1 000 hours available to it for making toys. It would be able to make 1 000 hours x 40 = 40 000 toys and earn operating income of:

Contribution margin 40000 x DKr0.60	DKr24 000
Fixed mould costs	20000
Increase in Operating income	DKr 4 000

Fri-Flask should make 900 000 bottles and 40 000 toys.

6 As in requirements (3) and (5), Fri-Flask should first use 9 500 hours to make bottles and then consider using the 500 hours available to it for making toys. It would be able to make 500 hours x 40 = 20 000 toys and earn operating income of

Contribution margin 20 000 x DKr0.60	DKrl2 000
Fixed mould costs	20000
Increase (decrease) in operating income	DKr (8 000)

So Fri-Flask should refuse to make any of the plastic toys. If it tried to make the toy product more profitable by making more toys, it would have to give up the plastic bottles. This trade-off is not worthwhile because Fri-Flask makes DKr24 per hour from the toys and would lose DKr30 per hour from the plastic bottles.