-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

HIGHER NATIONAL UNIT SPECIFICATION

GENERAL INFORMATION

-Unit Number- **7481664**
-Superclass- **RB**

-Title- **MATHEMATICS FOR BUSINESS**

-DESCRIPTION-

GENERAL COMPETENCE FOR UNIT: Formulating, solving and interpreting solutions of mathematical models for problems in relation to business and commerce.

OUTCOMES

1 solve business problems by the solution of equations;

2 solve business problems involving cost and revenue functions;

3 solve financial mathematics problems.

CREDIT VALUE: 1 HN Credit

ACCESS STATEMENT: Access to this unit is at the discretion of the centre. However, it would be beneficial if the candidate had basic algebraic skills as evidenced by possession of National Certificate Module 7180321 Core Mathematics 3 or SCE Standard Grade Mathematics at 3/4. It would also be beneficial if the candidate had some familiarity with the use of spreadsheets as evidenced by possession of National Certificate Module 81095 Introduction to Computer Applications or the Higher National Unit 8400289 Information Technology Applications.

For further information contact: Committee and Administration Unit, SQA, Hanover House, 24 Douglas Street, Glasgow G2 7NQ.

Additional copies of this unit may be purchased from SQA (Sales and Despatch section). At the time of publication, the cost is £1.50 (minimum order £5).

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STATEMENT OF STANDARDS

UNIT NUMBER: 7481664

UNIT TITLE: MATHEMATICS FOR BUSINESS

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

OUTCOME

1 SOLVE BUSINESS PROBLEMS BY THE SOLUTION OF EQUATIONS

PERFORMANCE CRITERIA

(a) Formulation of equations is correct.
(b) Solution of equations is correct.
(c) Interpretation of solutions is correct.

RANGE STATEMENT

The range for this outcome is fully expressed within the performance criteria.

EVIDENCE REQUIREMENTS

The solution of a minimum of two problems, one involving three equations in three unknowns, one involving a quadratic equation in one unknown.

OUTCOME

2 SOLVE BUSINESS PROBLEMS INVOLVING COST AND REVENUE FUNCTIONS

PERFORMANCE CRITERIA

(a) Formulation of functions is correct.
(b) Sketching of functions is accurate.
(c) Estimation of the production required to maximise profit or sales revenue is correct.
(d) The estimate of the range of production consistent with making a profit is correct.

RANGE STATEMENT

The range for this outcome is fully expressed within the performance criteria.

EVIDENCE REQUIREMENTS

Solutions involving cost and revenue functions.

OUTCOME

3 SOLVE FINANCIAL MATHEMATICS PROBLEMS

PERFORMANCE CRITERIA

(a) Calculation of the future value of deposits is correct.
(b) Calculation of the book values of assets is correct.
(c) Use of criteria to appraise investments is correct.
(d) Calculation of loan repayments is correct.
(e) Calculation of the redemption value of a loan is correct.

RANGE STATEMENT

Compounding: annually; monthly.

Investments: capital investments projects; annuities.

Criteria: net present value; yield.

EVIDENCE REQUIREMENTS

The solution of problems involving compound interest, depreciation, investment appraisal and the repayment and redemption of loans.

MERIT

A candidate who achieves all performance criteria for all outcomes will be awarded a pass. A pass with merit may be awarded to a candidate who demonstrates superior performance throughout the unit in each of the following aspects:

- consistently high level of accuracy
- outstanding skills of analysis
- consistently logical presentation of work.

Evidence which satisfies the criteria for merit may be generated by either:

- solving the problem to a level beyond that defined as pass
  or
- where this is not possible, including in the assessment a further section which would allow the candidate to demonstrate skills which satisfy the criteria for merit.

ASSESSMENT

In order to achieve this unit, candidates are required to present sufficient evidence that they have met all the performance criteria for each outcome within the range specified. Details of these requirements are given for each outcome. The assessment instruments used should follow the general guidance offered by the SQA assessment model and an integrative approach to assessment is encouraged. (See references at the end of the support notes.)

Accurate records should be made of the assessment instruments used showing how evidence is generated for each outcome and giving marking schemes and/or checklists, etc. Records of candidates' achievements should also be kept. These records will be required for external verification.

SPECIAL NEEDS

Proposals to modify outcomes, range statements or agreed assessment arrangements should be discussed in the first place with the external verifier.

HIGHER NATIONAL UNIT SPECIFICATION

SUPPORT NOTES

UNIT NUMBER: 7481664

UNIT TITLE: MATHEMATICS FOR BUSINESS

SUPPORT NOTES: This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

NOTIONAL DESIGN LENGTH: SQA allocates a notional design length to a unit on the basis of the time estimated for achievement of the stated standards by a candidate whose starting point is as described in the access statement. The notional design length for this unit is 40 hours. The use of notional design length for programme design and timetabling is advisory only.

CONTENT/CONTEXT Corresponding to outcomes:

1. Formulation of equation(s); solution of equation(s); interpretation of solution(s). Problems leading to linear equations, quadratic equations and simultaneous linear equations in 2 and 3 variables. Solution algebraically and using a computer algebra package (see the reference section at the end of the support notes).

2. Cost functions, price functions, revenue functions, profit functions and their graphs. Break-even charts. Supply and demand curves. Perfect and imperfect competition. Maximisation of profit or revenue using graphs or spreadsheets or calculus.

3. Financial problems may be solved by a variety of methods: use of arithmetic and geometric progressions; use of financial tables; use of spreadsheets. Whilst candidates will probably prefer to use spreadsheets, they should be shown all three approaches. If spreadsheets are used, loan repayments and yield can be found using trial and improvement.

   Book values using the straight line and reducing balance methods. Methods of investment appraisal notional interest to include payback period, cash flow considerations and percentage profit as well as net present value and yield.

APPROACHES TO GENERATING EVIDENCE It is recommended that candidates be given real-life examples to illustrate the statistical concepts and techniques used in this unit. These examples could be linked to relevant vocational areas, such as:

- business and finance
- quality control
- personnel
- adminstration
- production and manufacturing

The consolidation of skills should be achieved by including investigations of a practical and vocational context and not only by mechanical exercises.

The design of the unit is such that the use of computer packages is required and encouraged to achieve the outcomes. These packages will, by their nature, develop and therefore it is not possible to give an exhaustive list of all suitable packages (see the reference section at the end of the support notes). Thought should be given when developing the course and assessment to the nature of the packages candidates are likely to use in their employment and those which have been used in other units studied as part of a course.

Candidates are advised to maintain a workfile. This could comprise the candidate's own notes, class handouts, worksheets, exercises, a logbook of computer activities, project notes and other relevant material.

ASSESSMENT PROCEDURES Centres may use the instruments of assessment which are considered by tutors/trainers to be most appropriate. During assessments candidates should have access to their notes and textbooks. Where appropriate they should have access to a computer and suitable software.

Examples of the instruments of assessment which could be used are as follows:

Corresponding to outcomes:

1. Calculation exercise. This exercise will consist of 2 problems - one leading to the solution of 3 equations in 3 unknowns and the other leading to the solution of a quadratic equation in 1 unknown. At least one of the problems will involve the formulation of a mathematical model.

2. Calculation/graphical exercise which consists of a single problem covering all the PCs.

3. Calculation exercise which consists of problems involving compound interest, depreciation, investment appraisal and the repayment and redemption of loans.

EXEMPLARS Corresponding to outcomes:

Outcome 1

1. A factory produces three brands of dog food called Andy, Bow-Wow and Champ. The composition of 1 tonne of each brand is given in the table below.

	Andy	Bow-Wow	Champ
Horsemeat (kg)	200	400	200
Offal (kg)	500	250	750
Meal (kg)	300	350	50

During the course of a week 24 tonnes of horsemeat, 47.5 tonnes of offal and 18.5 tonnes of meal were used. How many tonnes of each brand of dog food were produced?

2. The revenue £R'000 obtained by selling a batch of n'000 electric shavers is given by the formula.

$R = 32n - 3n^2$

The production cost £C'000 of the batch is given by the formula

$C = 15 + 12n$

What is the minimum batch size required to make a profit?

Outcome 2

A company manufactures and sells a specialist security device. Last year they produced and sold 20,000 of the devices. The company estimates that for the coming year the fixed costs of production will be £120,000 and the variable cost will be £30 per device. They reckon that the selling price £P when n devices are sold will be given by the formula $P = 60 - 0.001n$.

(a) Write down a formula for the total cost £C of producing these n devices.

(b) Write down a formula for the revenue £R obtained from selling n devices.

(c) Sketch the cost and revenue functions on the same graph.

(d) What is the minimum production required to break even?

(e) What annual production maximises the sales revenue?

(f) What is the maximum production consistent with making a profit?

(g) What annual production maximises the profit?

Outcome 3

The Bully Beef Company has a considerable cash surplus and is considering opening a factory in Eastern Europe. Two locations are being considered, one in Poland and the other in Slovakia. In either case the Company expects to spend about £25 million on building and equipping the factory. The expected revenue flows (£million) at the end of each year over the next five years in the two locations are:

	Poland	Slovakia
1994	6	13
1995	11	16
1996	16	18
1997	25	20
1998	25	20

Determine the net present values and the yields of the two schemes and advise the company which, if either, location to choose. The expenditure may be considered to occur at the beginning of 1994. The discount rate is 12%.

At the beginning of this year the company installed a new mainframe computer at a cost of £450,000 which they expect to keep for 6 years and then resell. Produce a table showing the book value and the depreciation of the computer year by year. The company uses the reducing balance methods of depreciation.

The Production Manager has just negotiated a personal loan of £6000 from the company, repayable monthly over the next two years @ 0.8% per month compounded monthly. What is the size of her monthly repayment? How much would it cost to redeem the loan after the sixth monthly repayment?

The personal finances of the Sales Manager are in much better shape and he has just invested £5000 in a 7-year fixed interest bond. The interest rate is 7% per annum compounded annually. What sum will have accrued at the end of the seven years?

PROGRESSION

For information on how this unit relates to National Certificate mathematics provision and to other units in the Higher National mathematics framework, please refer to the following grid:

- Higher National mathematics grid for business

REFERENCES

1 Guide to unit writing.
2 For a full discussion on assessment issues, please refer to SQA's Guide to Assessment.
3 Information for centres on SQA's operating procedures is contained in SQA's Guide to Procedures.
4 For details of other SQA publications, please consult SQA's publications list.

HIGHER NATIONAL MATHEMATICS GRID FOR BUSINESS