

Contents

CHAPTER 1 | **Review and Applications of Basic Mathematics 2**

- 1.1 Order of Operations 4**
- 1.2 Fractions 5**
 - Decimal and Percent Equivalents 6
 - Rounding of Decimal and Percent Equivalents 7
 - Evaluating Complex Fractions 10
- 1.3 The Basic Percentage Problem 12**
- 1.4 Payroll 18**
 - Salaries 18
 - Hourly Wages 19
 - Commissions 21
- 1.5 Simple and Weighted Averages 23**
- 1.6 Taxes 30**
 - Goods and Services Tax (GST) 30
 - Provincial Sales Tax (PST) 31
 - Property Tax 32
- Review Problems 36**
- Self-Test Exercise 37**
- Appendix 1A: The Texas Instruments BA-II PLUS Format Settings 37**

CHAPTER 2 | **Review and Applications of Algebra 40**

- 2.1 Operations with Algebraic Expressions 41**
 - Definitions 41
 - Addition and Subtraction 42
 - Multiplication and Division 43
 - Substitution 45
- 2.2 Manipulating Equations and Formulas 48**
- 2.3 Solving Linear Equations 57**
 - Solving a Linear Equation in One Unknown 57
 - Solving Two Linear Equations in Two Unknowns 59
- 2.4 Solving Word Problems 62**
 - A General Approach for Solving Problems 63
- 2.5 Application: Percent Change 72**
- Review Problems 83**
- Self-Test Exercise 84**

CHAPTER 3 | Ratios and Proportions 86

- 3.1 Ratios 87
- 3.2 Proportions 91
- 3.3 Application: Proration 97
- 3.4 Application: Exchange Rates and Currency Conversion 103
- 3.5 Application: Appreciation and Depreciation of Currencies 112
- 3.6 Application: Index Numbers 115
- Review Problems 119
- Self-Test Exercise 120

CHAPTER 4 | Mathematics of Merchandising 122

- 4.1 Trade Discounts 123
- 4.2 Cash Discounts and Terms of Payment 131
- 4.3 Markup 138
 - The Connection Between the Net Price, N , and the Unit Cost, C 139
- 4.4 Markdown 146
- 4.5 Comprehensive Applications 149
- Review Problems 157
- Self-Test Exercise 158
- Appendix 4A: Other Notations for Terms of Payment 159
 - End-of-Month (EOM) Dating 159
 - Receipt-of-Goods (ROG) Dating 159

CHAPTER 5 | Applications of Linear Equations 162

- 5.1 Introduction to Graphical Techniques 163
 - Graphing a Linear Equation in Two Unknowns 163
 - The Slope-Intercept Form of a Linear Equation 166
 - Graphical Method for Solving Two Equations in Two Unknowns 167
- 5.2 Introduction to Cost-Volume-Profit Analysis 169
 - Fixed Costs and Variable Costs 169
 - Cost-Volume-Profit (CVP) Analysis 171
- 5.3 Revenue and Cost Function Approach to CVP Analysis 173
- 5.4 Graphical Approach to Cost-Volume-Profit Analysis 183
- 5.5 Contribution Margin Approach to CVP Analysis 187
- Review Problems 195
- Self-Test Exercise 196
- Appendix 5A: The Texas Instruments BA II Plus Breakeven Worksheet 197

**CHAPTER 6 | Simple Interest 200**

- 6.1 Basic Concepts 201
- 6.2 Determining the Time Period (Term) 206
- 6.3 Maturity Value (Future Value) of a Loan or Investment 213
- 6.4 Equivalent Payments 219
- 6.5 The Equivalent Value of a Payment Stream 224
- 6.6 Loans: A Principle about Principal 232
- Review Problems 235
- Self-Test Exercise 236
- Appendix 6A: An Aid for Determining the Number of Days in Each Month 237
- Appendix 6B: The Texas Instruments BA II PLUS DATE Worksheet 237

CHAPTER 7 | Applications of Simple Interest 240

- 7.1 Savings Accounts and Short-Term GICs 241
- 7.2 The Valuation Principle 245
- 7.3 Treasury Bills and Commercial Paper 249
- 7.4 Demand Loans 253
 - Common Terms and Conditions 253
 - Revolving Loans 254
 - Fixed-Payment Loans 258
- 7.5 Canada Student Loans 263
- Review Problems 266
- Self-Test Exercise 267
- Appendix 7A: Promissory Notes 269

CHAPTER 8 | Compound Interest: Future Value and Present Value 276

- 8.1 Basic Concepts 277
- 8.2 Future Value (or Maturity Value) 281
 - Calculating Future Value 281
 - Graphs of Future Value versus Time 284
- 8.3 Present Value 293
- 8.4 Using Financial Calculators 301
 - Key Definitions and Calculator Operation 302
 - Cash-Flow Sign Convention 304
- 8.5 Other Applications of Compounding 308
 - Compound-Interest Investments 308
 - Valuation of Investments 313
 - Compound Growth 316



8.6	Equivalent Payment Streams	323
	Review Problems	330
	Self-Test Exercises	332
	Appendix 8A: Instructions for Specific Models of Financial Calculators	333

CHAPTER 9 | Compound Interest: Further Topics and Applications 334

9.1	Calculating the Periodic Interest Rate, i	335
9.2	Calculating the Number of Compounding Periods, n	344
9.3	Effective Interest Rate	352
9.4	Equivalent Interest Rates	362
9.5	Investment Returns from Stocks and Mutual Funds	365
	Review Problems	377
	Self-Test Exercise	379
	Appendix 9A: The Texas Instruments BA II PLUS Interest Conversion Worksheet	381
	Appendix 9B: Annualized Rates of Return and Growth	(located on the textbook's Online Learning Centre)

CHAPTER 10 | Ordinary Annuities: Future Value and Present Value 382

10.1	Terminology	383
10.2	Future Value of an Ordinary Simple Annuity	385
	Future Value Using the Algebraic Method	385
	Future Value Using the Financial Calculator Functions	386
	Contribution of Each Payment to an Annuity's Future Value	386
	Applications of the Future Value of an Annuity	387
10.3	Present Value of an Ordinary Simple Annuity	395
	Present Value Using the Algebraic Method	395
	Present Value Using the Financial Calculator Functions	396
	Contribution of Each Payment to an Annuity's Present Value	397
	Applications of the Present Value of an Annuity	398
10.4	Deferred Annuities	412
10.5	Ordinary General Annuities	417
	Review Problems	429
	Self-Test Exercise	430

CHAPTER 11 | Ordinary Annuities: Periodic Payment, Number of Payments, and Interest Rate 432

11.1	Calculating the Periodic Payment	433
11.2	Calculating the Number of Payments	445
11.3	Calculating the Interest Rate	456
	Review Problems	463



Self-Test Exercise 464

Appendix 11A: Derivation of the Formula for n from the Formula for FV (located on the textbook's Online Learning Centre)

Appendix 11B: The Trial-and-Error Method for Calculating the Interest Rate per Payment Interval (located on the textbook's Online Learning Centre)

CHAPTER 12 | **Annuities Due 468**

12.1 Future Value of an Annuity Due 469

Future Value Using the Algebraic Method 470

Future Value Using the Financial Calculator Functions 471

12.2 Present Value of an Annuity Due 479

Present Value Using the Algebraic Method 479

Present Value Using the Financial Calculator Functions 479

Applications of the Present Value Calculation 479

12.3 Calculating the Periodic Payment, Number of Payments, and Interest Rate 487

12.4 Comprehensive Annuity Problems 500

Review Problems 509

Self-Test Exercise 510

Appendix 12A: Setting Your Calculator in the Annuity Due Mode 512

CHAPTER 13 | **Annuities: Special Situations 514**

13.1 Perpetuities 515

13.2 Constant-Growth Annuities 523

Review Problems 530

Self-Test Exercise 531

CHAPTER 14 | **Loan Amortization; Mortgages 532**

14.1 Loan Amortization 533

Amortization Schedules 534

Precise Calculation of a Loan's Balance 537

Partial Amortization Schedule 542

14.2 Direct Calculation of the Interest and Principal Components of a Payment or Group of Payments 548

14.3 Mortgage Loans: Fundamentals 558

Basic Concepts and Definitions 558

Calculating the Payment and Balance 559

Qualifying for a Mortgage Loan 563

Common Prepayment Privileges and Penalties 567



14.4 Mortgage Loans: Additional Topics (located on the textbook's Online Learning Centre)

The Effective Cost of Borrowing

Valuation of Mortgages

Review Problems 578

Self-Test Exercise 579

**Appendix 14A: Instructions for the Texas Instruments BA-II PLUS
Amortization Worksheet 580**

Appendix 14B: Amortization Functions on the Sharp EL-738 Calculator 581

CHAPTER 15 | Bonds and Sinking Funds 582

15.1 Basic Concepts and Definitions 583

15.2 Bond Price on an Interest Payment Date 584

Dependence of Bond Price on Prevailing Interest Rates 584

Calculating a Bond's Price on an Interest Payment Date 586

15.3 Yield to Maturity on an Interest Payment Date 595

15.4 Bond Price on Any Date 599

Calculating a Bond's Price on Any Date 599

Quotation of Bond Prices 601

15.5 Sinking Funds 607

Sinking Fund for a Capital Expenditure 607

Sinking Fund for Debt Retirement 611

Review Problems 619

Self-Test Exercise 620

Appendix 15A: Instructions for the Texas Instruments BA-II PLUS Bond Worksheet 621

CHAPTER 16 | Business Investment Decisions 622

16.1 Comparing Business to Personal Investment Decisions 623

16.2 The Net Present Value of an Investment 628

16.3 Comparing Investment Projects 636

Capital Rationing 636

Mutually Exclusive Projects 637

16.4 Internal Rate of Return 643

16.5 Comparing NPV and IRR Approaches 647

16.6 The Payback Period 651

Review Problems 656

Self-Test Exercise 657

Answers to Odd-Numbered Problems 659

Glossary 697

Index 701



FIGURE

List of Figures

1.1	Approach for Problems on Averages	24
4.1	The Distribution Chain	124
4.2	A Sample Sales Invoice	131
4.3	Interpreting the Terms of Payment in Ordinary Dating	132
4.4	Discount and Credit Periods for the Ordinary Dating Case 2/10, n/30	133
4.5	Markup Diagram	138
4.6	Discount and Credit Periods for the EOM Dating Case 2/10, n/30, EOM	159
4.7	Discount and Credit Periods for the ROG Dating Case 2/20, n/30, ROG	159
5.1	Break-Even Chart	183
6.1	Graphs of Present Values and Future Values of \$100	221
6.2	Entering Given Data on a Time Diagram	225
6.3	Showing the Solution Steps on a Time Diagram	225
7.1	Demand Loan Repayment Schedule	255
7.2	Term Promissory Note	270
7.3	Demand Promissory Note	270
7.4	Calculating the Proceeds of a Promissory Note	272
8.1	Converting Interest to Principal at the End of Each Compounding Period	278
8.2	The Components of the Future Value of \$100	285
8.3	Future Values of \$100 at Various Compound Rates of Interest	286
8.4	Future Values of \$100 at the Same Nominal Rate but Different Compounding Frequencies	287
8.5	The Present Value of \$1000 (Discounted at 10% Compounded Annually)	294
9.1	The Components of Investment Returns	365
10.1	Time Diagram for an n -Payment Ordinary Annuity	383
10.2	The Future Value of a Four-Payment Ordinary Simple Annuity	385
10.3	Contribution of Each Payment to an Annuity's Future Value	387
10.4	The Present Value of a Four-Payment Ordinary Simple Annuity	395
10.5	Contribution of Each Payment to an Annuity's Present Value	398
10.6	Time Diagram for a Deferred Annuity	412
10.7	The Present Value of a Deferred Annuity	412
12.1	Time Diagram for an n -Payment Annuity Due	469
12.2	The Relationship between $FV(\text{due})$ and FV	470
12.3	Annuity Classification Flowchart	501
13.1	Value of \$100,000 Investment that Pays Out Only Its Interest Earnings	515
13.2	Value of \$100,000 Investment that Pays Out More than Its Interest Earnings	516
13.3	Time Diagram for the Payments of an Ordinary Perpetuity	516
14.1	A Loan is Equivalent to a Series of Payments and the Principal Balance After the Payments	538



14.2	Placing the Focal Date at the Balance Date	538
14.3	The Composition of Mortgage Payments During a 25-Year Amortization	560
14.4	A Mortgage's Declining Balance During a 25-Year Amortization	560
15.1	Effect of Interest Rate Changes on Bond Prices	586
15.2	Expected Payments from a Bond	587
15.3	Bond Price versus Market Rate of Return for Two Maturities of 7% Coupon Bonds	591
15.4	Dependence of Bond Premium on Time to Maturity	592
15.5	Calculating a Bond's Price on Any Date	599
15.6	Price Change Over Time for a Bond Trading at a Premium	601
15.7	Price Change Over Time for a Bond Trading at a Discount	602

TABLE**List of Tables**

1.1	Provincial Sales Tax Rates (as of May 1, 2007)	32
3.1	Foreign Exchange Rates (noon, Toronto, April 12, 2007)	105
3.2	Currency Cross Rates (noon, Toronto, April 12, 2007)	105
6.1	The Number of Days in Each Month	206
6.2	The Serial Numbers for Each Day of the Year	207
7.1	Treasury Bill and Commercial Paper Rates (April 19, 2007)	250
8.1	Compounding Frequencies and Periods	278
8.2	Interest Rates (%) on Canada Savings Bonds	311
8.3	Strip Bond Price and Yield Quotations (December 1, 2006)	314
9.1	Strip Bond Price and Yield Quotations (December 1, 2006)	347
9.2	Forms of Income and Capital Gain from Various Types of Investments	365
9.3	Income and Price Data for Selected Stocks	367
9.4	Income and Price Data for Selected Mutual Funds	367
12.1	Distinguishing Characteristics of Annuity Categories	469
14.1	Column Headings for an Amortization Schedule	534
15.1	Relative Prices of \$1000 Face Value Bonds	585
15.2	Bond Price Quotations (February 27, 2007)	603

SECTION**Points of Interest**

1.2	Mathematical Abilities Expected for Courses Offered by the Institute of Canadian Bankers	10
2.4	A "Trick" Question	68
2.5	Pricejacks	74
2.5	Journalists' Difficulties with Numbers	78
3.2	Bigger Is Not Always Better	95
3.4	Card Tricks, Part 1—Keep Your Eye on the Exchange	107
3.5	Any Free Lunches?	113
4.2	When Late-Payment Penalties Really Are "Criminal"	135
4.4	Going for the Bait in Rebates	147



4.5	Misleading Price Representation	153
5.2	Break-Even Analysis as Part of a Business Plan	173
6.2	Card Tricks, Part 2—Taking More Interest	211
6.5	Consumers Often Defy Common Sense	229
7.4	Improving the Score on Your Credit Report	260
7.5	Repaying Student Loans is a Must	264
8.2	The “Magic” of Compound Interest	289
8.5	The RRSP Advantage	312
9.3	Not in Your Best Interest	354
9.3	Payday-Loan Operations Receive Unwanted Interest	357
9.5	False Profits and Bull Marketing	368
9.5	A 20% Gain Doesn’t Offset a 20% Loss	372
10.2	Your Potential to Become a Millionaire!	391
10.3	“Instant Millionaire”?	406
10.4	Card Tricks, Part 3—The “No-Interest, No-Payments-for-a-Year” Trap	415
10.5	\$1,000,000 Just for Kicks!	422
11.1	Reality Check	438
11.2	How the Rich Got Rich	451
11.3	Should You Choose “Cash Back” or Low-Interest-Rate Financing?	459
12.1	The Ten-Percent Solution for Achieving Financial Security	473
12.3	“Rent-to-Own” or “Rent Too Onerous”?	493
13.2	Such a Deal!	524
14.1	Just When You Thought You Had It All Figured Out ...	544
14.3	An Analysis of the Interest “Savings” from Choosing a Shorter Amortization Period	566
15.2	Short-term Investing in Long-term Bonds	587
16.6	What Investment Criteria Do Businesses Really Use?	654

CHAPTER

List of Cases

3	Calculations for an Investment Portfolio	121
5	Estimating the Contribution Rate in a Multi-Product Business	196
7	Debt Consolidation	268
9	Mountains of Money	379
11	Should You Borrow to Make an RRSP Contribution?	465
12	A “Lotto” Money	511
13	Should You Choose to Start Receiving the CPP Retirement Pension at Age 60 Instead of Age 65?	531