Sample Course Outline

Mathematics Specialist

ATAR Year 12

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Sample course outline

Mathematics Specialist – ATAR Year 12

Unit 3 and Unit 4

Semester 1

| **Week** | **Topic/Syllabus content** | **Assessment** |
| --- | --- | --- |
| 1–2 | Complex numbers (3.1.1–3.1.15)  Cartesian forms and complex arithmetic using polar form – review the concepts of complex numbers in Cartesian form; extend understanding to include modulus, argument and conversion to polar form; use and interpret results from operations with complex numbers in polar form including proofs of basic identities and de Moivre’s theorem |  |
| 3 | The complex plane – examine and use addition and multiplication of complex numbers in the complex plane; identify subsets of the complex plane |  |
| 4–5 | Roots of complex numbers and factorisation of polynomials – determine roots of unity/complex numbers and examine their location in the complex plane; prove and apply the factor and remainder theorem to locate conjugate roots and solve simple polynomial equations | **Task 1** (Week 5) |
| 6–7 | Functions and sketching graphs (3.2.1–3.2.8)  Functions – determine the existence and composition of two functions; identify and find the inverse and examine the graphical properties of a one-to-one function |  |
| 8–9 | Sketching graphs – use and apply absolute value to the graph of its function; examine relationships between graphs of other functions, their reciprocal and the absolute value of the functions; sketch graphs of simple rational functions | **Task 2** (Week 9) |
| 10 | Vectors in three dimensions (3.3.1–3.3.15)  The algebra of vectors in three dimensions – extend the concepts of vectors to three dimensions and construct simple proofs |  |
| 11–13 | Vector and Cartesian equations and vector calculus – determine and use vector and Cartesian equations and related concepts to represent curves, spheres, position of particles and planes; differentiate, integrate and use vector functions to solve problems involving motion | **Task 3** (Week 13) |
| 14 | Systems of linear equations – recognise systems of linear equations and use techniques of elimination to solve; examine the three cases for solutions and examine the geometric interpretation of solutions of systems of linear equations with three variables |  |
| 15 | Semester 1 examination | **Task 4** (Examination week) |

Semester 2

| **Week** | **Topic/Syllabus content** | **Assessment** |
| --- | --- | --- |
| 1–2 | Statistical inference (4.3.1–4.3.7)  Sample means – examine the concept of the sample mean and simulate repeated random sampling from a variety of distributions to illustrate properties of the distribution of sample means including the approximate normality for large samples |  |
| 3–4 | Confidence intervals for means – examine and use the concept of an interval estimate for the population mean; use simulation to illustrate variations between samples and use known parameters to approximate intervals covering desired proportions | **Task 5** (Week 4) |
| 5–6 | Integration and applications of integration (4.1.1–4.1.7)  Integration techniques – establish and use trigonometric identities, substitutions and partial fractions to integrate, establish and use integration to obtain a natural logarithm |  |
| 7–9 | Applications of integral calculus – use integration techniques and technology with numerical integration to solve problems including areas between curves and volumes of solids | **Task 6** (Weeks 8/9) |
| 10–12 | Rates of change and differential equations (4.2.1–4.2.7)  Applications of differentiation – examine and apply implicit differentiation, related rates, differential equations including the logistic equation and slope fields to solve problems | **Task 7** (Week 12) |
| 13–14 | Modelling motion – consider and solve problems involving straight line motion including simple harmonic motion |  |
| 15 | Semester 2 examination | **Task 8** (Examination week) |