

## Senior Mathematics

UNILEARN Senior Mathematics is the second of two courses in preparatory mathematics offered by Learning Network Queensland. The course provides the learner with a range of topics equivalent to those covered in the last two years of advanced mathematics at high school. The focus is on functions and their graphs, coordinate geometry, trigonometry and periodic functions, an introduction to differential and integral calculus and statistics and probability.

The course has been designed for self paced study in the distance mode. Although there is a 12 month formal time limit for completion of the course, regular progress is advised so that previously learned concepts are not forgotten.

On successful completion of UNILEARN Senior Mathematics the learner will have the prerequisite knowledge for the study of the mathematical content of undergraduate programs in the applied sciences, engineering, mathematical sciences, economics and similar courses which require mathematics at senior high school level. UNILEARN Senior Mathematics is also suitable for many positions in industry, commerce and the Services.

This course is listed with the Queensland Tertiary Admission Centre (QTAC) as equivalent to Queensland Senior Mathematics B for pre-requisite purposes.

### Aims

The main aim of this course is to assist the learner to obtain skills and competence in mathematics suitable for commencing studies in tertiary programs with a substantial mathematical component.

At the end of this course the learner should

- demonstrate a sound knowledge of functions, functional notation and graph interpretation, coordinate geometry of the straight line and conics, trigonometry and periodic functions, calculus and its applications, basic probability concepts and distributions and the mathematics of finance
- demonstrate confidence and competence in applying the mathematical concepts and techniques learned to problem solving situations with particular emphasis on the process of simple mathematical modelling
- have acquired prerequisite knowledge and confidence to undertake studies which require a higher level of mathematical competence
- be motivated to continue with lifelong learning where mathematical skills are required.

### Structure

UNILEARN Senior Mathematics consists of four Modules each with an overview of the Topics covered in that Module.

A range of Activities is included for the learner to work through to develop experience in problem solving. Detailed solutions for all Activities are included in each Module.

Ten Progress Tests are included. The Progress Tests give the learner the opportunity to obtain feedback on progress.

# course information (continued)

Tutorial Support is available from the UNILEARN Mathematics Tutor. This support, can be accessed by email, mail, telephone or fax to clarify understanding of concepts, details of solutions of activities, feedback on Progress Tests, features of the graphics calculator, general information on the mathematics required for undergraduate courses and other relevant queries.

A graphics calculator is recommended to assist the learning in this course. Many high schools and universities are incorporating this type of hand held technology into their mathematics curricula. The graphics calculator allows the learner to investigate and explore functions and their graphs, solve linear and non-linear equations, analyse statistical data and develop mathematical models of real situations.

## Presentation

Normally, candidates for UNILEARN Senior Mathematics should have prerequisite knowledge in mathematics equivalent to UNILEARN Introductory Mathematics or a similar course. For those who have not recently completed studies at high school grade 10 level a revision of basic algebra is highly recommended.

On enrolment students receive the complete package of Modules and information on contacting the Mathematics tutor. When the course package is received the student is encouraged to make contact with the UNILEARN Mathematics Tutor. The content of each Topic is studied with the Activities providing learning experiences. The relevant Progress Test should be completed and forwarded to the Mathematics Coordinator for assessment and feedback.

In general the course should be completed in 180-220 hours of study. The time taken will depend on the background, time available and needs of the learner.

## Assessment

The Activities and Progress Tests are preparation for the final assessment of UNILEARN Senior Mathematics.

The formal, supervised examination (two 2-hour papers) covers the content of the four Modules. On successful completion candidates are awarded a 'Certificate of Achievement' which lists the overall percentage mark gained and a grade of Pass, Credit, Distinction or High Distinction. If a candidate obtains an unsatisfactory percentage in the examinations, a second opportunity to sit the examinations can be arranged. A specimen examination is sent out to the student with the study materials .

## Content

### Module 1 – Introduction to Functions - Four Topics

Special algebraic forms, laws of indices, the concept of function, domain and range, special functions (polynomial, absolute value, rational), inverses of functions, continuity, growth and decay functions, exponential functions, laws of logarithms. Two Progress Tests.

# course information (continued)

**Module 2 – Coordinate Geometry and Trigonometry – Four Topics**

Coordinate geometry of the straight line and the circle, ellipse, parabola and hyperbola, tangent and normal lines, the trigonometrical functions and their inverses, trigonometrical identities, radian measure, the sine and cosine rules, periodic functions their graphs and applications. Two Progress Tests.

**Module 3 – Calculus and Its Applications – Five Topics**

Rates of change and the derivative, differentiability, rules of differentiation, derivatives of trigonometrical, exponential and logarithmic functions, optimisation problems using derivatives, rates of change and mathematical models, Newtons Method for solving equations, indefinite integrals, rules for integration, trigonometrical and exponential functions and their integrals, the definite integral, areas, numerical integration (trapezoidal rule). Four Progress Tests.

**Module 4 – Financial Mathematics and Statistics – Four Topics**

Sequences and series, compound interest, ordinary annuities, amortisation, permutations and combinations, probability of independent events, mutually exclusive events, tree diagrams, discrete and continuous variables, binomial, uniform and normal distributions, lines of best fit, linear regression. Two Progress Tests.