CHAPTER 6

Solutions to Chapter-End Problems

A. Key Concepts

6.1 (b)

6.2 The unscrambled Income Statements and Balance Sheets are:

Income Statement for Paradise Pond Co.: Month ending Dec. 31, 2016 (in $000s)		
	2015	**2016**
Revenues		
Sales	3 000	3 625
Cost of goods sold	1 750	2 125
Gross profit	1 250	1 500
Expenses		
Operating expenses	75	100
Depreciation expense	550	500
Interest expense	125	150
Total expenses	750	750
Net income before taxes	500	750
Income taxes	200	300
Net income after taxes	**300**	**450**

Comparative Balance Sheets for Paradise Pond Co.: Ending 2015 and 2016 (in $000s)		
	2015	**2016**
Assets		
Current assets		
Cash	300	225
Accounts receivable	675	638
Inventories	825	938
Total current assets	1 800	1 800
Long-term assets		
Plant and equipment	3 300	3 900
Less accumulated depreciation	1 500	1 800
Net plant and equipment	1 800	2 100
Total long-term assets	1 800	2 100
Total assets	**3 600**	**3 900**
Liabilities		
Current liabilities		
Accounts payable	300	225
Working capital loan	0	225
Total current liabilities	300	450
Long-term liabilities		
Bonds	900	900
Total long-term liabilities	900	900
Total liabilities	**1 200**	**1 350**
Owners' Equity		
Common shares	450	450
Contributed capital	900	900
Retained earnings	1 050	1 200
Total owners' equity	**2 400**	**2 550**
Total liabilities and owners' equity	**3 600**	**3 900**

6.3 The answer to this question will vary depending on the imagination and creativity of the student. However, a model answer is as follows:

Paradise Pond company should use direct advertisement strategies to attract investors to invest in the company. If the company is public, introducing its products to consumers through different media channels such as magazines for particular interest groups, TV, radio and internet will enhance consumers' recognition of the products and therefor more people will buy company's share and it could bring new streams of cash flow to the company. On the other hand, if the company is private, presenting the company's products directly to investors in exhibitions could attract investors. Also, presenting positive future outlook of the company after new developments could build better trust between the investors and the company.

The sales and marketing section of the business plan is as follows (It is assumed that the company is private and produces furniture):

Sales and Marketing:

The unique aspect of Paradise Pond business is recognizing customers' need and fulfilling them with high quality, durable and elegant furniture products. Our

strategy is to initially focus on the market for residential furniture and eventually move towards office furniture.
Our company distinguishes itself from other competitors by manufacturing its products from original Canadian wood and customizing products based on individual's taste and budget.
Our main marketing strategy is building a close relationship with our clients to ensure their needs are met. We believe that listening to customers and customizing products according to their need is the main key to repeat business and referrals. In order to maintain this personal relationship with clients we strongly rely on sales calls to build accounts.
To support our relationship with clients, maintain our brand in the industry and enhance our employees' product knowledge we attend as many area conventions and trade shows as possible.
Furthermore, we have built other media channels to provide customers with our promotions and new products. Interested customers who provide their email address automatically receive our weekly news release email, featuring new products, designs and promotions. Also, we publish our ads in local newspapers in different cities in Ontario on a monthly basis. On these ads we provide fun tips about design and home decoration, beside our products and services.

6.4

Balance Sheet for Paarl Manufacturing: As of xxx 3x, 20xx		
Assets		
Current assets		
Cash		45 954
Accounts receivable		22 943
Raw materials		102 000
Work in progress		40 000
Finished goods		123 000
Long-term assets		
Property		250 000
Equipment	450 000	
Less accumulated depreciation	240 000	210 000
Total assets		**793 897**
Liabilities		
Current liabilities		
Current bank account		30 000
Accounts payable		12 992
Accrued taxes		32 909
Long-term liabilities		
Mortgage loan		224 000
Government loan		258 996
Total liabilities		**558 897**
Owners' Equity		
Capital stock		100 000
Retained earnings		135 000
Total owners' equity		**235 000**

Total liabilities and owners' equity	**793 897**

Income Statement for Paarl Manufacturing: Month ending xxx 3x, 20xx	
Income	
Gross income from sales	220 000
Less cost of goods sold	40 000
Net income from sales	180 000
Expenses	
Salaries	45 000
Depreciation	34 000
Maintenance	1 500
Advertising	3 400
Insurance	300
Total expenses	84 200
Income before taxes	95 800
Taxes @ 55%	52 690
Net income	**43 110**

Equity ratio is 235 000/793 897 = 0.296. The company has too much debt, and thus is too dependent on its creditors. Consequently it should not issue dividends but rather use earnings to reduce debt.

6.5 The answer to this question will vary depending on the imagination and creativity of the student. However, a model answer is as follows:

Market analysis summary

Paarl Manufacturing specializes highly in providing vinyl, aluminium window and entry door products and services to home and condo builders in Eastern Canada. Despite the economic downturns in Canada, housing has been improving significantly in recent years and therefore the need for good quality windows and door products has been on a bright spot.

Target Market

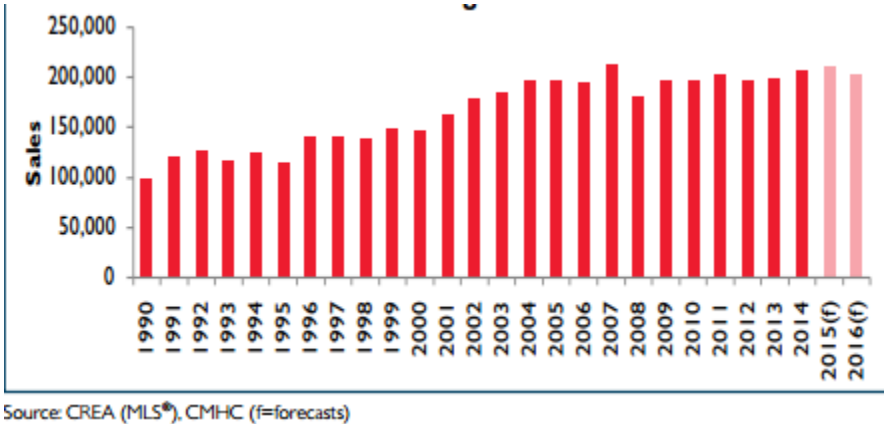
Paarl Manufacturing maintains a consistant high demand by satisfying the house owners' and builders' needs, considering the newest trends and styles in housing market. Paarl Manufacturing customers are categorized as follow:

Contractors: Approximately 5000 contractors buy window and door products from Paarl Manufacturing every year to invest in house renovation projects. Considering the number of house renovations in Eastern Canada, approximately 45% of the demand is supplied by Paarl manufacturing.

In order to attract contractors, Paarl Manufacturing relies heavily on referral and repeat-business with current clients. A discount from 10% to 15% is provided for each referral.

House builders: With the rising number of new houses and condos in Toronto and surrounding cities in Eastern Canada, the need for window frames and door products has increased dramatically. Approximately 55% of the company's gross income comes from selling products to individual house builders or condominium developers such as Tridal.
To maintain business with renowned builders, Paarl Manufacturing endeavours in customizing its products according to the builders' needs and requirements. For that, a special design department is set up to bridge the gap between engineering and manufacturing departments.

Future outlook
Considering low interest rates, growing economy and government support for new home owners, Paarl manufacturing predicts a steady demand trend in new housing market. The following chart shows new housing demand forecast:



Source: CREA (MLS®), CMHC (f=forecasts)

Considering steady construction and ongoing renovation projects for older houses, Paarl manufacturing predicts a 2% increase of sale.

6.6 (a)

Salvador Industries: Income Statement for the Year ended June 30, 2015		
Income		
Gross Income from sales		8 635 000
Less cost of goods sold	7 490 000	145 000
Total income		1 145 000
Expenses		
Depreciation		70 000
Interest paid		240 000
Other expenses		100 000
Total expenses		410 000
Income before taxes		735 000
Taxes at 40%		294 000
Income before extraordinary items		441 000

Extraordinary loss	100 000
Net income	**341 000**

Salvador Industries: Balance Sheet as of June 30, 2015		
Assets		
Current assets		
Cash		350 000
Accounts receivable		2 820 000
Inventories		2 003 000
Prepaid services		160 000
Total current assets		5 333 000
Long-term assets		
Building	200 000	
Less accumulated depreciation	100 000	100 000
Equipment	480 000	
less accumulated depreciation	474 466	5 534
Land		540 000
Total long-term assets		645 534
Total assets		**5 978 534**
Liabilities		
Current liabilities		
Accounts payable		921 534
Loan due Dec. 31, 1998		50 000
Accrued taxes		29 000
Total current liabilities		1 000 534
Long-term liabilities		
Mortgage		1 200 000
Long-term loan		318 000
Total long-term liabilities		1 518 000
Total liabilities		**2 518 534**
Owner's Equity		
Capital stock		1 920 000
Retained earnings		1 540 000
Total owners' equity		**3 460 000**
Total liabilities and owners' equity		**5 978 534**

(b) Current ratio = 5 333 000/1 000 534 = 5.33
Acid test ratio = (5 333 000 – 2 003 000 – 160 000)/1 000 534 = 3.17
Equity ratio = 3 460 000/5 978 534 = 0.58
Return on total assets = 341 000/5 978 534 = 5.7%

The current and acid test rations show considerable security in meeting obligations. The equity ratio is slightly low, indicating reliance on debt financing, and profits are meagre. However, the extraordinary loss of $100 000 is relatively small compared to the overall activities of the company.

6.7 A Financial Ratio Analysis for Fraser Phraser gives the following:

Phraser's financial ratios	**2014**	**2015**
Current ratio	1.84	0.90
Acid test	0.78	0.24
Equity ratio	0.50	0.39
Inventory turns	4.31	3.52
ROA	2%	2%
ROE	4%	5%

Phraser's ability to deal with unexpected changes in cash flows has been seriously compromised over the 2014–2015 period. Phraser is increasingly relying on debt financing, has lower turnover of inventory and has a lower return on total assets. The financial position does not look promising and Phraser does not look like a solid loan applicant.

B. Applications

6.8

Balance Sheet for Movit Manufacturing: As of Dec. 31, 2016 (in $000s)	
Assets	
Current assets	
Cash	2 100
GICs	450
Accounts receivable	15 000
Inventories	18 000
Prepaid expenses	450
Total current assets	36 000
Long-term assets	
Land	3 000
Plant and equipment	18 450
Less accumulated depreciation	10 950
Net plant and equipment	7 500
Total long-term assets	10 500
Total assets	**46 500**
Liabilities	
Current liabilities	
Accounts payable	7 500
Accrued wages	2 850
Working capital loan	4 650
Total current liabilities	15 000
Long-term liabilities	
Deferred income taxes	2 250
Mortgage	9 450
Long-term bonds	4 350
Total long-term liabilities	16 050
Owners' Equity	
Common shares	150
Contributed capital	3 000
Retained earnings	12 300
Total owners' equity	**15 450**

Total liabilities and owners' equity	**46 500**

Income Statement for Movit Manufacturing: Month ending Dec. 31, 2016 (in $000s)	
Net sales	76 500
Cost of goods sold	57 000
Gross profit	19 500
Operating expenses	
Selling expenses	4 650
Depreciation expense	750
General expense	8 100
Interest expense	1 500
Total expenses	15 000
Net income before taxes	4 500
Income taxes	1 800
Net income after taxes	**2 700**

6.9 The financial ratios for Movit Manufacturing for 2016, 20154 and 2014 are:

Movit's financial ratios	**2016**	**2015**	**2014**
Current ratio	2.40	1.90	1.60
Acid test	1.17	0.90	0.75
Equity ratio	0.33	0.40	0.55
Inventory turns	4.25	7.00	12.00
ROA	6%	8%	10%
ROE	17%	20%	18%

While Movit appears to be solvent, with an increasing current ratio and acid test values, their equity ratio has been dropping, as have their inventory turns and return on total assets. This could be due to a drop in sales effectiveness over the period (drop in turns) and an increase in debt financing (drop in equity ratio and return on total assets). Despite the solvency, there is some concern about the degree to which Movit relies on debt and the apparent drop in return on total assets and inventory turns. One reason for these changes could be increased borrowing coupled with lower sales volumes. Comparative income statements and balance sheets for the period would be useful in getting to the bottom of what is going on with Movit.

6.10 The answer to this question will vary depending on the imagination and creativity of the student.

C. More Challenging Problems

6.11 **(a)** The direct effect of each strategy is as follows:

Strategy (i) reduces the current assets.
Strategy (ii) reduces the current liabilities.
Strategy (iii) increases the total equity.

Current Ratio = (Current Assets)/(Current Liabilities)
Strategy (ii) will increase, hence improve, this ratio.

Quick Ratio
= (Quick Assets)/(Current Liabilities)
= (Current Assets − Inventories)/(Current Liabilities)
Strategy (i) or (ii) will increase, hence improve, this ratio.

Equity Ratio
= (Total Equity)/(Total Assets)
= (Total Equity)/(Current Assets + Long-Term Assets)
= (Total Equity)/(Total Liabilities + Total Equity)
Strategy (i), (ii), or (iii) will increase, hence improve, this ratio.

(b) Assuming no other information is available, strategy (ii) may be seen as most effective since it can improve all three ratios.

6.12 XYZ should compute the acid-test ratio for more assurance about their financial liquidity.

Let C represent the amount of current assets. Then the amount of long-term assets is 2C and the amount of quick assets is 0.5C.

Equity Ratio = (Total Equity)/(Total Assets) $\Leftrightarrow$ 0.45 = 68 000/(C + 2C)
Solving for C, we get C = 50 370.37.

Current Ratio = (Current Assets)/(Current Liabilities)

Solving for the current liabilities, we get:
Current Liabilities = Current Assets/Current Ratio
= 50 370.37/1.8
= 27 983.54

Acid-Test Ratio
= (Quick Assets)/(Current Liabilities)
= 0.5(50 370.37)/27 983.54
= 0.8989 $\cong$ 0.9

Since an acid-test ratio of 1 is considered adequate, the ratio of 0.9 indicates that XYZ's quick assets are not enough to pay current liabilities. XYZ should have some concern about liquidity.

6.13 The financial ratios for Milano Metals for the last three years:

	2014	2015	2016
Current ratio	1.09	1.03	1.32
Acid test ratio	0.20	0.23	0.40
Equity ratio	0.239	0.113	0.210
Inventory turnover	2.63	3.16	3.11
ROA	1.2%	–4.7%	–2.4%
ROE	4.9%	–41.2%	–11.2%

The fortunes of Milano Metals are quite precarious. Their current ratio is terribly low—only if everything goes right will they have enough money to pay their creditors over the next year. Moreover, as indicated by the acid test ratio, the vast (and increasing) majority of their current assets is inventory, which may or may not be sold. (The fact that inventories are an increasing component of the current assets is suspicious in itself.)

The equity ratio reveals that survival of the company seems to be due to an extreme reliance on debt financing. This again adds to the company's precarious position since they could be put into receivership virtually at the whim of their debtors. About the only favourable aspect of the analysis is that the company made a profit last year, and one well in excess of industry average, after losses for the previous two years.

6.14

Current assets (cash)	increased by $100 000 to $119 000
Fixed assets (bldgs & equip)	decreased by $100 000 to $2 286 000
Depreciation	decreased
Income taxes	increased
Net income, operations	decreased
Net income	decreased

6.15

Current assets (cash)	increased by $50 000 to $69 000
Current assets (accounts rec)	increased by $50 000 to $829 000
Current assets (inventories)	decreased by $100 000 to $3 463 000
Total revenue	increased by $100 000 to $9 455 000
Net revenue	increased by $100 000 to $1 174 000
Income taxes	increased
Net income, operations	increased
Net income	increased

6.16 The financial ratios for Petit Ourson SA are as below:

Petit Ourson's financial ratios	**2015**	**2016**	**Industry norm**
Current ratio	6.00	4.00	4.50
Acid test	3.25	1.92	2.75

Equity ratio	0.67	0.65	0.60
Inventory turns	2.18	2.32	2.20
ROA	5%	7%	9%
ROE	7.5%	11%	15%

Petit Ourson appears to be financially healthy in that its financial ratios are similar to that of the Industry Norm for ratios except return on total assets. The current and acid test ratio indicate that it should be able to handle some unexpected variation in working capital, although the 2015 figures for the current ratio and acid test are both down, and are below the industry norm. Petit Ourson relies a bit less heavily on debt financing than do its counterparts in industry (i.e. its equity ratio is somewhat higher than the industry average), but its return on total assets is several percentage points below industry norms. Though its financial position does not look precarious, Petit Ourson does not appear to be generating as large profits as the industry norms. Your advice would probably be to look for a company that is financially secure as well as having a higher return on assets. That way you are more likely to earn through either dividends or increased equity (value per share).

6.17 The answer to this question will vary depending on the imagination and creativity of the student.

6.18 The answer to this question will vary depending on the imagination and creativity of the student.

Notes for Case-in-Point 6.1

1) That they can make money from their investment
2) It might be considered at the confluence of technology, fashion and home appliance industries.

Notes for Case-in-Point 6.2

1) Strategies could include Dirk and Rahul not taking salaries, or taking low salaries, and working out of his parent's bedroom until it became necessary to rent manufacturing and office space. Investors will be interested in anything that reduces cost without interfering with the effective operation of the business
2) It is hard to know for sure without test marketing, but a typical customer would probably be young, affluent, and female
3) There are a wide variety of choices, but paid advertising is probably not a good choice.

Notes for Case-in-Point 6.3

1) A quick Google search can determine this. In 2015, according to one source, there were 11.5 million female college students in the US, so a reasonable estimate for North America would be about 12.5 million. Since Dirk will first be offering his product on-line, he will be selling to a global market from the beginning.

2) The company could, for example, have a person designated to follow the technology to ensure that the company is aware of any developments critical to its business. And of course there will be the possibility of customizing the product as different users give feedback on its use.

3) A variety of possibilities. One idea would be to use segmented pricing – a lower-featured version at a lower price and a full-featured version at a higher price.

4) A MARR significantly higher than his loan rate would be necessary. Also, he has very limited access to new funds. A MARR of 20-30% would not be too low.

Notes for Case-in-Point 6.5

1) Many creative answers possible

2) Many creative answers possible

3) One way to get consumer feedback is to include a warranty card that provides contact details for the consumer. Then, later, the consumer could be contacted to see if they are satisfied, and if not, why not.

Notes for Mini-Case 6.1

1) The financial ratios that can be calculated from the Balance Sheet are:

Year	2012	2013	2014	2015
Current Ratio	2.1	2.2	2.1	3.1
Acid test ratio	1.4	1.4	1.5	2.3
Equity ratio	0.74	0.72	0.48	0.52

There are no areas of concern with these ratios

2) The following is a reasonable estimate of the balance sheet entries for 2016, based on the entries from 2012 to 2015:

ASSETS	
Cash and Equivalents	1000
Short-Term Investments	1000
TOTAL CASH AND SHORT TERM INVESTMENTS	2000
Accounts Receivable, Trade	200
Total Receivables	500
Inventory	100
Other Current Assets	300
TOTAL CURRENT ASSETS	3100
Gross Property Plant and Equipment	1700
Accumulated Depreciation	-1000
Goodwill	0
Intangibles	1000
Long-Term Investments	300
Other Long Term Assets	0
TOTAL ASSETS	5100
LIABILITIES & EQUITY	
Accounts Payable	200
Accrued Expenses	500
Other Current Liabilities, Total	500
TOTAL CURRENT LIABILITIES	1200
Long-Term Debt	2000
TOTAL DEBT	2000
Deferred Income Tax	50
TOTAL LIABILITIES	3250
Common Stock	2400
Retained Earnings	(550)
Treasury Stock	0

Other Equity	0.00
TOTAL EQUITY	1850
TOTAL LIABILITIES AND EQUITY	5100

Appendix 6A Solutions

6A.1

F = Fixed; V = Variable.

- Rental of restaurant space (F)
- Purchase cost of tables, chairs and decorative items (F)
- Food items (V)
- Insurance (F)
- Lights and heating (V)
- Taxes (F)
- Part-time staff salaries (V)
- cleaning supplies (V)

6A.2

(a)	Hours/unit	
Plant A:	150	Historical Baseline
	-5	Adjustment for improved efficiency
	-4	Part now purchased.
	141	Projected hours per unit
Plant B:	100	Historical Baseline
	-15	less 5 parts at 3 hours per part each
	85	Projected hours per unit
Plant C:	100	Historical Baseline
	15	Parts moved to Plant C from B
	115	Projected hours per unit

(b) Manufacturing Labour Costs:

Plant A	898 875
Plant B	505 750
Plant C	684 250
Total:	2 088 875

(c) Purchased Parts:

Purchased Parts (including 5% allowance)	7 574 826.00
New Purchased Parts (including 5% allowance)	17 850.00
Total:	7 592 676.00

(d) Tooling and Equipment:	
Tooling	10 821.18
Test Equipment	18 035.30
Total:	28 856.48

(e) Support Labour Costs:	
Manufacturing Support:	1 120 500.00
Engineering Support:	531 200.00
Total Support Costs:	1 651 700.00

(f) Total Costs:	
Manufacturing Labour	2 088 875.00
Purchased Parts:	7 592 676.00
Tooling and Equipment:	28 856.48
Support Labour:	1 651 700.00
Total Cost Estimate:	11 362 107.48

6A.3 (a)

PREC	4
FLEX	1
RESL	5
TEAM	3
PMAT	3
Sum	16
B =	1.17
Cost =	8 743 012

(b) The number of person-months required (effort) is 2.94 $(130)^{1.17}$=874.3012

The cost estimate for this project at a cost of $10 000 per month is thus $8 743 012.

(c) From the table above, a project that would have close to a linear relationship between effort and size will be one where the organization has considerable experience with this type of application, where the client has not prescribed the development process, when a thorough risk analysis has been undertaken, where the development team has a track record of

working well together, and where there are clearcut and well-understood processes for software development.

(d) Diseconomies of effort in project size will occur when there are no precedents for this type of project in the organization, where the client has prescribed the development process, the project has not had a risk analysis carried out, the team has not worked together before (or has interpersonal friction), and where there is little in place in terms of process controls.

6A.4 The cost of the renovation will depend on the kind of roofing material he wants to use, as well as the the quality of the siding. If he is changing the roof and siding, this will mean that he will also need to replace the fascia, soffit, trim, gutters and downpipes.

Typical cost estimates for roofing, siding, and fascia etc. are in either square feet or per linear foot depending on the item being estimated. In order to construct an estimate, then, you will need to estimate the surface area of the roof, the perimeter of the roof, the surface area of the house exterior and the perimeter of the windows.

Some research on the internet can provide some guidance on the costs. Since there will be regional variations in prices, it would be good to know what the costs are locally. Below are some items to consider. Based on these rough estimates, you could estimate the cost to be between $55 000 and approximately $87 000, depending on the costs of the materials.

Basic Dimensions of house (ft)	L	42	ft			
	W	32	ft			
Height of roof truss	H	17	ft			
Peak runs length of house	Hypotenuse of Roof	23.35	ft			
	Area of Roof	980.50	ft 2			
Height of each floor 9 ft, x30 x40 ft	Exterior Surface	10 800	ft 2			
(two storeys)	Perimeter of Windows	120	lin ft			
Cost Item	**Min Unit Cost**	**Max Unit Cost**	**Units**	**N**	**Min Cost**	**Max Cost**
Removal of existing material, disposal & clean-up.	0.5	2	sq ft	980	490	1 961
Garbage Bin	$475	$475		1	475	475
Asphalt Shingles (fibreglass base)	2	3	sq ft	1 961	3 922	5 883
Aluminium Counter Flashing	3	4	lin ft	1 200	3 600	4 800
Drip Edge	1	2	lin ft	1 200	1 200	2 400
Aluminium Gutters & downpipes	1.5	3	lin ft	1 200	1 800	3 600
Aluminum fascia	1.8	3	lin ft	1 200	2 160	3 600
Aluminums offits	1.7	3	lin ft	1 200	2 040	3 600
Vents	85	150	per	2	170	300
Aluminums iding - R2000	3.6	5.5	sq ft.	10 800	38 880	59 400
Aluminum cladding of windows	1.8	3	lin ft	200	360	600
Total Estimated Cost:					55 097	86 619

Solutions to All Additional Problems

6S.1

If Sam waits till the depreciated value of the truck is below $500, he will have to wait *N* years, where

$10\,000(1 - 0.2)^N = 500$

Taking logarithms of both sides, we get

$N \log (0.8) = \log (0.05)$

implying that $N = 13.4$. So Sam would go back to Eddy's at the end of the fourteenth year.

If Sam puts money into a sinking fund at the bank, the value of the sinking fund at the end of the fourteenth year will be $9500, since the new truck will cost $10 000 and Sam will be paying cash, so he will get a $500 discount. The present value of this fund is

$PW = 9500(P/F, 0.08, 14) = \$3234$

(Note that we don't need to calculate the value of Sam's annual payments into the sinking fund, since we know their future value must be equivalent to the cost of the new truck.)

If Sam instead pays the annual depreciation amounts to Eddy, he will pay $10 000(0.2) in the first year, $10 000(0.8)(0.2) in the second year, and so on. We recognize this as a geometric gradient series with base value $2000 and growth rate $g = -0.2$. The present value of this series is

$PW = 2000(P/A,i^0,14)/(1 - 0.2)$ where $i^0 = (1 + 0.08)/(1 - 0.2) - 1 = 0.35$

$= 2000(2.814) / 0.8 = \$7036$

So accepting Eddy's first offer will cost Sam $3802.

If Sam trades in his truck after three years, Eddy will give him $10 000$(0.8)^3$ = $5120 credit. Assuming that he doesn't get the $500 discount in this case, Sam will owe an additional $4880. If he has put money into a sinking fund to accumulate $4880 at the end of three years, the present value of his payments into the sinking fund will be

$PW = 4880(P/F, 0.08, 3) = \$3874$

If Sam pays Eddy instead, the present worth of his payments to Eddy is

PW = 2000(*P/A*,0.35,3)/(1 – 0.2) = 2000(1.696) / 0.8 = $4240

So accepting Eddy's second offer will cost Sam $366.

6S.2

We first note that working nine months in a year at £2000 a month is equivalent to working all year at
£1500 a month.

There is a simple approximate solution to the problem, which is to assume that Nigel pays off the bank loan and deposits money in the sinking fund throughout the five-year life of the machine. This solution is given by:

Loan payoff = 15 000(*A/P*, 0.01, 60) = 15 000(0.02224) = 333.60

Sinking fund payments = 25 000(*A/F*, 0.005, 60) = 25 000(0.01433) = 358.25

So Nigel would pay a total of £691.85 to the bank every month, leaving himself, on average, £808.15 to live on.

However, this is not the optimum solution from Nigel's point of view; since he pays a higher interest rate on the loan than he gets for his sinking fund, he should pay the loan off first, and only then start paying into the sinking fund. So to find this optimum solution, he needs to solve the equations:

Loan payoff = 15 000(*A/P*, 0.01, *N*)

Sinking fund payments = 25 000(*A/F*, 0.005, 60−*N*)

And, if he is not to undergo an unsettling change in lifestyle during the five years, these two equations should have the same solution, that is,

15 000(*A/P*, 0.01, *N*) = 25 000(*A/F*, 0.005, 60−*N*)

or

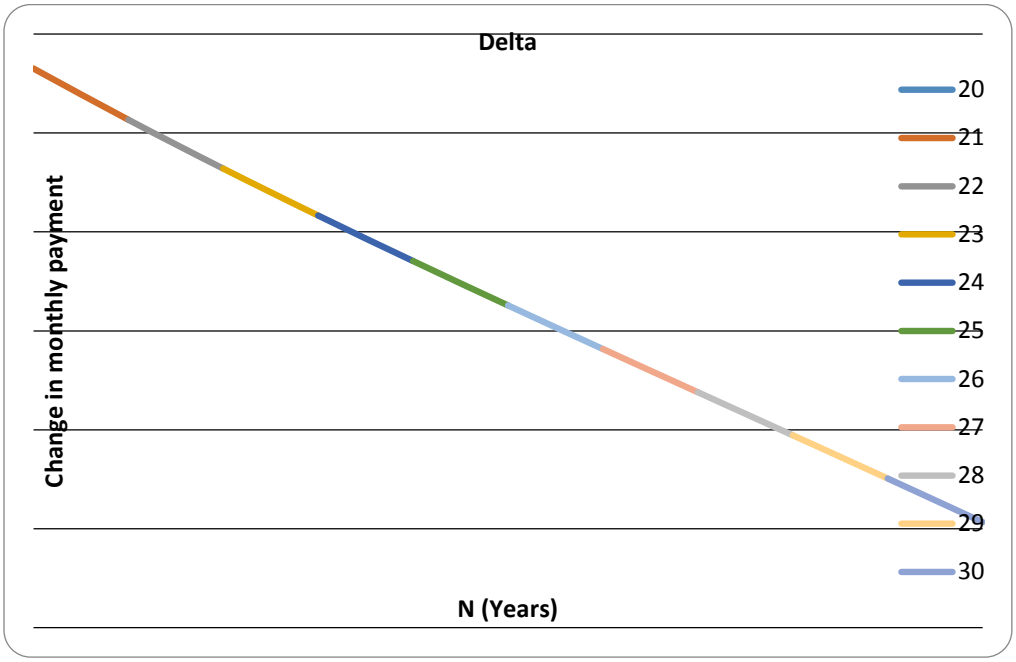
3(*A/P*, 0.01, *N*) − 5(*A/F*, 0.005, 60−*N*) = 0

Trying out various values for *N* in the associated spreadsheet, **6S_2.xls**, we see that the closest integral *N* to the solution is *N* = 26, for which Nigel's monthly payments will be

15 000(*A/P*, 0.01, 26) = 15 000(0.04387) = £658.05 for the first 26 months, and

25 000(*A/F*, 0.005, 34) = 25 000(0.02706) = £676.50 for the last 34 months

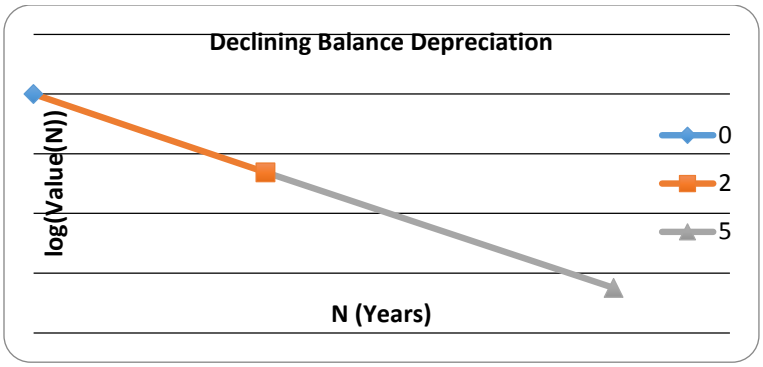
The chart shown below, constructed from the spreadsheet, shows the change in Nigel's monthly payments after he has finished paying off the loan.



6S.3

The simplest model for the decline in value of the mill is straight-line depreciation. But if this model were correct, and the mill had lost ₹42 800 in value over the first two years of its life, then after five years it would have lost ₹42 800 × 5/2 = ₹107 000 in value, leaving it worth ₹43 000. The current round of bids shows that it is worth significantly more than that, so the straight-line model cannot be correct.

We next try to fit a declining balance model. If the mill loses a fraction 1−*x* of its value every year, then its value after *N* years will be ₹150 000 x^N. So a plot of *log(Value(Year N))* against *N* should be a straight line with slope *log(x).* We construct such a plot in the accompanying spreadsheet, **6S_3.xls,** and note that it is a good approximation to a straight line, and that its slope is −0.162, corresponding to *x*=0.85. This implies a declining balance model, in which the current value drops by 15% each year. So in four years time, Kim would expect the value to be ₹66 500 × 0.85^4, which is ₹34 713.



6S.4

Viridian Income Statement, Year Ending April 01, 2010

Income	
Sales of plants	$16 000
Sales of 120 bags mulch	$720
Sales of 300 bags compost	$2 400
Landscaping services	$12 900
Total	$32 020
Expenses	
Salaries	$2 600
Loan pay-off	$5 000
Rent	$2 800
Depreciation	$ 5 940
Bags	$ 500
Bad debts	$600
Gasoline	$700
Total	$18 140
Net Income	$13 880

Viridian Balance Sheet, April 01, 2010

Assets		**Liabilities**	
Current Assets		*Current Liabilities*	
Cash	$23 480	Bank Loan	$0
Accounts Receivable	$1 500	Taxes due	$0
Potted Plants	$12 000	Unpaid wages	$0
5300 Bags of mulch	$40 800	Accounts payable	$4 000
5100 Bags compost	$31 800	Rent Due	$0
Total Current Assets	*$109 580*		
Fixed Assets		*Total Liabilities*	$4 000
Building	$20 340	**Net Worth**	
Truck	$7 600		**$ 138 110**
Various Tools	$1 440		
Computers (2)	$3 150		
Total Fixed Assets	*$32 530*		
Total Assets	$142 110		

6S.5

The company must bring in enough money to pay salaries, interest on the loan, and to offset depreciation of its assets. The buildings will depreciate by R 1 000 000(0.04) = R 40 000. The press has depreciated by a ratio of 1093/1500 = 0.7286 in three years. This is declining-balance depreciation, so if the depreciation rate is d, $(1-d)$ is the cube root of 0.7286, which is 0.9. So the press will depreciate by an additional R 109 000 in the coming year.

So the total income required is 1 200 000 + 50 000 + 40 000 + 109 000 = R 1 399 000. We know from the balance sheet that 1 kg of gems is worth R 45 000, so the total mass of gems that must be produced is 1399/45 = 31.1 kg.