

Contents

1 Money	1
1.1 Interest	1
1.2 Present Value and APR	3
1.3 Mortgage Repayments: Annuities	5
1.4 Investing	8
1.5 Personal Finance	9
1.6 More Worked Examples	13
1.7 Exercises	15
Reference	18
2 Differential Equations	19
2.1 What They Are, How They Arise	19
2.2 First Order Equations	22
2.3 Second Order Equations with Constant Coefficients	27
2.4 Linked Systems	29
2.5 Exercises	33
References and Further Reading	38
3 Sport and Games	39
3.1 Lawn Tennis	39
3.2 Rugby	43
3.3 The Snooker Family	44
3.4 Athletics	45
3.5 Darts	47
3.6 Tournament Design	50
3.7 Penalty Kicks in Soccer	54
3.8 Golf: Flamboyance Versus Consistency	57
3.9 Exercises	58
References and Further Reading	63

4 Business Applications	65
4.1 Stock Control	65
4.2 Linear Programming	67
4.3 Transporting Goods	70
4.4 Jobs and People	74
4.5 Check Digits	76
4.6 Hierarchies in Large Organisations	77
4.7 Investing for Profits	81
4.8 More Worked Examples	83
4.9 Exercises	85
References and Further Reading	90
5 Social Sciences	91
5.1 Voting Methods	91
5.2 Voting Dilemmas	96
5.3 From the USA	98
5.4 Simpson's Paradox	100
5.5 False Positives	101
5.6 Measuring Inequality	102
5.7 More Worked Examples	105
5.8 Exercises	106
References and Further Reading	112
6 TV Game Shows	113
6.1 Utility	113
6.2 Monty Hall's Game	115
6.3 The Price Is Right	116
6.4 Pointless	118
6.5 Two Tribes	119
6.6 The Million Pound Drop	120
6.7 Deal or No Deal	121
6.8 The Weakest Link	122
6.9 The Colour of Money	123
6.10 Who Wants to Be a Millionaire?	125
6.11 Other Shows	126
6.12 Exercises	128
References	131
7 Gambling	133
7.1 Introduction	133
7.2 Lotteries	134
7.3 Roulette	138
7.4 The Horse Racing Family	142
7.5 Card Games	144

7.6 Premium Bonds 148

7.7 Exercises 149

References 151

Appendix: Useful Mathematical Facts 153

Index 157