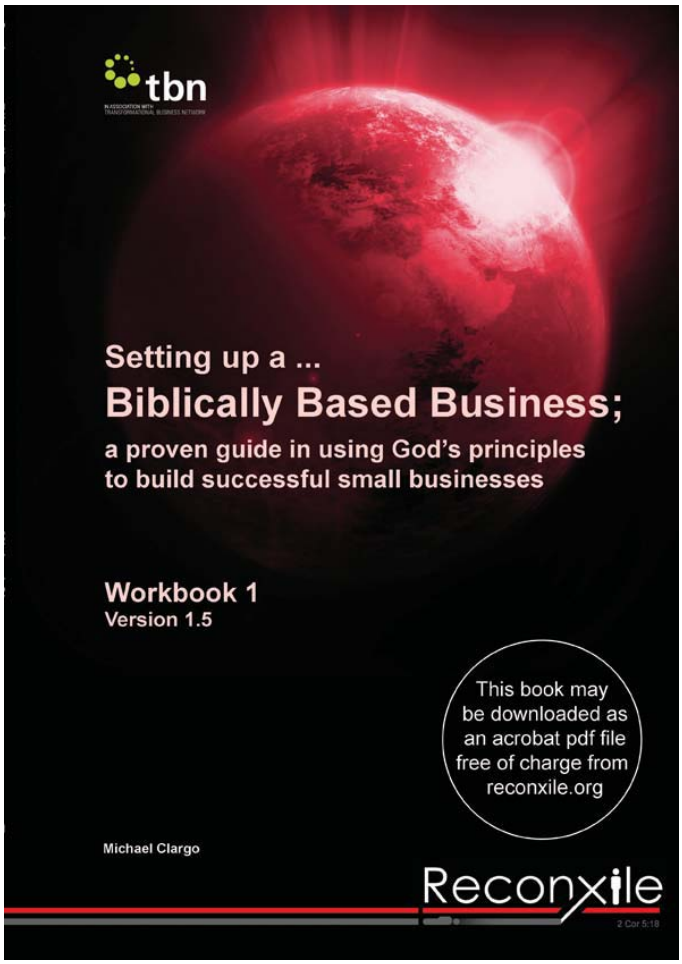

Setting-Up a...
Biblically Based Business

Mathematics Workbook 1

Simple questions to practice financial calculations from Workbook 1

Worked examples and answers – version 2.0 (English)

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Setting-up Your Own Small Business

Uganda Small Business Guide Series

Mathematics Workbook 1

Introduction

This maths workbook is designed to support Workbook 1 of the Biblically Based Business Series by providing worked examples and exercises based on the topics covered in that Workbook. Each section covers a particular topic in the Workbook and typically starts with a worked example, followed by 3 exercises.

In all examples, currency is quoted in Dollars. Depending on the area where the training is being undertaken this may need to be converted into the local currency in order to make the examples more relevant to the trainees..

Answers are given at the end of the workbook, occasionally with hints for some slightly more complex questions.

Section 1 Market Calculations

Exercise 13 on page 21 of Workbook 1 shows how to calculate the total accessible market and market share for a business. Below is a worked example of these market calculations, followed by 3 exercises for you to practise these kinds of calculations.

Worked Example

The Kampala Computer Company (KCC) is a new company offering technical computer support to small businesses in northern Kampala.
In this area of the city, approximately 50 small businesses operate PCs and, on average each of these businesses find they have a problem with one or other of their computers about two times a month, and need to make a technical support 'call-out' to get it fixed. The typical bill for each call-out is $150. KCC is aiming for $45,000 annual revenue to cover its costs.

The number of 'call-outs' *(which are the sales for this type of business)* which small businesses in the northern Kampala area make every month is the number of small businesses in the area (50) multiplied by the average number of callouts per business (2):

50	(businesses)
x 2	(callouts per business per month)
= 100	(callouts per month)

The number of call-outs per year is therefore the number of call outs per month (100) multiplied by the number of months in a year (12):

100	(callouts per month)
x 12	(months in a year)
= 1,200	(callouts per year)

The annual accessible market is the number sales, which in this case is the number of call-outs per year (1,200) multiplied by the average call-out cost ($150):

1,200	(callouts per year)
x 150	(price paid per callout)
= 180,000	(price paid per year – *by all small businesses in northern Kampala – otherwise known as the accessible market*)

The market share (expressed as a percentage) that KCC needs is the annual revenue it needs to cover its costs ($45,000) divided by the accessible market, which is the price paid per year by all small businesses in northern Kampala ($180,000) multiplied by 100 (to convert a fraction into a percentage):

45,000	(revenue KCC needs)
÷ 180,000	(accessible market)
x 100	(to convert to %age)
= 25%	

Exercises

Now it is your turn. Please use additional sheets of paper if you need to. Calculate the annual total accessible market and market share for each of the businesses in the exercises below.

Use this side of the page for your working

Exercise 1.1

The Cycle King company has just started selling bicycles in Ubora. There are 2 other competitor companies in the area who each sell an average of 50 cycles every month. The average price for a cycle is $80.
Cycle King has an annual target revenue of $12,000.

Accessible Market = $_____

Cycle King Market Share = _____%

Exercise 1.2

Kenya Office Cleaning Services (KOCS) offers cleaning services to offices in Central Nairobi. There are 120 offices in this area but one third of these employ their own cleaners and are not looking to outsource this work with another company. Offices are cleaned twice a month at an average price of $300 per clean. KOCS annual revenue is $144,000.

Accessible Market = $_____

UOCS Market Share = _____%

Exercise 1.3

The Victoria Tours Company (VTC) offers boat tours of Lake Victoria. Every month, 150 tourists take boat tours of Lake Victoria, paying $20 each. VTC annual revenue is $14,400.

Accessible Market = $_____

VTC Market Share = _____%

Section 2 Revenue, Costs & Profit

Pages 30-33 of Workbook 1 shows how to calculate the profit (or loss) of a business, given its revenue and costs, and how to calculate monthly revenue from unit price and monthly sales quantity. Below is a worked example of these calculations, followed by 3 exercises.

Worked Example

The Mongolia Fish Company (MFC), fishes the northern reaches of Hyargas Nuur, and sells its catch at Baruunturuun market. The market is held 4 times a month, and at each market MFC manages to sell its entire catch of 60 fish. The average price it gets for each fish it sells there is $2. The operating costs* of MFC are currently $150 a month loan repayments (to repay the loan it used to buy the boat and nets) $90 a month wages and $60 a month fuel. What is its monthly revenue, operating costs and profit (or loss)?

The monthly sales quantity is the sales quantity per market (60 fish) multiplied by the number of markets held each month (4)

60	(fish sold at each market)
x 4	(markets per month at Baruunturuun)
=240	(fish sold each month by MBC = *monthly sales quantity*)

The monthly revenue is the average selling price per fish ($2) multiplied by the monthly sales quantity (240):

$2	(average price per fish)
x 240	(number of fish sold per month *monthly sales quantity*)
= $480	(monthly revenue for EBC from fish sales at Market)

The total monthly operating cost* is the sum of the individual monthly operating costs: loan repayments ($150), wages ($90) and fuel ($60)

$150	(loan repayments per month)
+ $90	(wages to be paid per month)
+ $60	(fuel costs per month)
= $300	(total monthly operating cost)*

The monthly profit is the monthly revenue ($480) less the monthly costs ($300)

$480	(monthly revenue for EBC from fish sales at Market)
- $300	(total monthly operating cost)*
= $180	(monthly profit)

**Please note, these operating costs are for example only and are simplified to make it easy to do the exercise – in a real-life example, there would be many other costs of running this business, including repairs & maintenance, insurance, taxes and operating fees.*

Exercises

Now it is your turn. Please use additional sheets of paper if you need to. Calculate the monthly revenue, operating costs and profit (or loss) for the companies described below.

Use this side of the page for your working

Exercise 2.1

The Lanzhou Tea company sells tea for $0.30 per kg. It sells 15,000 kg per month. It pays its 10 workers $300 a month each and has a loan with monthly repayments of 900$.

Monthly Revenue = $_____

Monthly Operating Costs = $_____

Profit or Loss = $_____
(state which)

Exercise 2.2

The Changchun Towel Shop imports 200 towels a month at a cost of 7$ per towel. It sells each towel at a price at $9.75. It has 2 employees, each earning $250 a month, monthly rent on its shop premises of $40 & monthly loan repayments of $50.

Monthly Revenue = $_____

Monthly Operating Costs = $_____

Profit or Loss = $_____
(state which)

Exercise 2.3

Frank Wampamba is a peanut seller who buys 5 sacks of nuts a month for $30 each. Each sack contains 100 packets, sold for $0.40 each. He is repaying a loan at the rate of $20 per month.

Monthly Revenue = $_____

Monthly Operating Costs = $_____

Profit or Loss = $_____
(state which)

Section 3 Fixed and Variable Costs

Page 34 of Workbook 1 explains the difference between fixed and variable costs. Fixed costs do not change based on the amount of work you do, while variable costs do.

Exercise

For each cost listed below, indicate whether it is fixed or variable.

Rent	Fixed / Variable*
Raw materials	Fixed / Variable
Wages for fulltime employees	Fixed / Variable
Supplies (e.g. stationery)	Fixed / Variable
Cost of temporary employees	Fixed / Variable
Electricity	Fixed / Variable
Advertising	Fixed / Variable

* Delete (cross-out) as appropriate

Space for your own notes on fixed and variable costs

Section 4 Ideal Costs & Realistic Costs

Pages 36-37 of Workbook 1 shows how to calculate the realistic variable operating costs of a business based on ideal costs and the number of ‘good’ units, where good units can be thought of as those units that can be sold at full price.

Worked Example

Workbook 1 shows an example based on a biscuit factory on page 38.

Exercises

Now it is your turn. Please use additional sheets of paper if you need to. Calculate the monthly realistic costs for the following businesses.

Use this side of the page for your working

Exercise 4.1
The Nagpur Bakery bakes 100 loaves of bread a day at a cost of $2.40 per loaf. Of these, an average of 5% are overcooked and a further 15 are spoilt after cooking (e.g. due to mishandling by staff). The bakery operates for 25 days a month and sells only the good loaves.

Ideal cost to produce 100 units = $_____

Number of good units per 100 = _____

Realistic cost per unit = $_____

Realistic variable cost per month = $_____

Exercise 4.2
The Bapatia Fishing Net company imports fishing nets from Hyderabad at $54 per net. On average, 5 nets per month are found to contain an unacceptable level of flaws (holes & tears in the net) and are unsaleable. In an average month, 50 fishing nets are bought.

Ideal cost to produce 100 units = $_____

Number of good units per 100 = _____

Realistic cost per unit = $_____

Realistic variable cost per month = $_____

Exercise 4.3
Abel Freeman runs a shop selling fruit. He buys 300 oranges per delivery at $0.20 each. Of these, 20 oranges are rotten and a further 40 are donated to the local orphanage. He sells 600 oranges per month.

Ideal cost to produce 100 units = $_____

Number of good units per 100 = _____

Realistic cost per unit = $_____

Realistic variable cost per month = $_____

Section 5 Start-up Costs

Page 39 of Workbook 1 shows how to calculate the start-up costs of a business, given its set-up costs, the time from receiving your initial capital (perhaps a loan) and the monthly operating costs (we saw how to calculate monthly operating costs in Section 2 and in Chapter 5 of Workbook 1). Below is a worked example of these start-up cost calculations, followed by 3 exercises.

Worked Example

The Campo Florido Trading Company has a total monthly pay-bill (money paid to its employees) of $600, along with annual bill of $1,800 for electricity, gas and other service supplies.
The company was set up in January 2003, and in that same month bought a vehicle for $8,000, and other essentials such as shelving and a basic computer for another $3,000. In April 2003, it began trading at Havana market.

The monthly operating costs are the sum of the monthly paybill ($600) and one twelfth of the annual bill for electricity, gas and other service supplies ($1,800).

$1,800	(annual bill for service supplies)
÷12	(number of months in a year)
$150	(monthly cost of service supplies)
$150	(monthly cost of service supplies)
+ $600	(monthly pay-bill for employee salaries)
$750	(monthly operating costs)

The time from incurring loan costs until first revenue received was 3 months (January to April 2003), making the operating costs until first revenue 3 times the monthly operating costs.

$750	(monthly operating costs)
x3	(months from start-up to first revenue)
$2,250	(operating costs for the three months from January to April 2003)

The set-up costs were the sum of the cost of a vehicle (8,000,000) and other essentials (3,000,000).

$8,000	(cost of a vehicle)
+ $3,000	(cost of shelving, computer, etcetera)
=$11,000	(set-up costs)

The total start-up costs are the sum of the set-up costs plus the pre-revenue *(the period from January to April, before money starts coming in)* operating costs

$11,000	(set-up costs)
+ $2,250	(operating costs for 3 months)
= $13,250	(total start-up costs)

Exercises

Now it is your turn. Please use additional sheets of paper if you need to. Calculate the total start-up costs for the companies described below.

Use this side of the page for your working

Exercise 5.1
The Lima Beverages Emporium paid $2,500 for premises and equipment on 1st January 2004. On 1st October that year, it began trading. During this time its monthly paybill was $200, and another $100 per month was spent on rates & services.

Pre-revenue operating costs = $_____

Set-up Costs = $_____

Total Start-up Costs = $_____

Exercise 5.2
Arequipa Transport Services bought a bus for $45,000 on 1st January 2007. At the same time, it employed a driver with a monthly salary of $300 and 2 office staff each with a monthly salary of $210. Its first fare paying trip was on 1st June, when it received its first revenues.

Pre-revenue operating costs = $_____

Set-up Costs = $_____

Total Start-up Costs = $_____

Exercise 5.3
Tacna Computer Services began operations on 1st March 2006 by paying $8,000 for essential computer equipment, and another $4,000 was used to buy a vehicle at the same time. It also rented an office for $200 a month and pays its 2 employees $250 a month each. Its first revenues were received on 1st August 2006.

Pre-revenue operating costs = $_____

Set-up Costs = $_____

Total Start-up Costs = $_____

Section 6 Break-even Point

Pages 40-42 of Workbook 1 discuss the cost of loans and how to calculate the break-even point during a business's start-up phase. The break-even point is the number of unit sales required in order to cover all a business's costs, plus any loan repayments. Page 42 shows the calculations used to calculate the break-even point.

Worked Example

Tirana Plumbing Services' (TPS) main business is fixing broken water pipes, which they are called to do regularly by their customers. Their average charge is $20 for each call-out. The real cost to TPS for each call-out, in terms of materials, transport, labour etcetera is an average of $15. TPS also has monthly fixed costs of $200 and a loan of $1,200.

The money from each unit of sale (callout) is the average call-out charge (20) less the real cost per call-out (15):

$20	(average call-out charge)
- $15	(real cost per call out)
= $5	(actual money made by LPS each time they are called-out)

Monthly total fixed outgoings are a quarter of the loan costs[1] plus the monthly fixed costs:

$1,200	(value of the loan)
÷ 4	(one quarter)
= $300	(monthly cost of loan repayments[1])

$300	(monthly cost of loan repayments[1])
+$200	(monthly fixed costs)
=$500	(monthly total fixed outgoings)

Break-even point is the total fixed outgoings divided by the money received per unit:

$500	(monthly total fixed outgoings)
÷$5	(money received per unit - *actual money made by LPS each time they are called-out*)
=100	(call outs each month simply to cover fixed outgoings)

This means that Tirana Plumbing Services need to complete 100 call-outs per month to break even. Any less than that, and they are losing money, and will eventually lose their business.

[1] Typical repayment levels imply a monthly cost of ¼ of the loan amount

Exercises

Now it is your turn. Please use additional sheets of paper if you need to. Calculate the break-even point for the companies described below.

Use this side of the page for your working

Exercise 6.1

Paxol Radios Ltd (PRL) sells radios for an average of $5 per radio. The real cost to PRL for each radio is $3. The company pays annual rent of $840 and has no other fixed costs. It has an outstanding loan of $80

Money received per unit = $_____

Monthly Fixed Outgoings = $_____

Break-even Point = _____ units

Exercise 6.2

Kastos Kakes *(they misspelt it as a sales gimmick)* sells cakes for an average of $0.50. The real cost per cake is $0.10. The company pays annual rent of $600 and it has an outstanding loan of $400.

Money received per unit = $_____

Monthly Fixed Outgoings = $_____

Break-even Point = _____ units

Exercise 6.3

Ithaki Bricks sells lots of 100 bricks for an average of $7. The real cost per 100 bricks is $4. The company pays monthly rent of $100 and monthly salaries for their permanent staff totalling $300. It has an outstanding loan of $2,000.
(*Note: treat 100 bricks as 1 unit*).

Money received per unit = $_____

Monthly Fixed Outgoings = $_____

Break-even Point = _____ units

Section 7 Cash-flow Analysis

Page 43 of Workbook 1 explains cash-flow and Appendix 1 contains a detailed sheet for analysing cash-flow. In this section, we follow a worked example with 3 basic cash-flow tables for you to fill in. The income, expenditure and loan repayments are provided for each month, along with the opening balance for Month 1.
All other entries need to be calculated.

Worked Example

The problem as set – fill in all of the blank squares (all money is in $ Dollars)

Month	1	2	3	4	5	6
Opening Balance (o)	1,000					
Income (i)	0	0	400	700	900	900
Expenditure (e)	300	300	300	300	300	300
Loan Repayment (l)	150	150	150	150	150	150
Closing Balance (c) c=o+i-e-l						

The solution as worked out (items in italics):

Month	1	2	3	4	5	6
Opening Balance (o)	1,000	*550* *(from M1 closing balance)**	*100* *(from M2 closing balance)**	*50* *(from M3 closing balance)**	*300* *(from M4 closing balance)**	*750* *(from M5 closing balance)**
Income (i)	0	0	400	700	900	900
Expenditure (e)	300	300	300	300	300	300
Loan Repayment (l)	150	150	150	150	150	150
Closing Balance (c) c=o+i-e-l	*1000* *+0* *– 300* *– 150* _____ = ***550***	*550* *+0* *– 300* *– 150* _____ = ***100***	*100* *+400* *– 300* *– 150* _____ = ***50***	*50* *+700* *– 300* *– 150* _____ =***300***	*300* *+900* *– 300* *– 150* _____ =***750***	*750* *+900* *– 300* *– 150* _____ =***1,200***

* *The money that you have at the start of each month is the same as the money which you had at the end of the preceding month.*

Exercises

Now it is your turn. Please use additional sheets of paper if you need to. Fill in all of the blank squares in the cash-flow analysis tables below (all money is in UGS Ugandan Shillings).

Exercise 7.1

Month	1	2	3	4	5	6
Opening Balance (o)	2,000					
Income (i)	0	300	600	900	1100	1200
Expenditure (e)	600	600	600	600	600	600
Loan Repayment (l)	350	350	350	350	350	350
Closing Balance (c) c=o+i-e-l						

Exercise 7.2

Month	1	2	3	4	5	6
Opening Balance (o)	100					
Income (i)	0	0	50	60	80	90
Expenditure (e)	25	25	30	40	50	60
Loan Repayment (l)	20	20	20	20	20	20
Closing Balance (c) c=o+i-e-l						

Exercise 7.3

Month	1	2	3	4	5	6
Opening Balance (o)	200					
Income (i)	0	0	0	80	90	90
Expenditure (e)	40	40	40	50	60	60
Loan Repayment (l)	20	20	20	20	20	20
Closing Balance (c) c=o+i-e-l						

Answers

Section 1

1.1	Accessible Market	2	businesses
		x 50	cycles per month
		x 12	months per year
		x $80	per cycle
		= $96,000	per year
	Market Share	$12,000	Cycle King annual target revenue
		÷ $96,000	accessible market
		x 100	to convert into a percentage
		= 12.5%	
1.2	Accessible Market	120	offices in the Central Nairobi area
		x ⅔	proportion without their own cleaners
		x 24	annual opportunities to clean them (twice a month)
		x $300	average price per clean
		= $576,000	per year
	Market Share	$144,000	KOCS annual revenue
		÷ $576,000	accessible market
		x 100	to convert into a percentage
		= 25%	
1.3	Accessible Market	150	tourists per month
		x 12	months per year
		x $20	per tourist per boat tour
		= $36,000	per year
	Market Share	$14,400	VTC annual revenue
		÷ $36,000	accessible market
		x 100	to convert into a percentage
		= 40%	

Section 2

2.1	Monthly Revenue	$0.30	income per kg of tea sold
		x 15,000	kg of tea sold per month
		= $4,500	
	Monthly Operating Costs	10	workers
		x $300	wages per month per worker
		+ $900	monthly loan repayments
		= $3,900	
	Profit or Loss	$4,500	monthly revenue
		− $3,900	monthly operating costs
		= $600	(profit) per month
2.2	Monthly Revenue	$9.75	income per towel sold
		x 200	towels sold per month
		= $1,950	
	Monthly Operating Costs	1,400$	cost of towels (200 towels x 7$ each)
		+ 500$	wages per month (2 employees x 250$)
		+ 40$	rent per month on its premises
		+ 50$	monthly loan repayments
		= $1,990	
	Profit or Loss	1,950$	monthly revenue
		− 1,990$	monthly operating costs
		= −40$	(loss) per month
2.3	Monthly Revenue	$0.40	income per packet of peanuts
		x 100	packets per sack
		x 5	sacks per month
		= $200	
	Monthly Operating Costs	5	sacks of peanuts per month
		x $30	purchase price per sack
		+ $20	monthly loan repayments
		= $170	
	Profit or Loss	$200	monthly revenue
		− $170	monthly operating costs
		= $30	(profit) per month

Section 3

Rent	**Fixed** / ~~Variable~~
Raw materials	~~Fixed~~ / **Variable**
Wages for fulltime employees	**Fixed** / ~~Variable~~
Supplies (e.g. stationery)	~~Fixed~~ / **Variable**
Cost of temporary employees	~~Fixed~~ / **Variable**
Electricity	**Fixed** / ~~Variable~~
Advertising	**Fixed** / ~~Variable~~

Section 4

4.1	Ideal cost to produce 100 units	100 x $2.40	100 x ideal cost per loaf
		= $240	
	Number of good units per 100	100	loaves
		x 95%	not overcooked
		− 15	lost due to miss-handling etc.
		= 80	loaves
	Realistic cost per unit	$240	to produce 100 loaves (good & bad)
		÷ 80	number of good loaves produced for sum
		= $3	
	Realistic variable cost per month	$3	realistic cost per good loaf
		x 80	loaves sold per day
		x 25	days worked per month
		= $6,000	
4.2	Ideal cost to produce 100 units	100 x $54	100 x ideal cost per net
		= $5,400	
	Number of good units per 100	100	nets
		− 10	(5 unacceptable per every 50)
		90	nets
	Realistic cost per unit	$5,400	to buy 100 nets (good & bad)
		÷ 90	number of good nets bought for that sum
		$60	
	Realistic variable cost per month	$60	realistic cost per good net
		x 50	nets sold per month
		$3,000	
4.3	Ideal cost to produce 100 units	100 x $0.20	100 x ideal cost per orange
		=$20	
	Number of good units per 100	100	oranges
		− 7	rotten (20 in 300)
		− 13	given away (40 in 300)
		80	oranges
	Realistic cost per unit	$20	to produce 100 oranges (good & bad)
		÷ 80	number of oranges available to sell
		$0.25	
	Realistic variable cost per month	$0.25	realistic cost per orange sold
		x 600	oranges sold per month
		$150	

Section 5

5.1	Pre-revenue operating costs	$200	monthly pay-bill
		+ $100	rates and services
		x 9	months (January to October)
		$2,700	
	Set-up costs	$2,500	premises and equipment
		$2,500	
	Total start-up costs	$2,700	pre-revenue operating costs
		+ $2,500	set-up costs
		$5,200	
5.2	Pre-revenue operating costs	$300	monthly salary for driver
		+ $420	monthly salary for office staff x 2
		x 5	months (January to June)
		$3,600	
	Set-up costs	$45,000	bus
		$45,000	
	Total start-up costs	$3,600	pre-revenue operating costs
		+ $45,000	set-up costs
		$48,600	
5.3	Pre-revenue operating costs	$500	monthly pay-bill (2 employees)
		+ $200	monthly office rent
		x 5	months (March to August)
		$3,500	
	Set-up costs	$8,000	computer equipment
		$4,000	vehicle
		$12,000	
	Total start-up costs	$3,500	pre-revenue operating costs
		+ $12,000	set-up costs
		$15,500	

Section 6

6.1	Money received per unit	$5	selling price per radio
		− $3	production costs per radio
		$2	
	Monthly Fixed Outgoings	$80	outstanding loan
		÷ 4	one quarter *(typical rate of repayment)*
		+ $840	annual rent
		÷ 12	to convert to monthly rent
		$90	($20 repayment + $70 rent)
	Break-even Point	$90	monthly fixed outgoings
		÷ $2	money received per radio sold
		45	radios per month
6.2	Money received per unit	$0.50	selling price per cake
		− $0.10	production costs per cake
		$0.40	
	Monthly Fixed Outgoings	$400	outstanding loan
		÷ 4	one quarter *(typical rate of repayment)*
		+ $600	annual rent
		÷ 12	to convert to monthly rent
		$150	($100 repayment + $50 rent)
	Break-even Point	$150	monthly fixed outgoings
		÷ $0.40	money received per cake sold
		375	cakes per month
6.3	Money received per unit	$7	selling price per lot of 100 bricks
		− $4	production costs per lot of 100 bricks
		$3	
	Monthly Fixed Outgoings	$2,000	outstanding loan
		÷ 4	one quarter *(typical rate of repayment)*
		+ $100	monthly rent
		+ $300	monthly salaries
		$900	(500$ repayment + 400$)
	Break-even Point	$900	monthly fixed outgoings
		÷ $3	money received per lot of 100 bricks
		300	lots of 100 bricks

Section 7

7.1

Month	1	2	3	4	5	6
Opening Balance	2,000	1,050	400	50	0	150
Income	0	300	600	900	1100	1200
Expenditure	600	600	600	600	600	600
Loan Repayment	350	350	350	350	350	350
Closing Balance	1,050	400	50	0	150	400

7.2

Month	1	2	3	4	5	6
Opening Balance	100	55	10	10	10	20
Income	0	0	50	60	80	90
Expenditure	25	25	30	40	50	60
Loan Repayment	20	20	20	20	20	20
Closing Balance	55	10	10	10	20	30

7.3

Month	1	2	3	4	5	6
Opening Balance	200	140	80	20	30	40
Income	0	0	0	80	90	90
Expenditure	40	40	40	50	60	60
Loan Repayment	20	20	20	20	20	20
Closing Balance	140	80	20	30	40	50