



Mathematical Applications

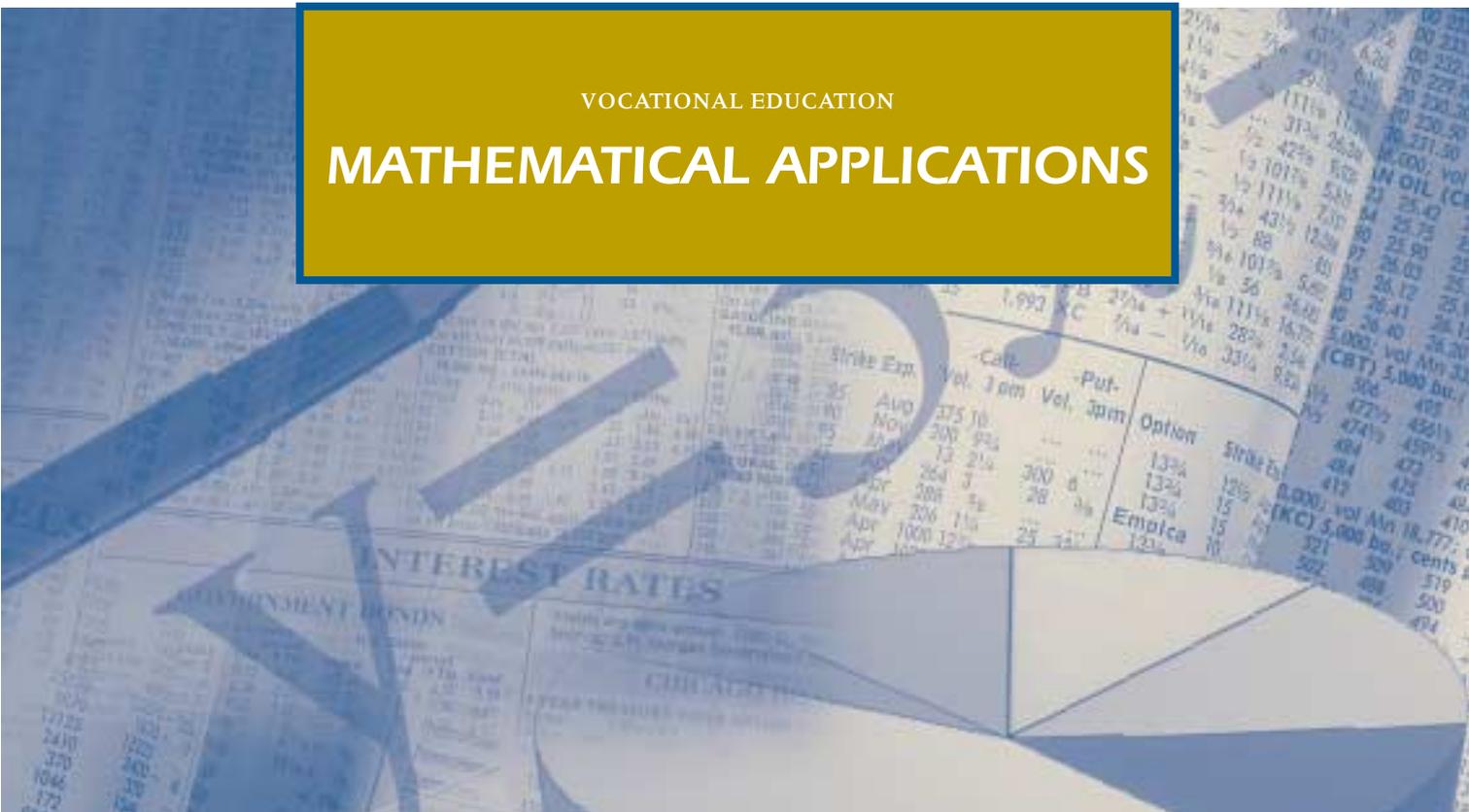


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APPLIED

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VOCATIONAL EDUCATION

MATHEMATICAL APPLICATIONS



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INTRODUCTION

RATIONALE

Mathematical Applications for the Leaving Certificate Applied is intended to prepare students for life, work, further education and a world where skills and knowledge require constant updating.

The course seeks to consolidate and improve students' mathematical knowledge, skills and concepts through practical, analytical, problem solving applications and through integration with other modules.

The modules reflect the applied nature of the Leaving Certificate Applied programme. They start with the students' experiences and seek to raise their enthusiasm for mathematics through the achievements and the skills they develop in dealing with mathematics in everyday life, work and play.

Students are encouraged to develop a work ethic where quality, accuracy and dependability are important.

NUMBER AND SEQUENCE OF MODULES

There are four modules, one in each session over the two years

YEAR 1

Module 1: Mathematics for Living

Module 2: Enterprise Mathematics

YEAR 2

Module 3: Mathematics for Leisure & Civic Affairs

Module 4: Mathematics for Working Life

DESCRIPTION OF MODULES

Any apparent repetition in the details of the modules is intended to reinforce and give a different perspective on similar topics.

Module 1 will seek to consolidate and improve students' mathematical knowledge through a practical approach and a variety of different methodologies where appropriate. Analytical and problem solving strategies will be developed with emphasis on accuracy and dependability.

Module 2 is intended to reinforce the mathematical knowledge and skills required for enterprise. It runs in parallel with the mandatory enterprise module in the Vocational Preparation section.

Module 3 will introduce students to mathematics associated with leisure activities. It will also introduce students to the mathematics associated with government, administration, civic rights and responsibilities.

Module 4 will revise and reinforce work done in previous modules and will introduce further concepts and skills relating to working life. It will allow time for revision of all modules in preparation for the personal reflection task and final examination.

GENERAL RECOMMENDATIONS

The modules should be taken in sequence. Within each module the order of units is discretionary to facilitate integration with other courses, tasks and current events. However unit one, module one, should be completed first to establish the proper use of the calculator from the beginning.

The use of the calculator is essential and it is recommended that all students should have the same model calculator in class.

The current affairs unit at the end of modules is a 'floating' unit to be covered once in the course of the four modules.

Active learning methodologies, including practical work, group work and out of school activities are essential.

Integration with other modules is part of the philosophy of the programme. All tasks are cross-curricular in nature and afford opportunities for the application of Mathematical Applications.

Furthermore in the case of the Vocational Education Tasks, Mathematical Applications is a specific requirement.

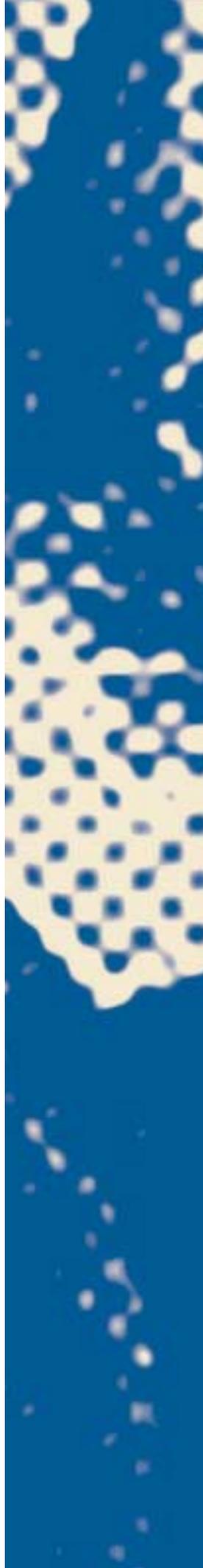
Students should work with real documents whenever possible (bills, pay slips, invoices, credit notes, lodgment forms, TFA certificates, brochures, catalogues, timetables etc.)

The Mathematical Applications course has many areas which can be effectively delivered through I.C.T. The Mathematical Applications and I.C.T. teachers should liaise to maximise this potential.

MATHEMATICAL APPLICATIONS

MODULE 1

MATHEMATICS FOR LIVING



MODULE 1:

MATHEMATICS FOR LIVING

PURPOSE

Students will develop their mathematical knowledge, concepts and skills through practical activities, and positive learning strategies employed in a disciplined learning environment.

PREREQUISITES

None.

AIMS

This Module aims:

- to review students' mathematical knowledge and skills
- to consolidate and reinforce previous mathematical knowledge and skills
- to set standards for the presentation of: work done, key assignments, and the application of mathematical applications in Tasks
- to provide a good foundation for everyday mathematics and the necessary practical mathematical abilities appropriate for entry to the workforce, further education or training.

UNITS

Unit 1: Approximation, Estimation, the Calculator and Strategies of Checking

Unit 2: Measurement – Linear – Area – Volume, Capacity and Weight

Unit 3: Measuring Time

Unit 4: Fractions, Decimals, Percentages and Ratio

Unit 5: House and Home Mathematics

Unit 6: Current Affairs

Unit 1: Approximation, Estimation, the Calculator and Strategies of Checking

LEARNING OUTCOMES

The student will be able to:

1. solve problems of rounding to the nearest whole number, place of decimal, pound, euro, cent, metre, kilogram etc.
2. apply methods of counting and tallying in practical situations
3. operate a calculator to solve problems involving $+$, $-$, \times , \div , $\%$, π , $\sqrt{\quad}$, x^2 , powers and brackets
4. use appropriate steps in exercises using extended operations.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ input and discussion with students on the expectations of the programme, modules, key assignments, participation and credits
- ▶ group work
- ▶ practical exercises
- ▶ worksheets
- ▶ demonstration
- ▶ present data in table format
- ▶ developing appropriate and effective use of the calculator is most important at this stage. This includes appropriate written record of work done with the calculator particularly where multiple operations are involved.

Possible strategies of checking

- *estimate then calculate*
- *calculate in a different order*
- *reverse the procedure*
- *how sensible is my answer?*
- *measure twice – cut once.*

Unit 2: Measurement – Linear – Area – Volume – Capacity – Weight

LEARNING OUTCOMES

The student will be able to:

1. identify and measure metric units of length, area, volume, capacity and weight and solve associated problems including conversion to imperial measure
2. identify and calculate the lengths of perimeters of various shapes
3. identify common shapes to include quadrilaterals, triangles, circles, regular polygons and combinations of shapes and calculate area, using appropriate formulae
4. distinguish between common solids – cube, prism, cylinder, pyramid, sphere and hemisphere and identify and use appropriate formulae to calculate volumes

TEACHER GUIDELINES

Possible approaches might include:

- ▶ estimate lengths, distances, areas, volumes, capacities and weights in real situations
- ▶ practical use of instruments of measurement for linear, area, volume, capacity and weight
- ▶ group work in discovery and identification of shapes, sizes, angle measurement, volumes and capacity
- ▶ practical work by individuals and groups in learning and discovering principles of measurement and applications in real situations
- ▶ finding out by doing
- ▶ verify the relationship between the diameter and circumference of a circle and identify π
- ▶ using equipment and instruments such as scale rule, vernier or caliper rule, trundle wheel, opisometer, rotameasure and measuring tapes

Unit 2: Measurement – Linear – Area – Volume – Capacity – Weight (Continued)

LEARNING OUTCOMES

5. estimate the weight of common products and use equipment (manual and electronic) to weigh and hence solve problems which involve addition, subtraction multiplication and division of weight.

TEACHER GUIDELINES

- ▶ experimenting, recording, analysing and discovering
- ▶ use displacement in water technique to find volume and capacity
- ▶ practical individual and group activities
- ▶ extensive use of the calculator
- ▶ using π from the calculator
- ▶ record work done with calculator
- ▶ use conversion programme and other relevant software on computer if available
- ▶ present reports and data on work done and practical applications.

Unit 3: Measuring Time

LEARNING OUTCOMES

The student will be able to:

1. differentiate between twelve hour and twenty four hour time systems and convert between them
2. convert minutes to decimal of hour and seconds to decimal of minute format and vice versa
3. interpret information from calendars, timetables, schedules, rosters, timesheets, cooker timers, etc. and calculate intervals using twelve or twenty-four hour systems
4. convert between days, weeks, months and years
5. compute or compare the time in different time zones and apply to real situations.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ group discussion
- ▶ practical applications
- ▶ role play – preparing for event which requires accurate scheduling
- ▶ generate timetables for events – study – sports day – week-end away – etc.
- ▶ interpreting actual timetables, schedules, etc.
- ▶ recording times and analysing events.
- ▶ keep time records of events – task time – work experience time – timesheet – timetable
- ▶ use and set timing devices – stop watch – alarms – videos – cookers – etc.
- ▶ timing events over long and short periods – growth of a plant each day over a month – a race among students or on television
- ▶ use the calculator in solving problems relating to time
- ▶ present data in table format
- ▶ record work done with calculator.

Unit 4: Fractions, Decimals, Percentages and Ratio

LEARNING OUTCOMES

The student will be able to:

1. manipulate simple fractions through addition, subtraction, multiplication and division and convert fractions to decimals and vice versa
2. select appropriate number of places of decimal and round correctly
3. interpret and solve problems of ratio and direct and indirect proportion involving common occurrences
4. interpret and solve problems involving % such as those involved in selling price, cost price and profit.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ setting the calculator to a given number of places of decimal
- ▶ relate to money, measurements and time
- ▶ group discussion
- ▶ worksheets
- ▶ information booklets, pamphlets and leaflets
- ▶ extensive use of the calculator
- ▶ real life examples
- ▶ record work done with calculator
- ▶ present data using charts and tables.

Unit 5: House and Home Mathematics

LEARNING OUTCOMES

The student will be able to:

1. compare prices for similar goods with differing quantities and identify the better value
2. compile a simple household budget for a given period of time to include a minimum of six cost elements and analyse figures with a view to adjusting a budget relative to income available
3. convert annual salary or wages to monthly and weekly and vice versa
4. read household meters and make calculations on usage over fixed periods
5. perform calculations related to household bills and understand the layout and terms used in such bills (gas, electric, telephone, etc.)
6. apply the skills of mathematics to household repairs, measurement and home improvements e.g. measuring for new curtains, allowing for pleats etc. measuring for carpets, wallpaper, lino etc.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ group discussion and debate
- ▶ practical activities
- ▶ visit to shop or supermarket
- ▶ extensive use of the calculator
- ▶ estimate through rounding up and down
- ▶ present findings in a suitable format
- ▶ record and analyse pricing practise in the sale of goods and determine the better value
- ▶ apply the skills and knowledge of this module to everyday occurrences in the home
- ▶ use of spreadsheet and other appropriate software
- ▶ students should work with real documents whenever possible. (bills, pay slips, invoices, credit notes, lodgment forms, TFA certificates, brochures, catalogues, timetables, etc.)
- ▶ a plan to redecorate a room to include measurements and costings for materials.

Unit 6: Current Affairs

LEARNING OUTCOMES

The student will be able to:

1. recognise mathematical applications in current affairs
2. interpret basic proposals in the annual government budget insofar as they relate to personal and household finances and social welfare
3. discuss the basic principles of mathematics in elections and make appropriate calculations in situations of fifty percent plus one
4. relate mathematical applications to everyday occurrences, local elections, club elections, school elections, budgets, taxation, etc.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ using this unit which is included at the end of each module to assist students to understand and appreciate the use of mathematics in their lives – it is best introduced when there is a suitable current affairs topic and this may be at any time over the two years
- ▶ class discussion to bring current affairs into mathematics as a means of giving real meaning to mathematical applications
- ▶ case study of the mathematics in a local election or other similar event and the use of percentages
- ▶ statistical aspects of environmental issues
- ▶ mathematics relating to other modules and tasks and the mathematics required therein or to other curricular areas
- ▶ use of newspapers, almanacs, magazines, multi-media resources, the internet, etc.
- ▶ use of spreadsheet and other appropriate computer software.

NB further development of elections in module three

RESOURCES

See end of manual.



KEY ASSIGNMENTS

MODULE 1: MATHEMATICS FOR LIVING

Students must complete at least four key assignments from the following list for module one:

CHECKLIST

I have completed and recorded an exercise in counting and tallying which was cross-checked by other members of my class.

I have estimated the length, width and height of several pieces of furniture at home and checked these measurements using a measuring instrument and I have made a table of my results.

I have co-operated with another student in measuring a number of diameters and circumferences of circles and then finding π . I recorded my results and then used the formula $A = \pi r^2$ to find the surface area of the discs.

I worked with another student and looked up timetables for buses and/or trains and calculated the time it would take to get to several other places in Ireland, away from home. I made a time table showing all the times including stop over time.

I made a table to record the heights of students in my class. I then made a grouped table showing the number of students in various height intervals and I wrote each down as a fraction of the total. I then used the calculator to convert the fractions to decimals and then converted the decimals to percentages.

I made a table to record the units used, as given on a household bill (telephone, gas, electric or other such) over a six month period. I made a graph to illustrate the usage. I calculated the total paid for the period. I calculated the average daily usage for the period and the average cost per day.

MODULE 2

ENTERPRISE MATHEMATICS

MODULE 2:

ENTERPRISE MATHEMATICS

PURPOSE

Students will continue to develop their mathematical knowledge, concepts and skills and a systematic approach to Mathematical Applications, problem solving, research, analysis and presentation skills. This module is set to coincide with the Vocational Preparation mandatory module on Enterprise and every effort should be made to integrate the two.

PREREQUISITES

Module 1: Mathematics for Living.

AIMS

This module aims:

- to help students understand the mathematical issues encountered by self employed people and small enterprises.

UNITS

Unit 1: Wages and Salaries

Unit 2: Business Transactions

Unit 3: Keeping Records

Unit 4: Foreign Business Transactions

Unit 5: Planning for Business and Monitoring

Unit 6: Presentation and Analysis

Unit 7: Current Affairs

Unit 1: Wages and Salaries

LEARNING OUTCOMES

The student will be able to:

1. calculate gross wages and salaries derived from time at a rate per hour, overtime, piecework, allowances (shift work etc.), bonuses and expenses
2. calculate basic tax free allowances, taxable income at current rates, deductions such as PAYE – PRSI – union – pension fund – insurance etc. and take home pay
3. solve wage calculations using time including conversion of minutes to decimal of an hour
4. analyse a small number of net wage amounts into notes and coins for payments in cash.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ group discussions
- ▶ small group activities
- ▶ use of actual time cards, time sheets, payslips, TFA certificates, P60, P45 etc.
- ▶ reference to the annual budget
- ▶ budget analyses in newspapers and handouts from banks and other sources
- ▶ practical work on coin analysis
- ▶ use of the calculator and recording steps
- ▶ Use of spreadsheets and other appropriate computer software.

Unit 2: Business Transactions

LEARNING OUTCOMES

The student will be able to:

1. make out invoices for a small number of items adding on VAT, carriage or other charges
2. calculate a cost price from given information including for example – materials, labour cost, machining cost, overheads, etc
3. calculate a selling price from given cost plus profit margin plus VAT
4. calculate the cost to a customer with selling price plus other elements e.g. postage, courier, carriage, etc.
5. calculate the cost price from a selling price when the mark up in percentage is known – unit cost = 100%
6. calculate “as a percentage of” – e.g. wages as a percentage of cost, overheads as a percentage of cost, materials as a percentage of cost price etc.
7. tabulate information in spreadsheet form for costing a product or a service under such headings as materials, labour, overheads, administration, VAT and profit.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ using actual invoices or realistic replicas
- ▶ analysing invoices, bills, accounts etc.
- ▶ working closely with the Enterprise teacher, the Office Administration and Customer Care teacher and the Information Technology teacher
- ▶ activities which reflect real life situations
- ▶ invite a business visitor to a discussion with students
- ▶ assist the Enterprise module
- ▶ a possible case study of a small enterprise
- ▶ record work done with calculator
- ▶ use of spreadsheets and other appropriate computer software
- ▶ If available transfer to computer spread sheet and adjust figures to see knock on effects.

Unit 3: Keeping Records

LEARNING OUTCOMES

The student will be able to:

1. analyse a bank statement relative to cheque book entries and reconcile the two in the context of standing orders, direct debits, bank charges etc.
2. make out a lodgment form for monies having a variety of cheques, notes and coins in pounds and for monies having a variety of cheques, notes and coins in euro
3. keep simple records of real or imaginary income from an enterprise or a small business under headings such as cash sales, payments on invoices, credit for returns, loans, etc
4. keep simple records of real or imaginary expenditure from an enterprise or a small business under headings such as payments on invoices, petty cash, rent, overheads, wages, bank charges, etc
5. Make out cheques, withdrawal forms, direct debit forms, bank draft application forms, etc.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ a visit to a bank or a visit from a banker to discuss the areas covered by the learning outcomes in units three and four
- ▶ use actual lodgment/giro forms and other real documents where possible
- ▶ practical activities in counting monies for lodgement etc.
- ▶ use simple recording sheets for income and expenditure
- ▶ use of spreadsheets and other appropriate computer software
- ▶ working closely with the Enterprise teacher in vocational preparation module, the Office Administration and Customer Care teacher and the Information Technology teacher.

Unit 4: Foreign Business Transactions

LEARNING OUTCOMES

The student will be able to:

1. identify currencies of common trading countries
2. identify some of the states of the European Monetary Union
3. use the set exchange rate to convert pounds to euro and vice-versa
4. use rates of exchange to convert between currencies and calculate additional charges, using advertised or quoted rates when changing between currencies
5. use buy and sell rates for currency conversion.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ a bank or business visitor for units three and four
- ▶ samples of other currencies brought in by students
- ▶ leaflets and posters from banks and EU publications on the introduction of the euro
- ▶ a strategic study on a business transaction with a foreign company involving invoices, foreign exchange, bank drafts etc.
- ▶ a strategic study on a delivery by road to a foreign country involving ferry cost, expenses (meals, bed and breakfast motor fuel etc), converting to currencies on route, emergency cash, etc.
- ▶ record work done with calculator
- ▶ costings such as those in unit two, where materials are sourced abroad, and/or goods or services are to be exported.

Unit 5: Planning for Business and Monitoring

LEARNING OUTCOMES

The student will be able to:

1. analyse some basic elements which make up capital expenditure in a small enterprise
2. analyse some of the basic elements which make up current expenditure in a small enterprise
3. analyse some of the basic elements from which income is derived in a small enterprise
4. make up income and expenditure for a given period using given figures
5. make up a simple budget for a given period for a small enterprise or club
6. present a simple cash flow forecast for a small enterprise or club
7. record income and expenditure for the enterprise in the enterprise module and balance the account at the end of a period.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ group discussion
- ▶ visitor from small business or club treasurer
- ▶ look at some case studies and analyse
- ▶ assisting research in the enterprise module
- ▶ practical application in the enterprise module in the Vocational Preparation course
- ▶ using samples from real situations – school shop – credit union report – club financial report – etc.
- ▶ use of spreadsheets and other appropriate computer software.

Unit 6: Presentation and Analysis

LEARNING OUTCOMES

The student will be able to:

1. present figures for accounting in table and other suitable formats
2. draw graphs and bar charts to show the numbers of a product sold for regular periods, daily, weekly, monthly as appropriate and predict, from trend graphs, the number of products likely to be required for the next period
3. draw graphs/charts to show the value of sales of products and the likely trends
4. draw bar and/or pie charts to compare the sales of a number of products over the same period
5. calculate the share of the market in percentage terms for known or imaginary product sales and chart as appropriate
6. make oral presentations using tables/charts.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ using a visitor to develop discussion and show examples
- ▶ use case studies
- ▶ practical applications in the enterprise module in vocational preparation
- ▶ use of real documents, reports, accounts for clubs, etc.
- ▶ use of spreadsheet, statistics software or other computer programmes
- ▶ use of slide projection software/overhead projector etc.

Unit 7: Current Affairs

LEARNING OUTCOMES

The student will be able to:

1. recognise mathematical applications in current affairs
2. interpret basic proposals in the annual government budget insofar as they relate to personal and household finances and social welfare
3. discuss the basic principles of mathematics in elections and make appropriate calculations in situations of fifty percent plus one
4. relate mathematical applications to everyday occurrences, local elections, club elections, school elections, budgets, taxation etc.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ using this unit which is included at the end of each module to assist students to understand and appreciate the use of mathematics in their lives – it is best introduced when there is a suitable current affairs topic and this may be at any time over the two years
- ▶ class discussion to bring current affairs into mathematics as a means of giving real meaning to mathematical applications
- ▶ case study of the mathematics in a local election or other similar event and the use of percentages
- ▶ statistical aspects of environmental issues
- ▶ mathematics relating to other modules and tasks and the mathematics required therein or to other curricular areas
- ▶ use of newspapers, almanacs, magazines, multi-media resources, the internet etc.
- ▶ use of spreadsheet and other appropriate computer software.

RESOURCES

See end of manual.



KEY ASSIGNMENTS

MODULE 2: **ENTERPRISE MATHEMATICS**

Students must complete at least four key assignments from the following list for module two:

CHECKLIST

I made up a wages amount from information on time, rates per hour and overtime. I calculated taxable pay when given gross income and tax free allowance. I calculated tax payable for the period. I calculated total deductions and net pay from given figures and gross wages.

I made out an invoice for at least six items, added on VAT and a carriage charge and gave the total invoice amount.

I made out a lodgment based on a case study where amounts were in coins, notes, cheques and euro cheques and I used the conversion rate to present the total lodgment in pounds.

I worked in a group where each one of us converted five different amounts, in pounds, to a different foreign currency and then converted that foreign currency to euro. We then converted these to U.S. Dollars.

I worked with a group to agree a budget for a small club. Income would come from members' subscriptions, a window cleaning fund-raiser and a cake sale. Expenses would include bus rental, prizes, replacement equipment and postage (or other similar). I kept records of our final budget.

I recorded information of business transactions and used graphs and charts to make an oral presentation to the class.

MODULE 3

**MATHEMATICS FOR LEISURE
AND CIVIC AFFAIRS**

MODULE 3:

MATHEMATICS FOR LEISURE AND CIVIC AFFAIRS

PURPOSE

Students will continue to develop their mathematical knowledge, concepts and skills and will begin to develop a systematic approach to mathematical applications, problem solving, research, analysis and presentation skills.

PREREQUISITES

Module 1: Mathematics for Living.

Module 2: Enterprise Mathematics.

AIMS

This Module aims to enable the students:

- to further develop their understanding of mathematical concepts
- to further develop their mathematical knowledge and skills
- to explore mathematical issues in relation to their social and future adult working life.

UNITS

Unit 1: The Mathematics of Games and Sport

Unit 2: Geometry and Sport

Unit 3: Leisure Time Mathematics

Unit 4: Holiday and Travel Mathematics

Unit 5: Elections

Unit 6: Current Affairs

Unit 1: The Mathematics of Games and Sport

LEARNING OUTCOMES

The student will be able to:

1. identify units of distance, time and speed and analyse the relationship between distance, time and speed
2. use formulae to calculate distance, time and speed
3. interpret result tables for a number of popular sports, compare statistical data and tabulate results
4. gather information, tabulate and analyse data and present as statistics in graph and chart formats
5. tabulate data in the form of a frequency distribution table
6. calculate averages – mean, median and mode
7. perform a number of practical exercises to estimate the probability of an occurrence by repeated experiment
8. calculate simple probability involving equally likely outcomes.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ group discussion on distance, time and speed measuring in sports
- ▶ group work and presentation on mathematical aspects in different sports
- ▶ using instruments to measure time, distance and hence calculating speed
- ▶ investigate reaction times in relation to various circumstances
- ▶ checking and analysing sport results from newspapers, almanacs, record books, internet, CD ROM, etc.
- ▶ practical exercises with dice and cards to introduce statistics and probability
- ▶ designing suitable table formats when gathering and presenting statistics
- ▶ record and present results of probability tests
- ▶ use and record work done with calculator
- ▶ use of spreadsheet, statistics software, probability modelling software etc.

Unit 2: Geometry and Sport

LEARNING OUTCOMES

The student will be able to:

1. identify a variety of shapes relating to sporting activities and construct or draw, full size or to scale, a variety of regular shapes common to games or sports
2. divide a disc into regular radial intervals around the centre point. Measure and record angle sizes formed at the centre and at the circumference
3. draw and explain the common relationships of angles in circles – angles at the centre to angles at the circumference, standing on the same arc, standing on a diameter (angle in semi-circle)
4. identify and illustrate the important relationships of angles in squares, rectangles, parallelograms and triangles
5. verify the theorem of Pythagoras, by measurement and construction and apply the theorem to solve straight forward problems
6. verify the 3:4:5 right angled triangle principle and apply it to practical situations
7. solve simple problems of gradient.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ examining the shapes and geometry of board games, sports equipment, play areas and sports fields (dart board, archery target, tennis court, basketball court, shot putt/discus/hammer throwing areas, etc) and make presentations to the class
- ▶ construct a play area to scale
- ▶ construct common triangles
- ▶ investigate a variety of triangles and angles
- ▶ use the 3:4:5 principle to mark out a sports area
- ▶ integrate with the Leisure and Recreation course on many aspects of this unit
- ▶ use of scale rule, trundle wheel, rotameasure, and drawing equipment
- ▶ link with the outdoor education of the Leisure and Recreation course to include use of the compass, estimates of time based on distance, climb (gradient) and terrain
- ▶ use a map compass to plot courses, determine location and indicate general directions
- ▶ translate and apply scale from drawings and maps to determine actual lengths
- ▶ use of calculator and presenting work done on the calculator in a step by step flow chart
- ▶ use of dynamic geometry, CAD or other computer software.

Unit 3: Leisure Time Mathematics

LEARNING OUTCOMES

The student will be able to:

1. analyse prices from a variety of sources including advertisements, brochures, catalogues, menus, etc. and budget for events taking account of discounts, special offers, hidden costs, supplements, service charges, etc.
2. estimate bills and change expected in social situations
3. plan a full cost analysis for a group social event and convert to cost per person and make a presentation for members of the group listing the expenses and explaining the figures shown.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ group discussion and shared research
- ▶ recounting experiences
- ▶ costing a school trip for a group and reducing to per person basis
- ▶ costing for a social outing, individual, pair and small group sharing elements such as taxi, etc.
- ▶ making a budget for the holiday period looking at possible income and proposed holiday expenditure
- ▶ practical exercises in groups on estimating change when purchasing a number of items
- ▶ extensive use of calculator and presentation of calculator work.

Unit 4: Holiday and Travel Mathematics

LEARNING OUTCOMES

The student will be able to:

1. interpret information from a variety of sources including holiday brochures, advertisements, schedules (rail, road, sea and air), analyse costs and combine to get a net cost analysis and compare cost with alternatives
2. convert various currencies to pounds and euro and vice-versa and use exchange rate (buy and sell) quotes to convert to different currencies
3. estimate cost of goods and services in foreign currencies and compare with local cost
4. research actual costs and prepare a budget for a foreign trip or holiday
5. compute the time in other time zones relative to times locally
6. interpret climate charts, graphs and tables; convert between Fahrenheit and Celsius using conversion tables or given formula
7. know the average seasonal land and sea temperatures in Ireland.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ group discussion and sharing experiences – remember sterling is a foreign currency
- ▶ individual research presented to the group
- ▶ group research and plan a possible trip.
- ▶ check current rate of exchange for a variety of currencies and convert both ways
- ▶ check buy and sell rates at bank, bureau de change or in newspapers and use in study
- ▶ compare times in different zones from diaries, almanacs etc. and do calculations to confirm
- ▶ compare temperatures in brochures and newspapers and compute difference
- ▶ use computer conversion programme if available
- ▶ use of calculator.

Unit 5: Elections

LEARNING OUTCOMES

The student will be able to:

1. discuss the concept of election in relation to mathematics, calculate the 50% + 1 to elect a candidate using simple majority and calculate the percentage of the poll obtained by each candidate in an election
2. count and record results of a school or class election
3. illustrate results of an election in graphic form
4. compute results when voting on issues – simple majority, two thirds majority
5. outline the PR system and make relevant calculations such as calculating the quota etc.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ class discussion
- ▶ shadow an election
- ▶ analyse newspaper reports if there is an opportunity
- ▶ relate to elections in clubs, credit unions, unions, etc.
- ▶ keep in touch with the Social Education module on Contemporary Issues
- ▶ simple majority when voting on issues in clubs etc.
- ▶ conduct an election within a class, year or school under simple majority rules and with a minimum of four candidates
- ▶ conduct a simple election using the PR system with a minimum of four candidates, determine the quota and do a count for two seats and present the results in numerical and graphical forms
- ▶ use of spreadsheet to analyse opinion polls and election results.

Unit 6: Current Affairs

LEARNING OUTCOMES

The student will be able to:

1. recognise mathematical applications in current affairs
2. interpret basic proposals in the annual government budget insofar as they relate to wages and tax
3. discuss the basic principles of mathematics in elections and calculate in situations of fifty percent plus one
4. relate mathematical applications to everyday occurrences, local elections, club elections, school elections, budgets, taxation etc.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ using this unit which is included at the end of each module to assist students to understand and appreciate the use of mathematics in their lives – it is best introduced when there is a suitable current affairs topic and this may be at any time over the two years
- ▶ class discussion to bring current affairs into mathematics as a means of giving real meaning to mathematical applications
- ▶ case study of the mathematics in a local election or other similar event and the use of percentages
- ▶ statistical aspects of environmental issues
- ▶ mathematics relating to other modules and tasks and the mathematics required therein or to other curricular areas
- ▶ use of newspapers, almanacs, magazines, multi-media resources, the internet, etc.
- ▶ use of spreadsheet and other appropriate computer software.

RESOURCES

See end of manual.



KEY ASSIGNMENTS

MODULE 3: MATHEMATICS FOR LEISURE AND CIVIC AFFAIRS

Students must complete at least four key assignments from the following list for module three:

CHECKLIST

I used a stop-watch to time a race over a known distance. I calculated the average speed in km per hour and kept a detailed record. I made an oral presentation to the class.

As part of a small group I researched, recorded and tabulated scores in a sporting event over a period of time and I made a presentation of the findings.

I looked up dimensions for a sports area and drew it to scale using mathematical instruments.

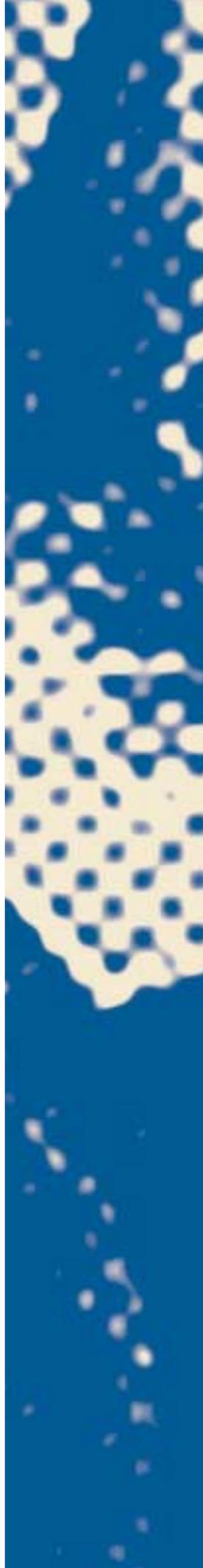
I was a member of a group that researched the costs for a group event and prepared a report for the class. I recorded my contribution and the group results and I took part in the presentation to the whole class.

I got information on holidays in a foreign country and prepared a budget for the travel costs, accommodation and spending money I would need. I calculated the total in pounds and converted this into a foreign currency using exchange rate tables. I also investigated and reported on the climate of the destination country in comparison with Ireland.

I investigated a recent (or last) election (local, national or European) conducted under the PR system. I recorded all the facts relating to the number of seats, the number of candidates, the electorate, the number who voted and the spoiled votes. I calculated the quota and compared this with the first preference votes for each candidate, noting by how much each had exceeded the quota or were short of the quota. I recorded the total first preference votes for each candidate. I converted these to percentages of the total valid poll and made out a bar chart and a pie chart to illustrate my findings.

MODULE 4

MATHEMATICS FOR WORKING LIFE



MODULE 4:

MATHEMATICS FOR WORKING LIFE

PURPOSE

Students will develop mathematical knowledge, concepts and skills, which are relevant in the workplace. The emphasis will be on developing skills for recording mathematical information to a high degree of accuracy and dependability and solving problems based on research information.

PREREQUISITES

- Modules 1: Mathematics for Living.
- Module 2: Enterprise Mathematics.
- Module 3: Mathematics for Leisure and Civic Affairs.

AIMS

This Module aims:

to consolidate and reinforce previous knowledge and skill

to develop in students a more in-depth understanding of the calculations required in processing wage and salary entitlements

to help students to learn the basics of metering, measuring, recording and presentation of numerical data and to interpret and work with such data

to give students an opportunity to complete a personal reflection presentation relating to mathematical applications

to prepare students for their final examination in mathematical applications.

UNITS

Unit 1: Wages and Salaries

Unit 2: Numerical Reading, Recording and Presentation

Unit 3: Money Matters in the World of Work

Unit 4: Government Budget

Unit 5: Examination Preparation and Personal Reflection

Unit 6: Current Affairs

Unit 1: Wages and Salaries

LEARNING OUTCOMES

The student will be able to:

1. solve problems on basic wages and salaries as outlined in module two unit one
2. identify relevant allowances from a list and calculate total tax free allowance and hence taxable pay
3. calculate PRSI given the appropriate rate or table without reference to limits or complications
4. distinguish between gross amount for PRSI deductions and taxable amount for PAYE
5. make up wages when given all the relevant information and an appropriate template
6. calculate yearly amounts for total gross wages, total tax paid, total other deductions and net annual income, at given rates or from monthly returns.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ research to find current rates from bank handouts – Revenue Commissioners information leaflets – newspapers, etc.
- ▶ discussion on take home pay
- ▶ visit from a young employed person on experiences with pay and deductions
- ▶ small groups reading and interpreting information from various sources
- ▶ use of real documents - time cards – pay slips – TFA forms – P45 – P60 and other appropriate forms
- ▶ wages on computer, the use of spreadsheet, software packages, etc.

Unit 2: Numerical Reading, Recording and Presentation

LEARNING OUTCOMES

The student will be able to:

1. use a variety of metering and recording instruments to make a series of readings and tabulate the results
2. analyse data recorded at regular intervals and represent the results in table, chart and graph formats
3. read common meters periodically and determine the variations for the periods and analyse for trends
4. use scale rules to convert scaled measurements to actual measurements
5. convert lengths on maps to actual distance within relative tolerances
6. use principles of ratio and proportion to increase or decrease amounts in a variety of units.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ group discussion
- ▶ practical reading, recording and presenting data from a variety of instruments such as electricity or gas meters, stop watch, pyrometer, weighing scales, electronic scales, vernier calipers, scale rule, pressure gauge, thermometers, tachograph, etc.
- ▶ applications of ratio and proportion in real work situations
- ▶ research – on going such as shadowing occurrences at home or at work experience or past events such as the use of electricity in a home based on the previous twelve months bill readings
- ▶ record work done with calculator
- ▶ use of computer with appropriate recording and presentation software
- ▶ use of computer/graphics calculators with data capture, metering accessories and associated software
- ▶ use of statistical software, spreadsheets, etc.

Unit 3: Money Matters in the World of Work

LEARNING OUTCOMES

The student will be able to:

1. apply the mathematics of previous modules to the world of work – buying and selling goods – borrowing and investing – manufacturing – services – etc.
2. prepare a quotation for a job given fixed costs, rates for labour and materials, percentages for VAT and profit margin
3. carry out a stock taking exercise and estimate the value of the stock
4. revise the work done in the enterprise module
5. calculate compound interest
6. analyse the relative merits or otherwise of hire purchase, overdraft or leasing in the purchase of an expensive piece of equipment (truck, fork lift, machine, test bench, etc.)

TEACHER GUIDELINES

Possible approaches might include:

- ▶ class discussion and the application of mathematics, observed by students at work experience
- ▶ problem solving
- ▶ make out a quotation – this might be a reflection of the costs of a task from an earlier module which involved materials and estimates of other costs if a quantity of the product or service was to be provided
- ▶ a stock take might be done of all the furniture and fittings in a room or some other real and relevant stock take
- ▶ look up charts or tables from commercial institutions showing repayments at compound interest rates
- ▶ Research and analyse the cost of capital using different approaches – HP, lease, long term loan, overdraft, etc.
- ▶ Use of spreadsheets and other computer software for quotations, costings, compound interest, etc.

Unit 4: Government Budget

LEARNING OUTCOMES

The student will be able to:

1. analyse large monetary figures and use conventions to prevent mistakes (£1m, £10k, £12.5k, £234,321,456 etc) and rounding off to the nearest million, thousand, etc
2. calculate percentages under various headings in budget figures and interpret charts and graphs on budget statistics
3. define personal income and calculate basic allowances in straight forward cases
4. analyse tax bands and calculate taxable pay
5. calculate PAYE for given incomes in different tax bands, incorporating table allowances, standard rating of allowances etc.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ class discussion on who pays for government services
- ▶ class discussion on types of taxes, social insurance, VAT, licences and other forms of tax
- ▶ handling very large numbers – investigate the buying power of very large sums of money (million, billion etc). What does it cost to build a school, run a hospital for a year, build a motorway, provide social services for a year etc?
- ▶ what could be done with the money it costs to buy a fighter plane?
- ▶ shadowing the debates on the budget in the class
- ▶ budget day analyses – simplified version
- ▶ calculate a typical take home pay
- ▶ Use of spreadsheets and other computer software for quotations, costings, compound interest, etc.

Unit 5: Examination Preparation and Personal Reflection

LEARNING OUTCOMES

The student will be able to:

1. review the elements of the modules and identify weak points for clarification and remedial action
2. review all the elements of the previous modules and prepare a presentation to reflect the main experiences and achievements and the possible applications to future plans for education and work
3. review sample and past papers and prepare appropriately.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ group discussion on each of the modules and individual personal evaluation
- ▶ some exercises to represent the most important elements of each module
- ▶ a review of portfolios
- ▶ a review of key assignments
- ▶ a review of the contribution that mathematical applications made to other modules and to tasks
- ▶ a review of the other modules which contributed to mathematical applications
- ▶ an assessment of personal feelings towards mathematics.

Unit 6: Current Affairs

LEARNING OUTCOMES

The student will be able to:

1. recognise mathematical applications in current affairs
2. interpret basic proposals in the annual government budget insofar as they relate to wages and tax
3. discuss the basic principles of mathematics in elections and calculate in situations of fifty percent plus one
4. relate mathematical applications to everyday occurrences, local elections, club elections, school elections, budgets, taxation etc.

TEACHER GUIDELINES

Possible approaches might include:

- ▶ using this unit which is included at the end of each module to assist students to understand and appreciate the use of mathematics in their lives – it is best introduced when there is a suitable current affairs topic and this may be at any time over the two years
- ▶ class discussion to bring current affairs into mathematics as a means of giving real meaning to mathematical applications
- ▶ case study of the mathematics in a local election or other similar event and the use of percentages
- ▶ environmental concerns in statistical form to enhance elements of mathematical applications
- ▶ current affairs mathematics can also be taken to mean mathematics relating to other modules and tasks and the mathematics required therein.

RESOURCES

ACTIVE LEARNING STATIONS

Active Learning Stations are physical resources where students learn through active, practical, experiential, exploratory, investigative and problem solving methods. (JEM Presentations, Dunshaughlin)

BOOKS (available 1999)

Practical Mathematics. A course for Transition Year

by O.D. Morris Celtic Press.

Mathematics for the future by Nelson. Miller & Newman.

ISBN0 17 4385366

Numbers at Work by John Gillespie National Extension College.

ISBN 0 86082 1552

Calculators in Secondary Schools Cambridge University Press

ISBN 0-521-31126-8

Real Life Maths Skills Heinemann ISBN 0-435-105

Enterprising Mathematics ISBN 0-435-575179

Complete mathematics for GCSE and Standard Grade

by David Rayner. Oxford Press

Mathematics The basic Skills

by Stanley Thornes Llewellyn & Greer ISBN 0-7487-2509-1

CALCULATOR

It is recommended that each member of the class use the same model – a visual display of formula and results is also recommended

Most of the calculator manufacturers have web sites, which include worksheets, support sheets, activities, etc. which can be downloaded

CONCRETE MATERIALS AND RESOURCES

A vast amount of materials and equipment is available from a wide range of suppliers - see catalogues from HOPE (Kylemore Road, Dublin), HELIX (ref. David Scales, 32 Riverdale Avenue, Old Lucan Road, Dublin 20), OPITEC (7 West Road, Woolston, Southampton), Classroom Resources, (9 Logan Road, Bristol), Shaw Scientific.

IT**Computer Software which includes**

- Spreadsheets
- Graphics Packages
- Statistical Software
- Dynamic Geometry Package (including Geometers Sketch Pad and CABRI)
- Probability modelling software

Internet

as a source of information on statistics, travel information, accommodation, climate, Government information, sports statistics and information, current affairs, employment, etc.

Multi-media Resources

- CD ROM
- Encyclopaedias
- Almanacs
- Route Planners, etc.

PROFESSIONAL ASSOCIATIONS

Irish Maths Teachers Association, Association of Teachers of Mathematics (ATM) have newsletters and resource materials. They also have newsletters on topics of interest, new materials and resources.

PUBLICATIONS

Journals, newsletters, publications, etc. from Mathematical Associations.

Newspapers and magazines as sources of information current affairs, sport, travel, etc.

Almanacs, encyclopaedias, etc

REAL DOCUMENTS

Banks, Building Societies, Government Departments, Local Authorities, Revenue Commissioners as well as local businesses and industries will generally supply small quantities for educational purposes free to schools.



KEY ASSIGNMENTS

MODULE 4: MATHEMATICS FOR WORKING LIFE

Students must complete at least four key assignments from the following list for module four:

I computed and presented all the figures for a wages slip showing details of earnings and deductions.

I used a spreadsheet to 'sum' amounts and to do some formulae calculations.

I carried out a small stocktaking exercise, estimated the cost of the items and made a presentation of my work.

I tabulated and presented results from a periodic study/research exercise which required the use of at least one piece of measuring or metering equipment.

I calculated the price for a job which included estimates for labour, materials, overheads, VAT and a profit margin.

I reviewed my work for the four modules and made a presentation reflecting how much I achieved and where mathematical applications might help me in future.

CHECKLIST



Published by The Stationery Office
To be purchased directly from:
Government Publications Sales Office,
Sun Alliance House,
Molesworth Street, Dublin 2.
Or by mail order from:
Government Publications, Postal Trade Section,
4-5 Harcourt Road, Dublin 2.
Tel: 01-647 6834/5 Fax: 01-475 2760
Or through any bookseller.
Price: £1.50



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