Solutions Chapter 2

Fundamental Review Material

2-A1 (20–25 min.)

1. The cost driver for both resources is square metres cleaned. Labour cost is a fixed-cost resource, and cleaning supplies is a variable cost. Costs for cleaning between four and eight times a month are:

Number of Times Plant Is Cleaned	Square Metres Cleaned	Labour Cost	Cleaning Supplies Cost	Total Cost	Total Cost per Square Metre
4	160,000*	$24,000	$ 9,600**	$33,600	$0.210
5	200,000	24,000	12,000***	36,000	0.180
6	240,000	24,000	14,400	38,400	0.160
7	280,000	24,000	16,800	40,800	0.146
8	320,000	24,000	19,200	43,200	0.135

* 4 x 40,000 square metres
** Cleaning supplies cost per square metre cleaned = $9,600 ÷ 160,000 = $0.06
*** $0.06 per square metre x 200,000

The predicted total cost to clean the plant during the next quarter is the sum of the total costs for monthly cleanings of 5, 6, and 8 times. This is

$36,000 + $38,400 + $43,200 = $117,600

2. If Bombardier hires the outside cleaning company, all its cleaning costs will be variable at a rate of $5,900 per cleaning. The cost driver will be ―number of times cleaned.‖ The predicted cost to clean a total of 5 + 6 + 8 = 19 times is 19 x $5,900 = $112,100. Thus, Bombardier will save by hiring the outside cleaning company.

The table and chart below show the total costs for the two alternatives. The cost driver for the outsource alternative is different than the cost driver if Bombardier cleans the plant with its own employees. If Bombardier expects average ―times cleaned‖ to be six or more, it would save by cleaning with its own employees.

Bombardier Cleans Plant		Outsource Cleaning Plant	
Square Metres Cleaned	Bombardier	Times Cleaned	Outside
160,000	$ 33,600	4	$23,600

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200,000	36,000	5	29,500
240,000	38,400	6	35,400
280,000	40,800	7	41,300
320,000	43,200	8	47,200

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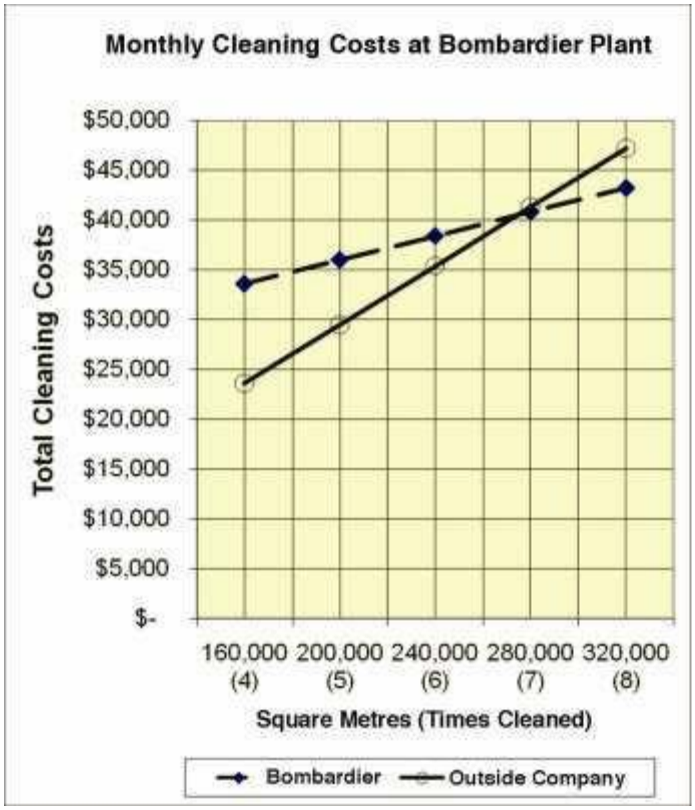

2-A2 (20–25 min.)

1. Let N = number of units
Sales = Fixed expenses + Variable expenses + Net income
$1.00 N = $6,000 + $0.80 N + 0
$0.20 N= $6,000
N = 30,000 units

Let S = sales in dollars
S = $6,000 + 0.80 S + 0
0.20 S= $6,000
S = $30,000

Alternatively, the 30,000 units may be multiplied by $1.00 to obtain $30,000.

In formula form:
In units

$$\frac{\text{Fixed costs} + \text{Net income}}{\text{Contribution margin per unit}} = \frac{(\$6,000 + 0)}{\$0.20} = 30,000$$

In dollars

$$\frac{\text{Fixed costs} + \text{Net income}}{\text{Contribution margin per unit}} = \frac{(\$6{,}000 + 0)}{0.20} = \$30{,}000$$

2. The quick way: (40,000 – 30,000) x $0.20 = $2,000

Compare income statements:

	Break-Even Point	Increment	Total
Volume in units	30,000	10,000	40,000
Sales	$30,000	$10,000	$40,000
Deduct expenses:			
Variable	24,000	8,000	32,000
Fixed	6,000	---	6,000
Total expenses	$30,000	$8,000	$38,000
Effect on net income	$ 0	$ 2,000	$ 2,000

3. Total fixed expenses would be $6,000 + $1,552 = $7,552

$$\frac{\$7{,}552}{\$0.20\,/\,\text{unit}} = 37{,}760 \text{ units}; \quad \frac{\$7{,}552}{0.20} = \$37{,}760 \text{ sales}$$

or 37,760 x $1.00 = $37,760 sales

4. New contribution margin is $0.18 per unit; $6,000 ÷ $0.18 = 33,333 units

33,333 units x $1.00 = $33,333 in sales

5. The quick way: (40,000 – 30,000) x $0.16 = $1,600. On a graph, the slope of the total cost line would have a kink upward, beginning at the break-even point.

2-A3 (20–30 min.)

The following format is only one of many ways to present a solution. This situation is really a demonstration of ―sensitivity analysis,‖ whereby a basic solution is tested to see how much it is affected by changes in critical factors. Much discussion can ensue, particularly about the final three changes.

The basic contribution margin per revenue kilometre is $1.50 – $1.30 = $0.20.

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		(1)	(2)	(3)	(4)	(5)
				(1) x (2)		(3) - (4)
		Revenue Kilometres Sold	Contribution Margin per Revenue Km	Total Contribution Margin	Fixed Expenses	Net Income
1.		800,000	$0.20	$160,000	$120,000	$ 40,000
2.	(a)	800,000	0.35	280,000	120,000	160,000
	(b)	880,000	0.20	176,000	120,000	56,000
	(c)	800,000	0.07	56,000	120,000	(64,000)
	(d)	800,000	0.20	160,000	132,000	28,000
	(e)	840,000	0.17	142,800	120,000	22,800
	(f)	720,000	0.25	180,000	120,000	60,000
	(g)	840,000	.020	168,000	132,000	36,000

2-B1 (20–25 min.)

1. The cost driver for both resources is square metres cleaned. Labour cost is a fixed-cost resource, and cleaning supplies is a variable cost. Costs for cleaning between 35 and 50 times are:

Times Cleaned	Square Metres Cleaned	Labour Cost	Cleaning Supplies Cost	Total Cost	Total Cost per Square Metre
35	175,000*	$30,000	$ 10,500**	$40,500	$0.23143
40	200,000	30,000	12,000	42,000	0.21000
45	225,000	30,000	13,500	43,500	0.19333
50	250,000	30,000	15,000	45,000	0.18000

* 35 x 5,000
** The cost of cleaning supplies per square metre cleaned = $10,500 ÷ 175,000 = $0.06 per square metre. Cleaning supplies cost = $0.06 x 175,000 = $10,500.

The predicted total cost to clean during November and December is the sum of the total costs for monthly cleanings of 45 and 50 times. This is:

$43,500 + $45,000 = $88,500

2. If The Keg hires the outside cleaning company, all its cleaning costs will be variable at a rate of $0.20 per square metre cleaned. The predicted cost to clean a total of 45 + 50 = 95 times is 95 x 5,000 x $0.20 = $95,000. Thus, The Keg will not save by hiring the outside cleaning company.

To determine whether outsourcing is a good decision on a permanent basis, The Keg needs to know the expected demand for the cost driver over an extended time frame. As the following table and graph show, outsourcing becomes less attractive when cost

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driver levels are high. If average demand for cleaning is expected to be more than about 164,000 ÷ 5,000 = 41 times a month, The Keg should continue to do its own

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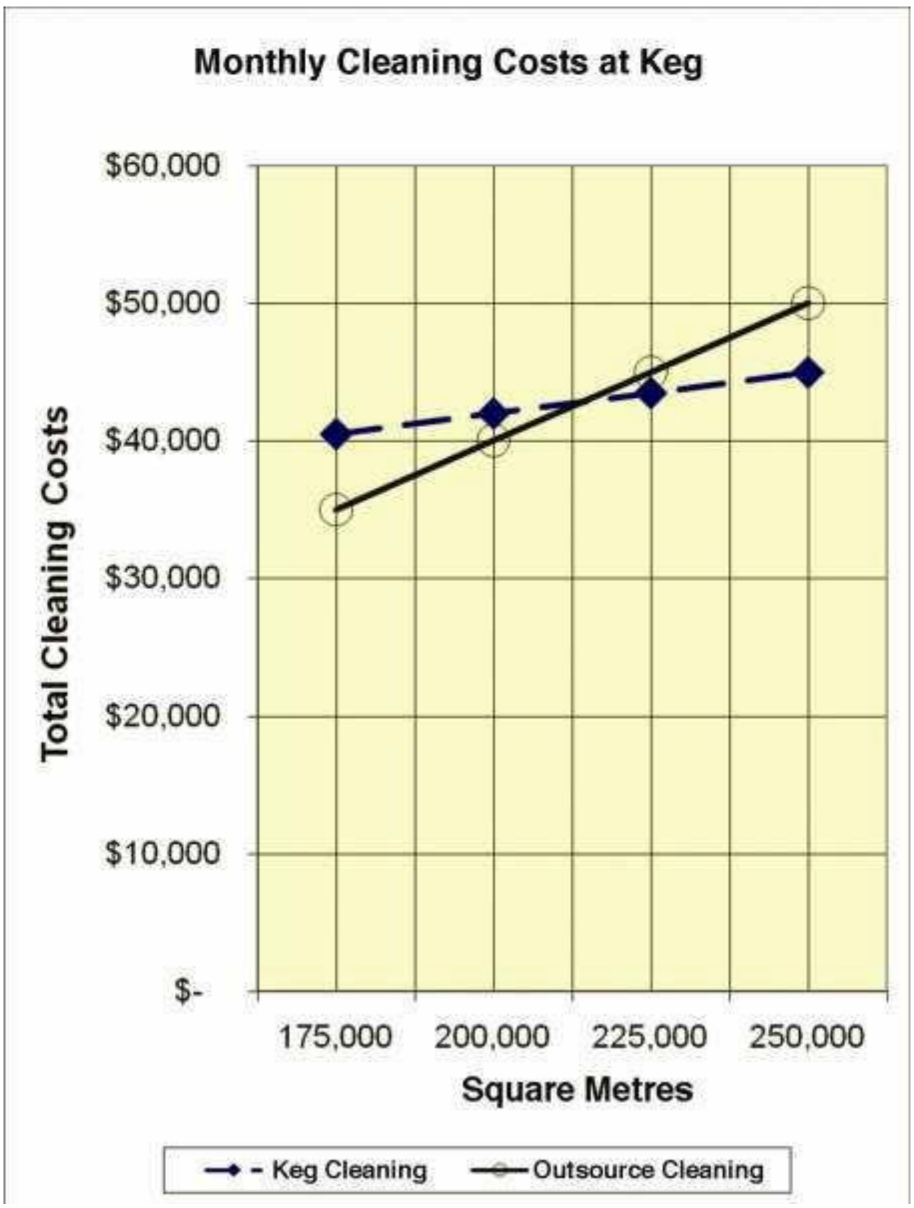
cleaning. The Keg should also consider such factors as quality and cost control when an outside cleaning company is used.

(1) Times Cleaned	(2) Square Metres Cleaned	(3) Keg Total Cleaning Cost*	Outside Cleaning Cost $0.20 x (2)
35	175,000	$40,500	$35,000
40	200,000	42,000	40,000
45	225,000	43,500	45,000
50	250,000	45,000	50,000

* From requirement 1, total cost is the fixed cost of $30,000 + variable costs of $0.06 x square metres cleaned



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2-B2 (15–25 min.)

1. $2,300 ÷ ($30 - $10) = 115 child-days or 115 x $30 = $3,450 revenue dollars.

2. 176 x ($30 – $10) – $2,300 = $3,520 – $2,300 = $1,220

3. a. 198 x ($30 – $10) – $2,300 = $3,960 – $2,300 = $1,660
   or (22 x $20) + $1,220 = $440 + $1,220 = $1,660

   b. 176 x ($30 – $12) – $2,300 = $3,168 – $2,300 = $868
   or $1,220 – ($2 x 176) = $868

   c. $1,220 – $220 = $1,000

   d. [(9.5 x 22) x ($30 – $10)] – ($2,300 + $300) = $4,180 – $2,600 = $1,580

   e. [(7 x 22) x ($33 – $10)] – $2,300 = $3,542 – $2,300 = $1,242

2-B3 (15–20 min.)

1. $\frac{\$5,000}{(\$20 - \$16)} = \frac{\$5,000}{\$4}$ = 1,250 units

2. Contribution margin ratio: $\frac{(\$40,000 - \$30,000)}{(\$40,000)}$ = 25%

   $8,000 ÷ 25% = $32,000

3. $\frac{(\$33,000 + \$7,000)}{(\$30 - \$14)} = \frac{\$40,000}{\$16}$ = 2,500 units

4. ($50,000 – $20,000)(110%) = $33,000 contribution margin;
   $33,000 – $20,000 = $13,000

5. New contribution margin: $40 – ($30 – 20% of $30)
   = $40 – ($30 – $6) = $16;

   New fixed expenses: $80,000 x 110% = $88,000;
   $\frac{(\$88,000 + \$20,000)}{\$16} = \frac{\$108,000}{\$16}$ = 6,750 units

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Questions

Q2-1 This is a good characterization of cost behaviour. Identifying cost drivers will identify activities that affect costs, and the relationship between a cost driver and costs specifies how the cost driver influences costs.

Q2-2 Examples of variable costs are the costs of merchandise, materials, parts, supplies, commissions, and many types of labour. Examples of fixed costs are real estate taxes, real estate insurance, many executive salaries, and space rentals.

Q2-3 Fixed costs, by definition, do not vary in total as volume changes. However, if fixed costs are allocated or spread over volume on a per-unit-of-volume basis, they decline per unit as volume increases.

Q2-4 Yes. Fixed costs per unit change as the volume of activity changes. Therefore, for fixed cost per unit to be meaningful, you must identify an appropriate volume level. In contrast, total fixed costs are independent of volume level.

Q2-5 No. Cost behaviour is much more complex than a simple division into fixed or variable. For example, some costs are not linear, and some have more than one cost driver. Division of costs into fixed and variable categories is a useful simplification, but it is not a complete description of cost behaviour in most situations.

Q2-6 No. The relevant range pertains to both variable and fixed costs. Outside a relevant range, some variable costs, such as fuel consumed, may behave differently per unit of activity volume.

Q2-7 Two simplifying assumptions are linearity of costs and only one measure of volume.

Q2-8 The same cost may be regarded as variable in one decision situation and fixed in a second decision situation. For example, fuel costs are fixed with respect to the addition of one more passenger on a bus because the added passenger has almost no effect on total fuel costs. In contrast, total fuel costs are variable in relation to the decision of whether to add one more kilometre to a city bus route.

Q2-9 No. Contribution margin is the excess of sales over all variable costs, not fixed costs. It may be expressed as a total, as a ratio, as a percentage, or per unit.

Q2-10 A ―break-even analysis‖ does not include a provision for minimum acceptable profit required before deciding in favour of the project being analyzed. The break-even point is often only incidental in studies of cost-volume relationships.

Q2-11 No. break-even points can vary greatly within an industry. For example, Rolls-Royce has a much lower break-even volume than does Chrysler (or Ford, Toyota, and other high-volume auto producers).

Q2-12 No. The CVP technique you choose is a matter of personal preference or convenience. The equation technique is the most general, but it may not be the easiest to apply. All three techniques yield the same results.

Q2-13 Three ways of lowering a break-even point, holding other factors constant, are: decrease total fixed costs, increase selling prices, and decrease unit variable costs.

Q2-14 No. In addition to being quicker, incremental analysis is simpler. This is important because it keeps the analysis from being cluttered by irrelevant and potentially confusing data.

Q2-15 Operating leverage is a firm's ratio of fixed and variable costs. A highly leveraged company has relatively high fixed costs and low variable costs. Such a firm is risky because small changes in volume lead to large changes in income.

Q2-16 No. In retailing, the contribution margin is likely to be smaller than the gross margin. For instance, sales commissions are deducted in computing the contribution margin but not the gross margin.

Q2-17 No. CVP relationships pertain to both profit-seeking and not-for-profit organizations. In particular, managers of not-for-profit organizations must deal with tradeoffs between variable and fixed costs. To many government department managers, lump-sum budget appropriations are regarded as the available revenues.

Q2-18 Contribution margin could be lower because of a decline in the proportion of the product bearing the higher unit contribution margin.

Q2-19

$$\text{Target income before income taxes} = \frac{\text{Target after-tax net income}}{1 - \text{tax rate}}$$

Q2-20

$$\text{Change in net income} = (\text{Change in volume in units}) \times (\text{Contribution margin per unit}) \times (1 - \text{tax rate})$$

Exercises

E2-1 (5–10 min.)

1.	Contribution margin	= $900,000 – $500,000	= $400,000
	Net income	= $400,000 − $330,000	= $ 70,000
2.	Variable expenses	= $800,000 – $350,000	= $450,000
	Fixed expenses	= $350,000 – $ 80,000	= $270,000
3.	Sales	= $600,000 + $360,000	= $960,000
	Net income	= $360,000 – $250,000	= $110,000

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E2-2 (10–20 min.)

1. d = c(a – b)
$720,000 = 120,000($25 – b)
b = $19
f = d – e
= $720,000 – $650,000 = $70,000

2. d = c(a – b)
= 100,000($10 – $6) = $400,000
f = d – e
= $400,000 – $320,000 = $80,000

3. c = d ÷ (a – b)
= $100,000 ÷ $5 = 20,000 units
e = d – f
= $100,000 – $15,000 = $85,000

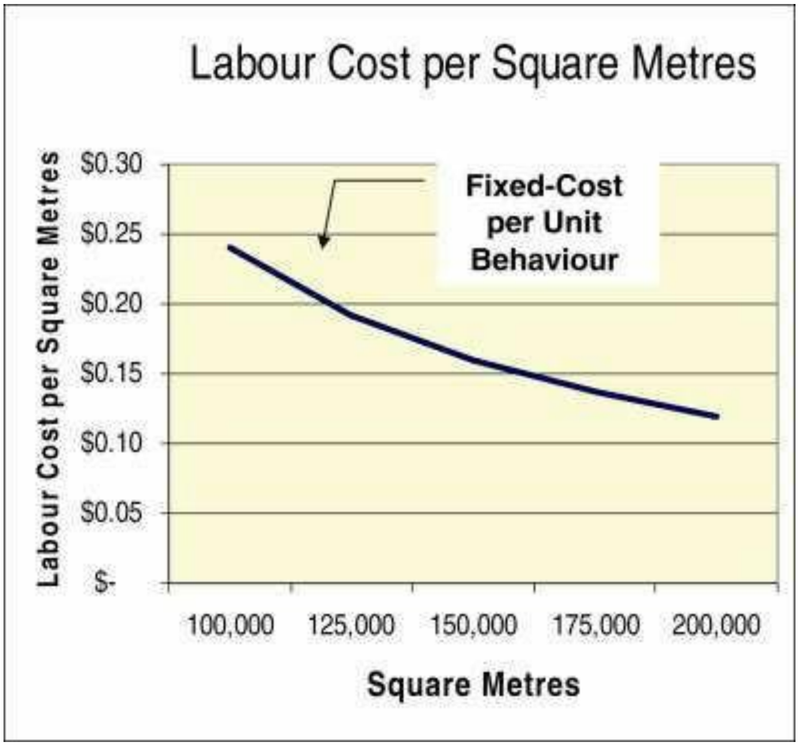
4. d = c(a – b)
= 60,000($30 – $20)
= $600,000
e = d – f
= $600,000 – $12,000 = $588,000

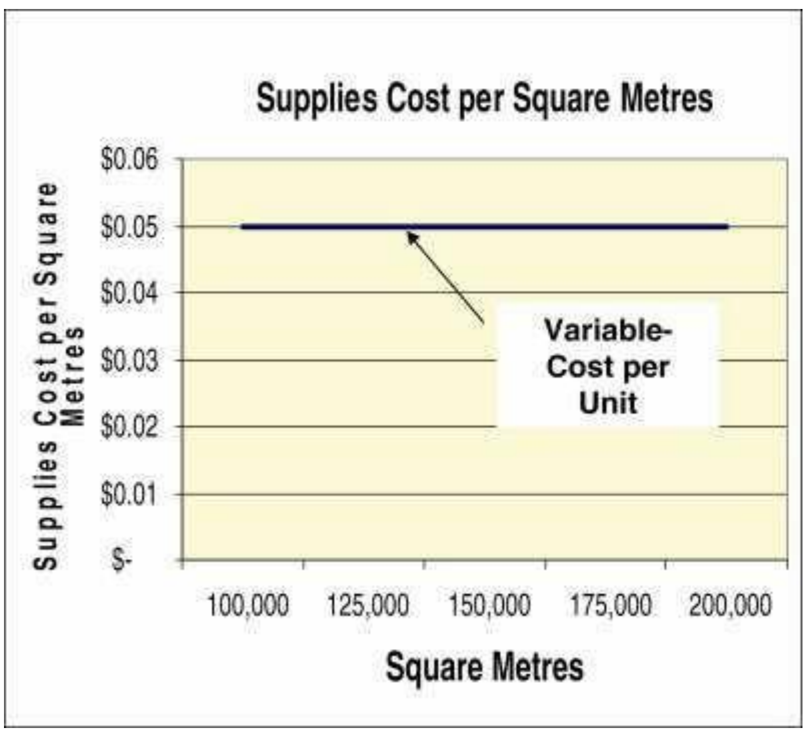
5. d = c(a – b)
$160,000 = 80,000(a – $9)
a = $11
f = d – e
= $160,000 – $110,000 = $50,000

E2-3 (20–25 min.)

Square Metre	Labour Cost	Labour Cost per Square Metre	Supplies Cost	Supplies Cost per Square Metre
100,000	$24,000	$ 0.240	$ 5,000	$0.050*
125,000	24,000	$ 0.192	6,250	0.050
150,000	24,000	$ 0.160	7,500	0.050
175,000	24,000	$ 0.137	8,750	0.050
200,000	24,000	$ 0.120	10,000	0.050

* At 100,000 square metres on the second graph the total supplies cost is $5,000, so the slope of the line is $0.05.

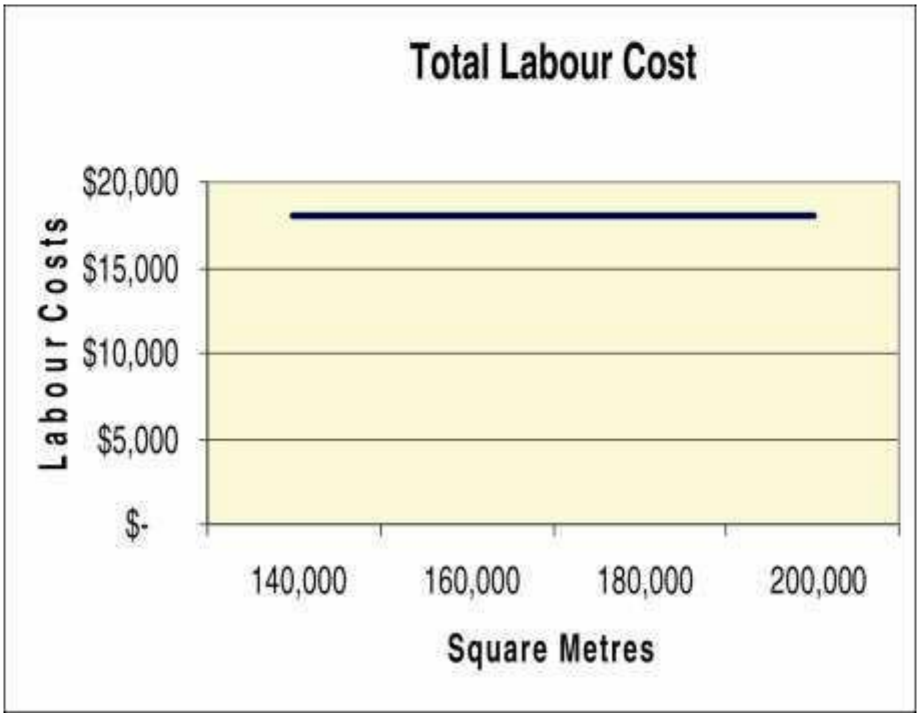

Labour Cost per Square Metres
Labour Cost per Square Metres
$0.30
$0.25
$0.20
$0.15
$0.10
$0.05
$-
Fixed-Cost per Unit Behaviour
100,000
125,000
150,000
175,000
200,000
Square Metres

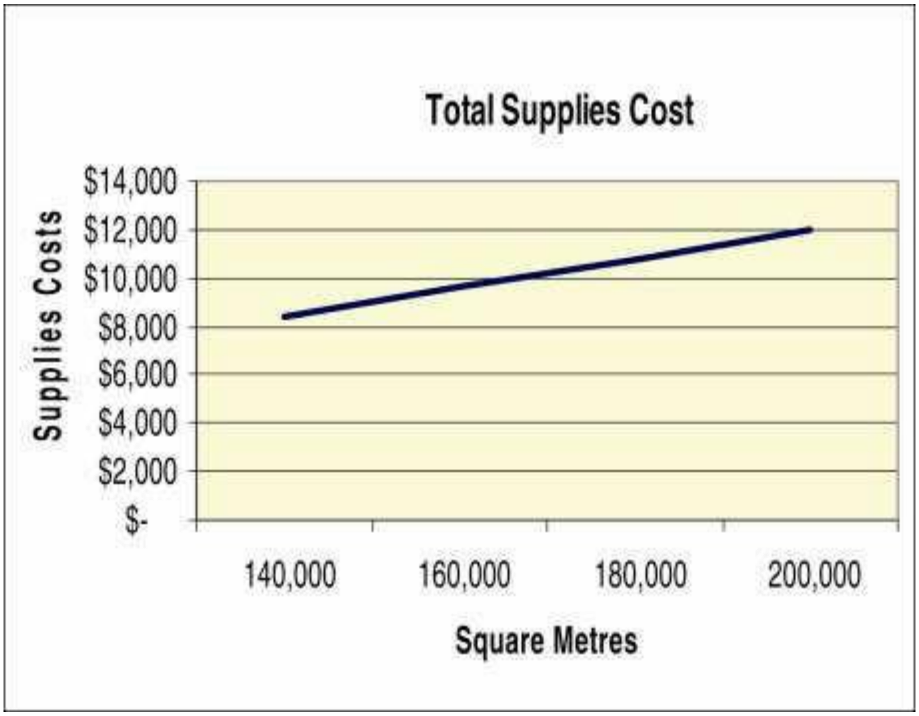

Supplies Cost per Square Metres
Supplies Cost per Square Metres
$0.06
$0.05
$0.04
$0.03
$0.02
$0.01
$-
Variable-Cost per Unit
100,000
125,000
150,000
175,000
200,000
Square Metres

E2-4 (20–25 min.)

Square Metres	Labour Cost per Square Metre (estimated)	Total Labour Cost*	Supplies Cost per Square Metre	Total Supplies Cost
140,000	$0.13	$18,200	$0.06	$ 8,400
160,000	0.11	17,600	0.06	9,600
180,000	0.10	18,000	0.06	10,800
200,000	0.09	18,000	0.06	12,000

* The estimates for labour cost per square metre yield slightly different total labour cost estimates. In the graph below, $18,000 is used.





E2-5 (10 min.)

1.

Let TR	=	total revenue
TR – 0.20(TR) –$40,000,000	=	0
0.80(TR)	=	$40,000,000
TR	=	$50,000,000

2. Daily revenue per patient = $50,000,000 ÷ 40,000 = $1,250. This may appear high, but it includes the room charge plus additional charges for drugs, X-rays, and so forth.

E2-6 (15 min.)

1.

	100% Full	50% Full
Room revenue @ $50	$1,825,000 [a]	$ 912,500 [b]
Variable costs @ $10	365,000	182,500
Contribution margin	1,460,000	730,000
Fixed costs	1,200,000	1,200,000
Net income (loss)	$ 260,000	$ (470,000)

[a] 100 x 365 = 36,500 rooms per year
36,500 x $50 = $1,825,000

[b] 50% of $1,825,000 = $912,500

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2.
Let N = number of rooms
$50N – $10N – $1,200,000 = 0
N = $1,200,000 ÷ $40 = 30,000 rooms
Percentage occupancy = 30,000 ÷ 36,500 = 82.2%

E2-7 (15–20 min.)

1. Let R = litres of raspberries and 2R = litres of strawberries
sales – variable expenses – fixed expenses = zero net income
$1.10(2R) + $1.45(R) – $0.75(2R) – $0.95(R) – $15,600 = 0
$2.20R + $1.45R – $1.50R – $0.95R – $15,600 = 0
$1.20R – $15,600 = 0
R = 13,000 litres of raspberries
2R = 26,000 litres of strawberries

2. Let S = litres of strawberries
($1.10 – $0.75) x S – $15,600 = 0
0.35S – $15,600 = 0
S = 44,571 litres of strawberries

3. Let R = litres of raspberries
($1.45 – $0.95) x R – $15,600 = 0
$0.50R – $15,600 = 0
R = 31,200 litres of raspberries

E2-8 (15 min.)

Several variations of the following general approach are possible:

$$\text{Sales} - \text{Variable expenses} - \text{Fixed expenses} = \frac{\text{Target after-tax net income}}{1 - \text{tax rate}}$$

$$S - 0.7S - \$440,000 = \frac{\$42,000}{(1-0.4)}$$

0.3S = $440,000 + $70,000

S = $510,000 ÷ 0.3 = $1,700,000

Check:		
	Sales	$1,700,000
	Variable expenses (70%)	1,190,000
	Contribution margin	510,000
	Fixed expenses	440,000
	Income before taxes	$ 70,000
	Income taxes	28,000
	Net income	$ 42,000

Problems

P2-1 (40–50 min.)

1. Several variations of the following general approach are possible:

Let N = Unit sales

Sales – Variable expenses – Fixed expenses = Profit
$3N – $2.20N – ($3,000 + $2,000 + $5,000) = $2,000
$0.80N – $10,000 = $2,000
N = $12,000 ÷ $0.80 = 15,000 glasses of beer

Check:	Sales (15,000 × $3)	$45,000
	Variable expenses (15,000 × $2.20)	33,000
	Contribution margin	12,000
	Fixed expenses	10,000
	Profit	$ 2,000

2. $3N – $2.20N – $10,000 = 0.05 × ($3N)

N = $10,000 ÷ ($0.80 – $0.15) = 15,385 glasses of beer

3. $1,560 ÷ ($1.25 – $0.70) = 2,836 hamburgers

4. (2,000 × $0.55) + (3,000 × $0.80) – $1,560 = $1,100 + $2,400 – $1,560 = $1,940

5. $1,560 ÷ ($0.80 + $0.55) = 1,156 new customers are needed to break even on the new business.

A sensitivity analysis would help provide Joe with an assessment of the financial risks associated with the new hamburger business. Suppose that Joe is confident that demand for hamburgers would range between break-even ± 500 new customers and that expected fixed costs will not change within this range. The contribution margin generated by each new customer is $1.35, so Joe will realize a maximum loss or profit from the new business in the range ± $1.35 × 500 = ± $675.

Another way to assess financial risk that Joe should be aware of is the company's operating leverage (the ratio of fixed to variable costs). A highly leveraged company has relatively high fixed costs and low variable costs. Such a firm is risky because small changes in volume lead to large changes in net income. This is good when volume increases but can be disastrous when volumes fall.

6. The additional cost of hamburger ingredients is 0.5 × $0.70 = $0.35. Any price above the current price of $1.25 plus $0.35, or $1.70, will improve profits.

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P2-2 (15–20 min.)

1. Microsoft: ($60,420 – $11,598) ÷ $60,420 = 0.81 or 81%

Procter & Gamble: ($83,503 – $40,695) ÷ $83,503) = 0.51 or 51%

There is very little variable cost for each unit of software sold by Microsoft, while the variable cost of the soap, cosmetics, foods, and other products of Procter & Gamble is substantial.

2. Microsoft: $10,000,000 x 0.81 = $8,100,000

Procter & Gamble: $10,000,000 x 0.51 = $5,100,000

3. By assuming that changes in sales volume do not move the volume outside the relevant range, we know that the total contribution margin generated by any added sales will be added to the operating income. Thus, we can simply multiply the contribution margin percentage by the changes in sales to get the change in operating income.

The main assumptions we make when we assume that the sales volume remains in the relevant range are that total fixed costs do not change and unit variable cost remains unchanged. This generally means that such predictions will apply only to small changes in volume—changes that do not cause either the addition or reduction of capacity.

P2-3 (15 min.)

1. Let X = amount of additional fixed costs for advertising

(1,100,000 x £13) + £300,000 – 0.30(1,100,000 x £13) – (£7,000,000 + X) = 0
£14,300,000 + £300,000 – £4,290,000 – £7,000,000 – X = 0
X = £14,600,000 – £11,290,000
X = £3,310,000

2. Let Y = number of seats sold

£13Y + £300,000 – 0.30(£13)Y – £9,000,000 = £500,000
£9.10Y = £9,200,000
Y = 1,010,989 seats

P2-4 (20–30 min.)

Many shortcuts are available, but this solution uses the equation technique:

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1. Let N = meals sold

Sales – Variable expenses – Fixed expenses = Profit before taxes

$19N – $10.60N – $21,000 = $8,400

N = $29,400 ÷ $8.40

N = 3,500 meals

2. $19N – $10.60N – $21,000 = $0

N = $21,000 ÷ $8.40

N = 2,500 meals

3. $23N – $12.50N – $29,925 = $8,400

N = $38,325 ÷ $10.50

N = 3,650 meals

4. Profit = $23(3,150) – $12.50(3,150) – $29,925

Profit = $3,150

5. Profit = $23(3,450) –$12.50(3,450) – ($29,925 + $2,000)

Profit = $36,225 – $31,925

Profit = $4,300, an increase of $1,150.

A shortcut, incremental approach follows:

Increase in contribution margin, 300 x $10.50 =	$3,150
Increase in fixed costs	2,000
Increase in profit	$1,150

P2-5 (10–15 min.)

Amounts are in millions

Net sales (0.8 x $83,503)	$66,802
Variable costs:	
Cost of goods sold (0.8 x $40,695)	32,556
Contribution margin	34,246
Fixed costs:	
Selling, administrative, and general expenses	25,725
Operating income	$8,521

The percentage decrease in operating income would be ($8,521 ÷ $17,083) – 1 = –0.50 or 50 percent, compared with a 20 percent decrease in sales. The contribution margin would decrease by 20 percent or 0.20 x ($83,503 – $40,695) = $8,562 million. Because fixed costs would not change (assuming the new volume is within the relevant range), operating income would also decrease by $8,562 million, from $17,083 million to $8,521 million. If all costs had been variable, fixed costs would have decreased by an additional 0.20 x $25,725 = $5,145 million, making operating income $8,521 + $5,145 = $13,666 million, a 20 percent decrease under the 2008 operating income of $17,083 million. Because of the existence of fixed costs, the percentage decrease in operating income will exceed the percentage decrease in sales.

P2-6 (15–25 min.)

1.

Average revenue per person	$4.00 + 3($1.50) = $8.50
Total revenue, 200 @ $8.50 =	$1,700
Rent	600
Total available for prizes and operating income	$1,100

The church could award $1,100 and break even.

2.

Number of persons		100	200	300
Total revenue @ $8.50		$ 850	$1,700	$2,550
Fixed costs				
Rent	$ 600			
Prizes	1,100	1,700	1,700	1,700
Operating income (loss)		$ (850)	$ 0	$ 850

Note how —leverage‖ works. Being highly leveraged means having relatively high fixed costs. In this case, there are no variable costs. Therefore, the revenue is the same as the contribution margin. As volume departs from the break-even point, operating income is affected at a significant rate of $8.50 per person.

3.

Number of persons		100	200	300
Revenue		$ 850	$1,700	$2,550
Variable costs		200	400	600
Contribution margin		$ 650	$1,300	$1,950
Fixed costs Rent	$ 200			
Prizes	1,100	1,300	1,300	1,300
Operating income (loss)		$ (650)	$ 0	$ 650

Note how the risk is lower because of less leverage. Fixed costs are less, and some of the risk has been shifted to the hotel. Note too that lower risk brings lower rewards and lower punishments. The income and losses are $650 instead of the $850 shown in part 2.

P2-7 (15–20 min.)
Note in requirements 2 and 3 how the percentage declines exceed the 15 percent budget reduction.

1. Let N = number of persons
Revenue – variable expenses – fixed expenses = 0

$900,000 – $5,000N – $280,000 = 0
5,000N = $900,000 - $280,000
N = $620,000 ÷ $5,000
N = 124 persons

2. Revenue is now 0.85($900,000) = $765,000

$765,000 – $5,000N – $280,000 = 0

$5,000N = $765,000 – $280,000

N = $485,000 ÷ $5,000

N = 97 persons

Percentage drop: (124 – 97) ÷ 124 = 21.8%

3. Let y = supplement per person

$765,000 – 124y – $280,000 = 0

124y = $765,000 – $280,000

y = $485,000 ÷ 124

y = $3,911

Percentage drop: ($5,000 – $3,911) ÷ $5,000 = 21.8%

Regarding requirements 2 and 3, note that the cut in service can be measured by a formula:

$$\% \text{ cut in service} = \frac{\% \text{ budget change}}{\% \text{ variable cost}}$$

The variable cost ratio is $620,000 ÷ $900,000 = 68.9%

$$\% \text{ cut in service} = \frac{15\%}{68.9\%} = 21.8\%$$

P2-8 (15–20 min.)

Answers are in millions.

1.	Sales		$9,416
	Variable costs:		
	Variable costs of goods sold	$5,847	
	Variable other operating expenses	896	6,743
	Contribution margin		$ 2,673

Contribution margin percentage = $2,673 ÷ $9,416 = 28.4%

The contribution margin is sales less all variable costs, while gross margin is sales less cost of goods sold. The variable costs include part of the costs of goods sold and also part of the other operating costs. Note that contribution margin can be either larger or smaller than the gross margin. If most of the cost of goods sold and a good portion of the other operating costs are variable, then variable costs may exceed the cost of goods sold, and the contribution margin will be smaller than the gross margin. However, if a large portion of both the cost of goods sold and the other expenses are fixed, cost of goods sold may exceed the variable cost, resulting in the contribution margin exceeding gross margin.

2. Predicted sales increase = $9,416 x 0.10 = $941.6

Additional contribution margin = $941.6 x 0.284 = $267

Fixed costs do not change

Predicted 2009 operating loss = $(727) + $267 = $(460)

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Percentage decrease in operating loss = [($727) – ($460)] ÷ $(727) = 37%

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3. Assumptions include:
   - Expenses can be classified into variable and fixed categories that completely describe their behaviour within the relevant range.
   - Costs and revenues are linear within the relevant range.
   - 2009 volume is within the relevant range.
   - Efficiency and productivity are unchanged.
   - Sales mix is unchanged.
   - Changes in inventory levels are insignificant.

P2-9 (20–25 min.)

1. Net income (loss) = 250,000($2) + 125,000($3) – $735,000
   = $500,000 + $375,000 – $735,000
   = $140,000

2. Let B = number of units of beef enchiladas to break even (B)
   2B = number of units of chicken tacos to break even (C)

   Total contribution margin – fixed expenses = zero net income

   $3B + $2(2B) – $735,000 = 0
   $7B = $735,000
   B = 105,000
   2B = 210,000 = C

   The break-even point is 105,000 units of beef enchiladas plus 210,000 units of chicken tacos, a grand total of 315,000 units.

3. If tacos, break-even would be $735,000 ÷ $2 = 367,500 units.
   If enchiladas, break-even would be $735,000 ÷ $3 = 245,000 units.

   Note that as the mixes change from 1 enchilada to 2 tacos, to 0 tacos to 1 enchilada, and to 1 taco to 0 enchiladas, the break-even point changes from 315,000 to 245,000 to 367,500.

4. Net income (loss) = 236,250($2) + 78,750($3) – $735,000
   = $472,500 + $236,250 – $735,000
   = $(26,250)

   Let B = number of units of beef enchiladas to break even (B)
   3B = number of units of chicken tacos to break even (C)

   Total contribution margin – fixed expenses = zero net income

   $3B + $2(3B) – $735,000 = 0
   $9B = $735,000
   B = 81,667
   3B = 245,000 = C

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The major lesson of this problem is that changes in sales mix change break-even points and net incomes. The break-even point is 81,667 units of enchiladas plus 245,000 units of tacos, a total of 326,667 units. Thus, the unfavourable change in mix results in a net loss of $26,250 at the old total break-even level of 315,000 units. In short, the break-even level is higher because the sales mix is less profitable when tacos represent a higher proportion of sales. In this example, the budgeted and actual total sales in number of units were identical, but the proportion of product having the higher contribution margin declined.

<u>P2-10</u> (15–25 min.)

1. Let N = number of rooms

$$\$105N - \$25N - \$9{,}200{,}000 = \frac{\$720{,}000}{(1-0.4)}$$

$$\$80N - \$9{,}200{,}000 = \$1{,}200{,}000$$
$$\$80N = \$10{,}400{,}000$$
$$N = 130{,}000 \text{ rooms}$$

$$\$80N - \$9{,}200{,}000 = \frac{\$360{,}000}{(1-0.4)}$$

$$\$80N - \$9{,}200{,}000 = \$600{,}000$$
$$\$80N = \$9{,}800{,}000$$
$$N = 122{,}500 \text{ rooms}$$

2. $$\$105N - \$25N - \$9{,}200{,}000 = 0$$
$$\$80N = \$9{,}200{,}000$$
$$N = 115{,}000 \text{ rooms}$$

Number of rooms at 100% capacity = 600 x 365 = 219,000
Percentage occupancy to break even = 115,000 ÷ 219,000 = 52.5%

3. Using the shortcut approach described in the chapter appendix:

$$\text{Change in net income} = \text{Change in volume in units} \times \text{Contribution margin in units} \times (1 - \text{tax rate})$$

= 15,000 x $80 x (1 – 0.40)
= 15,000 x $48
= $720,000, a large increase because of a high contribution margin per dollar of revenue.

Note that a 10% increase in rooms sold increases net income by $720,000 ÷ $1,680,000 or 43%.

Rooms sold	150,000	165,000
Contribution margin @ $80	$12,000,000	$13,200,000
Fixed expenses	9,200,000	9,200,000
Income before taxes	2,800,000	4,000,000

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Income taxes @ 40%	1,120,000	1,600,000
Net income	$ 1,680,000	$ 2,400,000
Increase in net income	$720,000	
Percentage increase	43%	

P2-11 (15–25 min.)

Current contribution margin = $16 – $10 – $2 = $4.
New variable costs per DVD will be 130% of $10 + $2 = $13 + $2 = $15.

1. a. Break-even point = $\dfrac{\$600{,}000}{\$16 - (\$10 + \$2)}$ = 150,000 DVDs

2. d. Contribution margin: $16 – ($10 + $2) = $4
Increased after-tax income: 10% x 200,000 x $4 x 60% = $48,000; or using formula:

$$\text{Change in net income} = \text{Change in volume in units} \times \text{Contribution margin in units} \times (1 - \text{tax rate})$$

= 20,000 x $4 x (1 – 0.40)
= $48,000

3. a. Let N = target sales in units

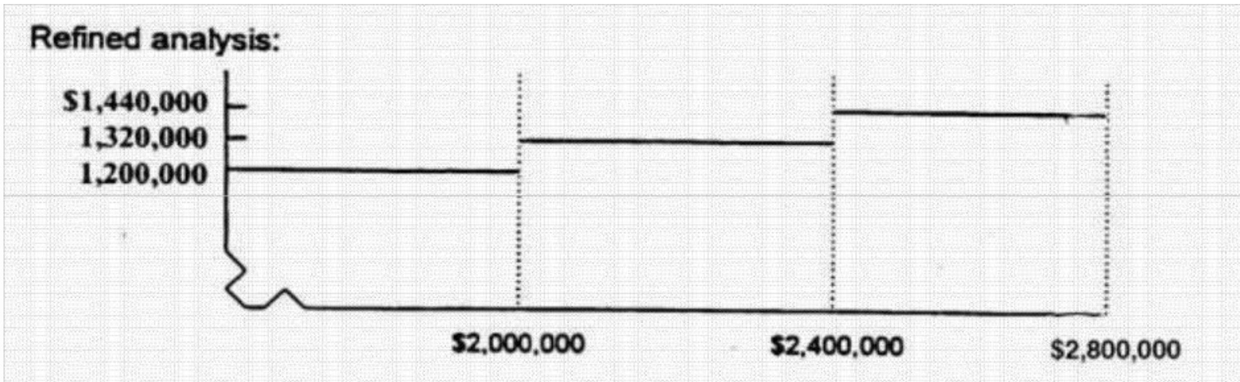
$$\text{Target sales} - \text{variable expenses} - \text{fixed expenses} = \frac{\text{target after-tax net income}}{1 - \text{tax rate}}$$

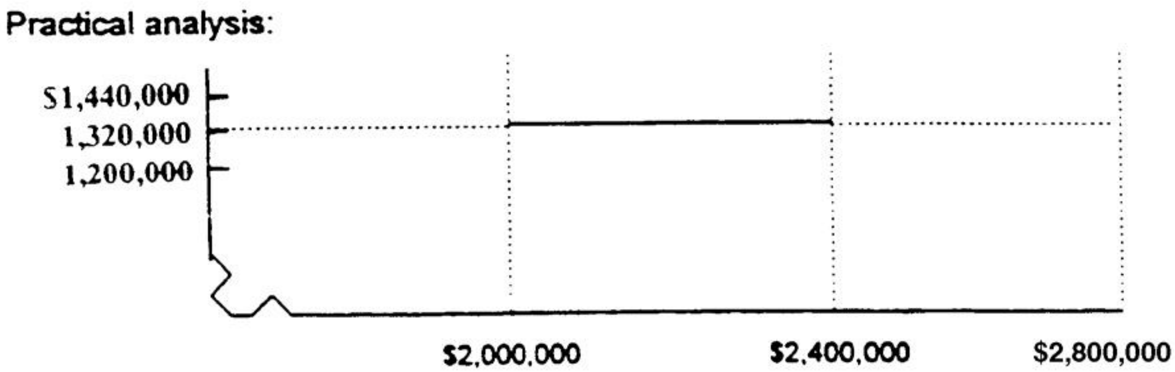
$$\$16N - \$15N - \$600{,}000 = \frac{\$120{,}000}{(1 - 0.4)}$$

$16N – $15N – $600,000 = $200,000
N = 800,000 units
$16N = $12,800,000

4. b. Let P = new selling price
Current contribution ratio is $4 ÷ $16 = 0.25
New contribution ratio is (P – $15) ÷ P = 0.25
0.25P = P – $15
0.75P = $15
P = $15 ÷ 0.75
P = $20

P2-12 (10–15 min.)
The answer is $1,320,000.





P2-13 (40 min.)

1. Let N = the number of people to be admitted for the season

Revenue:

Rights for concession	$50,000
Admissions	$1.00N
Percentage of bets	10% of $27N = $2.70N

Total revenue = $50,000 + $3.70N

Expense:

Fixed costs:

Wages of cashiers and ticket takers	$ 160,000
Commissioner's salary	20,000
Maintenance	20,000
Utilities	30,000
Other expense	90,000
Purses	810,000
Total fixed costs	$1,130,000

Variable costs:

Parking is $6.00 per car or $1.00 per person
(6 persons attended per car, so $6.00 ÷ 6 = $1.00)

Total expense = $1,130,000 + $1.00N

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(a) Break-Even Point:

$50,000 + $3.70N – $1,130,000 – $1.00N = 0
$2.70N = $1,080,000
N = 400,000 people

(b) $1,130,000

(c) Desired Operating Profit $270,000:

$50,000 + $3.70N – $1,130,000 – $1.00N = $270,000
$2.70N = $1,350,000
N = 500,000 people

2.

Previous level of attendance	600,000 people	
20% increase in attendance	720,000 people	
Total bets: 720,000 x $27	$19,440,000	
Revenue:		
Concession		$ 50,000
Admission		None
Percentage of bets (10% x $19,440,000)		1,944,000
Total revenue		$1,994,000
Expense:		
Fixed	$1,130,000	
Variable ($1.00 x 720,000)	720,000	$1,850,000
Operating profit		$ 144,000

3. The purses are doubled:

Previous fixed expense	$1,130,000
Additional purse money	810,000
New fixed expense	$1,940,000

Variable expense $1.00 per person
Revenue $50,000 + $3.70N

$50,000 + $3.70N – $1,940,000 – $1.00N = 0
$2.70N = $1,890,000
N = 700,000 people

P2-14 (30–40 min.)

1.

Fixed costs:	
Depreciation ($13,500 – $6,000) ÷ 3 =	$2,500
Insurance	700
Total fixed costs	$3,200
Variable costs:	
Gas, $0.60 ÷ 6 kilometres	$0.10
Oil, $30.00 ÷ 3,000 kilometres	0.01
Maintenance, $240 ÷ 6,000 kilometres	0.04
Variable cost per kilometre	$0.15

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Let N = Number of kilometres to break even
Revenue – Variable costs – Fixed costs = 0
\$0.23N – \$3,200 – \$0.15N = 0
N = \$3,200 ÷ \$0.08 = 40,000 kilometres

2. An —equitablell rate might be based on the actual number of business-related kilometres expected. The days not on the road are:

	Days
Weekends, 52 x 2	104
Vacation	10
Holidays	6
Home office	15
Not on the road	135
On the road, 365 – 135 =	230
Kilometres, 230 x 120 =	27,600

Let X = Reimbursement per kilometre to break even
27,600X = \$3,200 – 27,600(\$0.15)
27,600X – \$3,200 – \$4,140 = 0
X= \$7,340 ÷ 27,600 = \$0.266

Therefore, a rate of \$0.27 seems more equitable than \$0.23.

P2-15 (20–30 min.)

Variable costs per bag are (\$0.14 + \$0.09 + \$0.22), (\$0.14 + \$0.09 + \$0.14), and (\$0.14 + \$0.09 + \$0.05), or \$0.45, \$0.37, and \$0.28, respectively.

1. Let N = volume level in bags that would earn same profit
\$8,000 + \$0.45N = \$11,200 + \$0.37N
\$0.08N = \$3,200
N= 40,000 boxes

2. As volume increases, the more expensive models would generate more profits. Compare the regular and super models:

Let N = volume level in bags that would earn same profit
\$20,200 + \$0.28N= \$11,200 + \$0.37N
\$0.09N = \$9,000
N = 100,000 boxes

Therefore, the decision rule is as shown below.

Anticipated Annual Sales Between	Use Model
0 – 40,000	Economy
40,000 – 100,000	Regular
100,000 and above	Super

The decision rule places volume well within the capacity of each model.

3. No, management cannot use theatre capacity or average bags sold because the number of seats per theatre does not indicate the number of patrons attending or the popcorn buying habits in different geographic locations. Each theatre may have a different —bags sold per seat‖ average with significant variations. The decision rule does not take into account variations in demand that could affect model choice.

<u>P2-16</u> (25–30 min.)

This case is based on real data that has been simplified so that the numbers are easier to handle.

1. Daily break-even volume is 85 dinners and 170 lunches:

First, compute contribution margins on lunches and dinners:

Variable cost percentage = ($1,246,500 + $222,380) ÷ $2,098,400
= 70%

Contribution margin percentage = 1 – variable cost percentage
= 1 – 70% = 30%

Lunch contribution margin = 0.30 x $20 = $6
Dinner contribution margin = 0.30 x $40 = $12

Annual fixed cost is $170,700 + $451,500 = $622,200

Let X = number of dinners and 2X = number of lunches

12(X) + 6(2X) – $622,200 = 0
24(X) = 622,200
X = 25,925 dinners annually to break even
2X = 51,850 lunches annually to break even

On a daily basis:
Dinners to break even = 25,925 ÷ 305 = 85 dinners daily
Lunches to break even = 85 x 2 = 170 lunches daily or 51,850 ÷ 305 = 170 lunches daily.

To determine the actual volume, let Y be a combination of 1 dinner and 2 lunches. The price of Y is $40 + (2 x $20) = $80. Total volume in units of Y is $2,098,400 ÷ $80 = 26,230. Daily volume is 26,230 ÷ 305 = 86. Therefore, 86 dinners and 2 x 86 = 172 lunches were served on an average day. This is 1 dinner and 2 lunches above the break-even volume.

2. The extra annual contribution margin from the 3 dinners and 6 lunches is:

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3 x $40 x .30 x 305	= $10,980
6 x $20 x .30 x 305	= 10,980
Total	$21,960

The added contribution margin is greater than the $15,000 advertising expenditure. Therefore, the advertising expenditure would be warranted. It would increase operating income by $21,960 – $15,000 = $6,960.

3. Let Y again be a combination of 1 dinner and 2 lunches, priced at $80. Variable costs are 0.70 x $80 = $56, of which $56 x 0.25 = $14 is food cost. Cutting food costs by 20% reduces variable costs by 0.20 x $14 = $2.80, making the variable cost of Y $56 – $2.80 = $53.20 and the contribution margin $80 – $53.20 = $26.80. (This could also be determined by adding the $2.80 saving in food cost directly to the old contribution margin of $24.) The required annual volume in Y needed to keep operating income at $7,320 is:

   $26.80 (Y) – $622,200 = $7,320
   $26.80 (Y) = $629,520
   Y = 23,490
   Therefore, daily volume = 23,490 ÷ 305 = 77 (rounded)

   If volume drops no more than 86 – 77 = 9 dinners and 172 – 154 = 18 lunches, using the less costly food is more profitable. However, there are many subjective factors to be considered. Volume may not fall in the short run, but the decline in quality may eventually affect repeat business and cause a long-run decline. Much may depend on the skill of the chef. If the quality difference is not readily noticeable, so that volume falls less than, say, 10%, saving money on the purchases of food may be desirable.

P2-17 (15–20 min.)

1. Old: (Contribution margin x 600,000) – $585,000 = Budgeted profit
   [($3.10 – $2.10) x 600,000] – $585,000 = $15,000

   New: (Contribution margin x 600,000) – $1,140,000 = Budgeted profit
   [($3.10 – $1.10) x 600,000] – $1,140,000 = $60,000

2. Old: $585,000 ÷ $1.00 = 585,000 units
   New: $1,140,000 ÷ $2.00 = 570,000 units

3. A fall in volume will be more devastating under the new system because the high fixed costs will not be affected by the fall in volume:

   Old: ($1.00 x 500,000) – $585,000 = –$85,000 (an $85,000 loss)
   New: ($2.00 x 500,000) – $1,140,000 = –$140,000 (a $140,000 loss)

   The 100,000 unit fall in volume caused a $15,000 – (–$85,000) = $100,000 decrease in profits under the old environment and a $60,000 – (–$140,000) =

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$200,000 decrease under the new environment.

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4. Increases in volume create larger increases in profit in the new environment:

   Old: ($1.00 x 700,000) – $585,000 = $115,000
   New: ($2.00 x 700,000) – $1,140,000 = $260,000

   The 100,000 unit increase in volume caused a $115,000 – $15,000 = $100,000 increase in profit under the old environment and a $260,000 – $60,000 = $200,000 increase under the new environment.

5. Changes in volume affect profits in the new environment (a high-fixed-cost, low-variable-cost environment) more than they affect profits in the old environment. Therefore, profits in the old environment are more stable and less risky. The higher-risk new environment promises greater rewards when conditions are favourable, but also leads to greater losses when conditions are unfavourable, a more risky situation.

P2-18 (20–30 min.)

1. 2012 revenue = 61,000 million x 0.681 x $0.1310 = $5,442 million
   2011 revenue = 61,000 million x 0.656 x $0.1251 = $5,006 million

2. a) $3,000 million ÷ ($0.1251 – $0.05) = 39,947 million revenue-passenger kilometre
   39,947 ÷ 61,000 = 65.5% load factor

   b) $3,000 million ÷ ($0.1310 – $0.05) = 37,037 million revenue-passenger-kilometre
   37,037 ÷ 61,000 = 60.7% load factor

3. $3,400 million ÷ ($0.13 – $0.05) = 42,500 million revenue-passenger-kilometre
   42,500 ÷ 61,000 = 69.7% load factor

P2-19 (40–60 min.)

Some instructors may prefer to omit some of these requirements. Requirement 4 is especially difficult.

1.

Contribution margin, 11,000 units x ($7 – $5) =	$22,000
Fixed costs	25,000
Net income (loss)	$ (3,000)

Sales in the unrelated market must obtain a total contribution margin large enough to recoup the loss of $3,000 plus $900:

Total contribution margin needed	$3,900
Divide by unit contribution margin in unrelated market	÷ $1
Total units needed to be sold	3,900

2.

Contribution margin, 20,000 units x ($7 – $5) =	$40,000
Fixed costs	27,000
Net income	$13,000

Desired net income	$14,500
Net income on 20,000 units	13,000
Additional net income desired on 3,000 units	$ 1,500

Additional contribution margin desired per unit is
$1,500 ÷ 3,000 = $0.50

Selling price per unit	$7.00
Contribution margin per unit	0.50
Maximum price to be paid to subcontractor	$6.50

3. Let A = increase in advertising

14,500($7) = 14,500($5) + $25,000 + A + .02($7) (14,500)
$101,500 = $72,500 + $25,000 + A + $2,030
A = $101,500 - $99,530 = $1,970

4. Many students will erroneously assume a selling price of $7.

Let X = units and Y = current selling price

1.00XY = $25,000 + $5X + $12,500		(1)
0.95XY = $25,000 + $5X + $ 7,750		(2)
0.05XY =	$ 4,750	(1) minus (2)
XY = $95,000		

Substitute $95,000 = $25,000 + $5X + $12,500
$5X = $57,500
X = 11,500 units
and since XY = $95,000
Y = $95,000 ÷ 11,500 units or $8.26

P2-20 (30 min. or more)

The purpose of this problem is to develop an intuitive feel for the costs involved in a simple production process and to assess whether various costs are fixed or variable. Then students must assess the market to determine a price so that they can compute a break-even point.

Completing this problem can be done quickly or it can take much time. It might even be done in class, with students suggesting the various costs and predicting their levels. A complete analysis might involve finding the actual prices of the resources needed to make the product or service. This could lead to time-consuming research. Whatever approach is taken, students are led to see the real-world application of what they are learning.

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Cases

C2-1 (25–30 min.)

1. $\text{Break even in boxes} = \dfrac{\text{Annual fixed costs}}{\text{Contribution margin per box}}$

$$= \frac{\$550{,}000}{\$5.00 - \$3.00} = 275{,}000 \text{ boxes}$$

2. Contribution margin ratio = $2.00 ÷ $5.00 = 40%
Old variable cost = $3.00
Only the cost of candy is affected:
New variable cost = $3.00 + 0.15 ($2.50) = $3.375

Let S = Selling price
Selling price – Variable costs = Contribution margin
S – $3.375 = 0.40S
0.60S = $3.375
S = $5.625

Check: ($5.625 – $3.375) ÷ $5.625 = 40%

3. Current income before taxes:
= 390,000 boxes ($5.00 – $3.00) – $550,000
= $780,000 – $550,000 = $230,000

Current income after taxes:
= $230,000(0.60) = $138,000

The problem can be solved by using units and then converting to dollar sales.

Let N = sales in units

$$\text{Sales} - \text{Variable expenses} - \text{Fixed expenses} = \frac{\text{Net income}}{1 - \text{tax rate}}$$

$$\$5.00N - [\$3.00 + 0.15(\$2.50)]N - \$550{,}000 = \frac{\$138{,}000}{1 - 0.4}$$

$5.00N – $3.375N – $550,000 = $230,000
$1.625N = $780,000
N = 480,000 boxes
$5.00N = $2,400,000 sales

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An alternative way to get the solution is:

$$\text{New contribution margin ratio} = \frac{\$5.00 - \$3.375}{\$5.00} = 0.325$$

New variable cost ratio = 1.000 - 0.325 = 0.675

Let S = Sales
S = 0.675S + $550,000 + $138,000 × (1 – 0.4)

0.325S = $780,000
S = $2,400,000

4. Strategies might include:
   (a) Increase selling price by the $0.375 cost increase
   (b) Decrease other variable costs by $0.375 per box
   (c) Decrease fixed costs by $0.375 x 390,000 = $146,250
   (d) Increase unit sales by 480,000 – 390,000 = 90,000 boxes
   (e) Some combination of the above.

C2-2 (25–35 min.)

1. $$\frac{(\$12,000,000)}{\$800} = 15,000 \text{ patient-days}$$

2. $$\text{Variable costs} = \frac{(\$3,150,000)}{(15,000)} = \$210 \text{ per patient-day}$$

Contribution margin = $800 – $210 = $590 per patient-day

To recoup the specified fixed expenses:
$5,900,000 ÷ $590 = 10,000 patient-days

3. The fixed-cost levels differ as the relevant range changes:

Patient-Days	Non-Nursing Fixed Expenses	Nursing Fixed Expenses	Total Fixed Expenses
10,000–12,000	$5,900,000	$1,350,000(a)	$7,250,000
12,001–16,000	5,900,000	1,575,000(b)	7,475,000

(a) $45,000 x 30 = $1,350,000
(b) $45,000 x 35 = $1,575,000

To break even on a lower level of fixed costs:
$7,250,000 ÷ $590 = 12,288 patient-days

This answer exceeds the lower-level maximum; therefore, this answer is infeasible. The department must operate at the $7,475,000 level of fixed costs to break even: $7,475,000 ÷ $590 = 12,669 patient-days.

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4. The nursing costs would have been variable instead of fixed. The contribution margin per patient-day would have been $800 – $210 – $200 = $390. The break-even point would be higher: $5,900,000 ÷ 390 = 15,128 patient-days.

Some instructors might want to point out that hospitals have been under severe pressures to reduce costs. More than ever, nursing costs are controlled as variable rather than fixed costs. For example, more part-time help is used, and nurses may be used for full shifts but only as volume requires.

C2-3 (40–50 min.)

1.

Price	$550
Less variable costs:	
Catering	60
Supplies	36
Feedback	24
Royalty	100
Total variable costs	220
CM per person	$330

Fixed costs	
Instructor	$3,000
Advertising	1,500
Administration	250
Total fixed costs	$4,750

There are two break-even points (BEP), one for the small room and one for the large room.

Small-room BEP = ($4,750 + $800) / $330
Small-room BEP = $5,550 / $330
= 16.82 or 17 people

Large-room BEP = ($4,750 + $1,500) / $330
Large-room BEP = $6,250 / $330
= 18.94 or 19 people

2.
Let p = price
18(p) – 18($220) – $5,550 = $3,000
18(p) – $3,960 – $5,550 = $3,000
18(p) = $12,510
p = $695

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3.

Central Hotel CM per person:

Price	$650
Less variable costs:	
Catering	50
Supplies	36
Feedback	24
Royalty	100
Total variable costs	210
CM per person	$440

Fixed costs	$4,750
Plus room	3,000
Total fixed costs	$7,750

Let x = attendance

profit at Central Hotel = profit at Hotel Suburb in large room

$440(x) – $7,750 = $330(x) – $6,250

$110(x) = $1,500

x = 13.64 or 14 people

Note that at 13.64, both would be making losses of $1,750. If rounded up to 14 people losses are almost the same, $1,590 for Central Hotel and $1,630 for Hotel Suburb.

4.

This is an open-ended and challenging question that requires students to consider many factors. Risk in particular is difficult to assess, given the financial information in this case. Typical —boilerplate‖ answers are insufficient.

First, calculate the break-even point using Central Hotel:

$7,750 / $440 = 17.61, or 18 people

The following table summarizes the data and calculations.

	Hotel Suburb (small rm)	Hotel Suburb (large rm)	Central Hotel
Capacity	20	50	40
CM per student	$330	$330	$440
Break-even point	17	19	18
Total fixed costs	$5,550	$6,250	$7,750
Maximum profit potential	$1,050*	$10,250**	$9,850***

*20($330 – $5,550 = $1,050

**50($330) – $6,250 = $10,250

***40($440) – $7,750 = $9,850

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Hotel Suburb's small room has the lowest operating leverage and lowest fixed costs and break-even point, so it poses the least risk. Although the Central Hotel break-even point (18) is slightly lower than Hotel Suburb's large room (19), it has more risk in that it has significantly higher operating leverage and fixed costs. A consideration is that Hotel Suburb's large room and Central have the same loss at 14 students (see part 3), and at greater enrolments. Central will produce more profit. If the experience in Edmonton is a guide, there should be more than 14 students. In summary, in the likely range of operations, Central does not pose greater risk than Hotel Suburb's small room. Hotel Suburb's small room clearly has the lowest profit potential based on room capacity. With such small profit potential it can be ruled out; the most that could be saved compared to the large room in terms of break-even numbers is two students, a total contribution of $660.

The choice is therefore between Hotel Suburb's large room and Central Hotel. Risk has already been discussed above. Hotel Suburb's large room can produce more profit only if it has 49 or 50 students. (Profit at Hotel Suburb's large room with 49 = 49[$330] – $6,250 = $9,920.) Finally, consider market expectations given the experience in Edmonton. If that is a guide, it is doubtful that QCS will be able to fill the large room in Hotel Suburb. In the expected range of enrolment, Central dominates Suburb in terms of risk and profit potential.