AVIATION HIGH SCHOOL

Mathematics C

Senior Syllabus 2008

Approved Work Program

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RATIONALE

- Mathematics C studies Groups, Real & Complex Number Systems, Matrices, Vectors, Calculus, and Structures & Patterns.
  Mathematics C at Aviation High will also include the following two complete Option Topics: Conics and Dynamics.

- The subject develops skills in:
  "Knowledge and Procedures", "Modelling and Problem-Solving", "Communication and Justification".

- Mathematics C develops the following key competencies within mathematical contexts:
  Collecting, analysing, organising information; Communicating ideas and information;
  Planning and organising activities; Working with others; Using mathematical ideas and techniques;
  Solving problems; Using technology.

- Mathematics C is a companion subject to Mathematics B.
  It is recommended for students pursuing tertiary study where Mathematics C is a recommended pre-requisite.

- Mathematics C at Aviation High will incorporate aviation/aerospace applications into both topics in order to:
  -Increase exposure to and familiarity with a wide variety of aviation/aerospace settings;
  -Generate interest in aviation/aerospace and satellite industries for future employment;
  -Integrate with the mathematical skill requirements of
  i)Aviation High's Aeroskills and Aerospace subjects;
  ii)Aviation Mathematics modules within Aviation Australia courses;
  iii)Aviation/aerospace related subjects at university or TAFE level, including engineering courses;
  -Support the mathematical skill needs of aerospace-related work placements and apprenticeships;
  -Respond to the requests and advice from aviation/aerospace industry partners;
  -Achieve improved mathematics results through motivation that results from high-interest applications.

COURSE ORGANISATION OVERVIEW:

TIME ALLOCATION: 55 hours per semester; 220 hours over 2 years. Topic hours as per syllabus.

SEQUENCING: Sequencing should include--A spiralling and integrated approach;
--Relevant prerequisite material coverage;
--Provision of mathematics to meet student needs:
-co-development of Mathematics B and Mathematics C;
--Linkage of subject matter across topics;
--Physical resources consideration;
--Maintenance of quantitative concepts and skills (QCS).

TECHNOLOGY: Technology should include--Regular and frequent use without complete dependence;
--General purpose computer software such as spreadsheets;
--Specialist mathematical graphing/geometry software;
--Calculator technologies.

COURSE SUMMARY: Time in hours

TOPIC	SEM 1	SEM 2	SEM 3	SEM 4	TOTAL
INTRODUCTION TO GROUPS	5	2			**7**
REAL AND COMPLEX NUMBER SYSTEMS	10	10	5		**25**
MATRICES AND APPLICATIONS	12	13		5	**30**
VECTORS AND APPLICATIONS	10	15	5		**30**
CALCULUS			10	20	**30**
STRUCTURES AND PATTERNS	12	13	5		**30**
FIRST OPTION: CONICS			15	15	**30**
SECOND OPTION: DYNAMICS			15	15	**30**
QUANTITATIVE CONCEPTS AND SKILLS (QCS)	6	2			**8**
TIME ALLOCATION	**55**	**55**	**55**	**55**	**220**

ASSESSMENT:

ASSESSMENT PLAN: The assessment plan should--
--Cover all syllabus topics, subject matter and general objectives (KAP, MAPS, CAJ) as continuous assessment in appropriate sequence and balance, avoiding over-assessment;
--Detail a variety of assessment categories to ensure validity and reliability:
Supervised Tests including 'Short items', 'Practical exercises', 'Stimulus response', 'Paragraph response';
Extended Modelling and Problem-Solving Tasks (at least 1 per year); Reports (at least 1 per year);
--Use a variety of implementation conditions for assessment to ensure validity and reliability, with conditions and criteria assessed appropriate to the actual instruments supplied at monitoring and verification;
--Prescribe adequate assessment for each of the three criteria during Semester 4 prior to verification and assessment instruments for completion after verification;
--Allow for assessment items with unique identifiers to be constructed to collect evidence reflecting syllabus standards and exit criteria.

STUDENT PROFILE AND FOLIO: The assessment package (Profile + Folio) should--
--Correspond to the assessment plan with each instrument identified and the criteria indicated in correct sequence, including assessment after verification;
--Record:
-Data from each assessment instrument for feedback purposes;
-Standards awarded for each criterion (KAP, MAPS, CAJ) and proposed levels of achievement based on the whole package rather than the sum of its parts, at Reporting/Monitoring/Verification/Exit;
--Illustrate achievement in all three general objectives (KAP, MAPS, CAJ), with the emphasis on each criterion varying from instrument to instrument;
--Be 'Formative' for Year 11 and 'Summative' for Year 12 due to the spiralling and integrated course structure;
--Inform and validate judgments about standards by matching student responses to the syllabus/exit criteria;
--Allow for 'Fullest and Latest' information and "Selective Updating" to be obtained due to the spiralling and integrated approach, not by an arbitrary weighting of semesters, but by matching to syllabus standards/exit criteria.
--Provide evidence to make decisions regarding interim and exit levels of achievement

which are consistent with the criteria and standards of the syllabus, especially for threshold cases.

COURSE ORGANISATION SEMESTER 1					
SEM	**UNIT: SYLLABUS TOPIC**	**TIME (55h)**	**SUBJECT MATTER**	**ASSESSMENT ITEM**	**TEXT**
SEM 1A	**1 RATIONAL AND IRRATIONAL NUMBERS:** Real and Complex Number Systems (SLEs 2,8,9) Quantitative Concepts & Skills	10 5	-Structure of the real number system including: Rational numbers; Irrational numbers -Simple manipulation of surds -QCS: Calculation and estimation with and without instruments; Rates, percentages, ratio and proportion; Identities, linear equations and inequalities; Absolute value	1: TEST 2: EXT. MAPS/ REPORT	*New QMaths 11C* Chapter 1
SEM 1A	**2 THEORY OF GROUPS:** Introduction to Groups (SLEs 1-9) Quantitative Concepts & Skills	5 1	-Concepts of closure, associativity, identity, inverse -Definition of a group -QCS: Identities, linear equations and inequalities; Basic algebraic manipulations	1: TEST 2: EXT. MAPS/ REPORT	*New QMaths 11C* Chapter 2
SEM 1A	**3 MATRICES AND OPERATIONS:** Matrices and Applications (SLEs 3; 13,14) Quantitative Concepts & Skills	6	-Definition of a matrix as data storage and as a mathematical tool -Dimension of a matrix -Relationship between matrices and vectors -Matrix operations: Addition/Subtraction; Transpose; Multiplication by a scalar; Multiplication by a matrix -Inverse of a matrix -Solution of simple matrix equations -Definition and properties of the identity matrix -QCS: Calculation and estimation with and without instruments; The summation notation	1: TEST 2: EXT. MAPS/ REPORT	*New QMaths 11C* Chapter 3
SEM 1B	**4 SEQUENCES AND SERIES:** Structures and Patterns (SLEs 1-2; 6-8; 12-15) Quantitative Concepts & Skills	12	-Sum to infinity of a geometric progression -Purely mathematical and life-related applications of arithmetic and geometric progressions -Sequences and series other than arithmetic and geometric -Recognition of patterns in well known structures including Pascal's Triangle and Fibonacci sequence -Applications of patterns -Proof by induction -QCS: Calculation and estimation with and without instruments; The summation notation	3: TEST	*New QMaths 11C* Chapter 4
SEM 1B	**5 MATRICES AND VECTORS:** Matrices and Applications (SLEs 2, 6, 8-12) Vectors and Applications (SLEs 1-2, 13) Quantitative Concepts & Skills	6 10	-Relationship between matrices and vectors -Applications of matrices in both life-related and purely mathematical situations -For vectors as a single column or single row array: --Definition of a vector; --Operations on vectors including addition and multiplication by a scalar; --Scalar product of two vectors; --Simple life-related applications of vectors -QCS: Calculation and estimation with and without instruments; Rates, percentages, ratio and proportion; Gradient of a straight line; Plotting points using Cartesian coordinates	3: TEST	*New QMaths 11C* Chapter 5

COURSE ORGANISATION SEMESTER 2					
SEM	**UNIT: SYLLABUS TOPIC**	**TIME (55h)**	**SUBJECT MATTER**	**ASSESSMENT ITEM**	**TEXT**
SEM 2A	**6 PERMUTATIONS AND COMBINATIONS:** Structures and Patterns (SLEs 9-11; 16-17) Quantitative Concepts & Skills	13	-Permutations and combinations and their use in purely mathematical and life-related situations -Applications of patterns -Proof by induction -QCS: Calculation and estimation with and without instruments	4: TEST	*New QMaths 11C* Chapter 6
SEM 2A	**7 MATRIX METHODS:** Matrices and Applications (SLEs 1; 3-4; 8) Quantitative Concepts & Skills	7	-Relationship between matrices and vectors -Matrix operations: Addition/Subtraction; Transpose; Multiplication by a scalar and by a matrix -Solution of systems of homogeneous and non-homogeneous linear equations using matrices -Applications of matrices in both life-related and purely mathematical situations -QCS: Calculation and estimation with and without instruments; Identities, linear equations and inequalities; Basic algebraic manipulations	4:TEST	*New Qmaths 11C* Chapter 7
SEM 2A	**8 COMPLEX NUMBERS:** Real & Complex Number Systems (SLEs 1; 6-7; 11) Introduction to Groups Quantitative Concepts & Skills	5 1 1	-Definition of complex numbers including standard and trigonometrical (modulus-argument) form -Algebraic representation of complex numbers in Cartesian, trigonometric, and polar form -Operations with complex numbers: Addition/subtraction; Scalar multiplication; Multiplication of complex numbers; Conjugation -Concepts of closure, associativity, identity, inverse -Definition of a group -QCS: For quadratic equations, finding zeros by formula and by completing the square; Absolute value	4: TEST	*New Qmaths 11C* Chapter 8
SEM 2B	**9 GEOMETRIC VECTORS:** Vectors and Application (SLEs 3-5; 9-12) Matrices and Applications (SLE 4) Quantitative Concepts & Skills	15	-For vectors describing situations involving magnitude and direction: -- Definition of a vector, including standard unit vectors *i*, *j*, and *k*; --Relationship between vectors and matrices; --Two and three dimensional vectors and their algebraic and geometric representation; --Operations on vectors including addition and multiplication by a scalar; --Unit vectors; --Resolution of vectors into components acting at right angles to each other; --Applications of vectors in both life-related and purely mathematical situations; -Applications of matrices in both life-related and purely mathematical situations -QCS: Calculation and estimation with and without instruments	5: EXT. MAPS/ REPORT 6: TEST	*New Qmaths 11C* Chapter 9
SEM 2B	**10 COMPLEX NUMBERS IN THE PLANE:** Real and Complex Number Systems (SLEs 2-4; 6-7; 10-12) Quantitative Concepts & Skills	5 1	-Definition of complex numbers including standard and trigonometrical (modulus-argument) -Algebraic representation of complex numbers in Cartesian, trigonometric, and polar form -Geometric representation of complex numbers—Argand diagrams -Operations with complex numbers including: Addition/Subtraction; Scalar multiplication; Multiplication of complex numbers; Conjugation -Simple, purely mathematical application of complex numbers QCS: Identities, linear equation, and inequalities; Plotting points using Cartesian coordinates; Basic algebraic manipulations; Absolute value	5: EXT. MAPS/ REPORT 6: TEST	*New Qmaths 11C* Chapter 10
SEM 2B	**11 MATRIX ALGEBRA:** Matrices and Applications (SLEs 1; 5; 7; 12) Introduction to Groups Quantitative Concepts & Skills	6 1	-Matrix operations: Addition/Subtraction; Transpose; Multiplication by a scalar and by a matrix -Inverse of a matrix -Solution of simple matrix equations -Definition and properties of the identity matrix -Group properties of 2x2 matrices -Singular and non-singular matrices -Solution of systems of homogeneous and non-homogeneous linear equations using matrices -Applications of matrices in both life-related and purely mathematical situations -Concepts of closure, associativity, identity, inverse -Definition of a group QCS: Calculation and estimation with and without instruments; Identities, linear equations, and inequalities; Basic algebraic manipulations	6: TEST	*New Qmaths 11C* Chapter 11

COURSE ORGANISATION SEMESTER 3					
SEM	**UNIT: SYLLABUS TOPIC**	**TIME (55h)**	**SUBJECT MATTER**	**ASSESSMENT ITEM**	**TEXT**
SEM 3A	**12 OPTION--CONICS I:** Conics (SLEs 1-8; 10; 12-18) Quantitative Concepts & Skills	15	-Definitions of circles, ellipses, parabolas, and hyperbolas in terms of cones, and their use in the development of conic equations -Concept of a locus, directrix, and focal point -The circle, ellipse, and hyperbola as a locus in Cartesian and complex number form -The parabola as a locus in Cartesian form -Definition of eccentricity *e* -Simple applications of conics -QCS: Calculation and estimation with and without instruments; The gradient and equation of a straight line	7: EXT. MAPS/ REPORT 8: TEST	*New QMaths 12C* Chapter 6
SEM 3A	**13 FINITE DIFFERENCES:** Structures and Patterns (SLEs 3-5) Quantitative Concepts & Skills	5	-Use of the method of finite differences -Proof by induction -QCS: Calculation and estimation with and without instruments; Identities, linear equations, and inequalities	8: TEST	*New QMaths 12C* Chapter 1
SEM 3A	**14 PRODUCTS OF VECTORS:** Vectors and Applications (SLEs 6-12) Quantitative Concepts & Skills	5	-Scalar product of two vectors -Vector product of two vectors -Calculation of the angle between two vectors -Applications of vectors in both life-related and purely mathematical situations -QCS: Calculation and estimation with and without instruments	8: TEST	*New QMaths 12C* Chapter 2
SEM 3B	**15 DE MOIVRE'S THEOREM:** Real and Complex Number Systems (SLEs 5-7; 10) Structures and Patterns Quantitative Concepts & Skills	5	-Roots of complex numbers -Use of complex numbers in proving trigonometric identities -Powers of complex numbers including De Moivre's Theorem -Simple, purely mathematical applications of complex numbers -Proof by induction -Use mathematical induction to prove De Moivre's Theorem -QCS: Calculation and estimation with and without instruments; Identities, linear equations, and inequalities	9: TEST	*New QMaths 12C* Chapter 3
SEM 3B	**16 INTEGRATION TECHNIQUES:** Calculus (SLEs 4, 10, 12, 15) Quantitative Concepts & Skills	10	-Integrals of the form $\int \frac{f'(x)}{f(x)}\,dx$ and $\int f[g(x)]g'(x)\,dx$ -Simple integration by parts -QCS: Calculation and estimation with and without instruments; Basic algebraic manipulations	9: TEST 10: EXT. MAPS/ REPORT	*New QMaths 12C* Chapter 4
SEM 3B	**17 OPTION--DYNAMICS I:** Dynamics (SLEs 1-3; 5; 7-11; 15-16) Quantitative Concepts & Skills	15	-Derivatives and integrals of vectors -Newton's laws of motion in vector form applied to objects of constant mass -Application of the above to: --Vertical motion under gravity with and without air resistance; --Projectile motion without air resistance; --Simple harmonic motion (derivation of the solutions to differential equation is not required) -QCS: Calculation and estimation with and without instruments	9: TEST 10: EXT. MAPS/ REPORT	*New QMaths 12C* Chapter 7

COURSE ORGANISATION SEMESTER 4					
SEM	**UNIT: SYLLABUS TOPIC**	**TIME (55h)**	**SUBJECT MATTER**	**ASSESSMENT ITEM**	**TEXT**
SEM 4A	**18 ADVANCED DIFFERENTIAL CALCULUS:** Calculus (SLEs 3; 8; 13-15) Quantitative Concepts & Skills	10	-Life-related applications of simple, linear, first-order differential equations with constant coefficients -Solution of simple, linear, first-order differential equations with constant coefficients -QCS: Calculation and estimation with and without instruments	10: EXT. MAPS/ REPORT 11: TEST	*New QMaths 12C* Chapter 11
SEM 4A	**19 MATRICES AND DETERMINANTS:** Matrices and Applications (SLEs 1; 3; 11; 16) Quantitative Concepts & Skills	5	-Relationship between matrices and vectors -Inverse of a matrix -Determinant of a matrix -Singular and non-singular matrices -Solution of systems of homogeneous and non-homogeneous linear equations using matrices -Applications of matrices in both life-related and purely mathematical situations -QCS: Calculation and estimation with and without instruments; The summation notation	11: TEST	*New QMaths 12C* Chapter 12
SEM 4A/B*	**20 OPTION--CONICS II:** Conics (SLEs 9-11; 13-18) Quantitative Concepts & Skills	15	-Concept of a locus, directrix, and focal point -Circle as a locus in parametric form -Definition of eccentricity *e* -Ellipse as a locus in parametric form and polar form -Hyperbola as a locus in parametric form and polar form -Parabola as a locus in parametric form and polar form -Simple applications of conics -QCS: Calculation and estimation with and without instruments; The gradient and equation of a straight line	11: TEST 12: TEST*	*New QMaths 12C* Chapter 15
SEM 4B	**21 APPROXIMATION METHODS IN CALCULUS:** Calculus (SLEs 1-2; 5-7; 9; 11; 16) Quantitative Concepts & Skills	10	-Approximating small changes in functions using derivatives -Development and use of Simpson's Rule -QCS: Calculation and estimation with and without instruments; The summation notation	12: TEST	*New Qmaths 12C* Chapter 13
SEM 4B	**22 OPTION--DYNAMICS II :** Dynamics (SLEs 3-6; 9-16) Quantitative Concepts & Skills	15	-Derivatives and integrals of vectors -Newton's laws of motion in vector form applied to objects of constant mass -Application of the above to: --Straight line motion in a horizontal plane with variable force; --Vertical motion under gravity with and without air resistance; --Circular motion with uniform angular velocity -QCS: Calculation and estimation with and without instruments; Basic algebraic manipulations	12: TEST	*New Qmaths 12C* Chapter 16

***** Unit 20 should be completed prior to verification. However, time constraints may require a small amount of content to be carried over to 4B and assessed on item 12.

SAMPLE UNIT OF WORK **UNIT 17: OPTION TOPIC--- DYNAMICS 1** **SYLLABUS TOPIC: DYNAMICS (15h)**

SUBJECT MATTER	CONTENT	LEARNING EXPERIENCES *including Technology*	RESOURCES
-Derivatives and integrals of vectors	-Recall methods of deriving and integrating from previous units. -Determine derivatives and integrals of vector functions. -Derive and integrate to find expressions for position, velocity, and acceleration. -Calculate the magnitude of velocity and acceleration. -Express vector functions in Cartesian form.	**SLE1** Given the position vector of a point as a function of time, determine the velocity and acceleration vectors. **SLE2** Given the displacement vector of an object as a function of time, find the force which gives this motion by differentiation. **SLE3** Given the force on an object as a function of time, use integration to find the position vector of the object. ->Use advanced ***graphing calculators*** for derivatives and integrals. **AVIATION/AEROSPACE LINKS** ->Apply derivatives and integrals of vector functions to find position, velocity, and acceleration of aircraft, rockets, satellites, space vehicles.	**Textbook:** *New QMaths 12C* Chapter 7 **Print Resources**: *Quest 12C* *Flight Theory-Dole* *Mechanics of Flight-Kermode* Aviation Library **Technology**: -Graphics Calculators -Data Loggers -Maths Helper Plus -Excel -Measuring equipment -See **Aviation** **Aviation:** -Industry Partners -Models/UAV/Rockets -Wind Tunnel -Print Resources -Aerospace Websites
-Newton's laws of motion in vector form applied to objects of constant mass	-State and investigate Newton's laws of motion. -Define momentum (p=mv) and force (F=ma). -Using derivatives and integrals, develop and apply the general equations for motion under constant acceleration. -Create force diagrams and vector expressions for resultant force including: friction, normal reaction, weight, and tension. -Apply vector expressions to practical situations.	**SLE7** From a table of vehicle stopping distances from various speeds, calculate the reaction time of the driver and the deceleration of the vehicle. **SLE15** Use ***detectors*** or ***sensors*** to investigate problems, e.g. rolling a ball down a plank. **SLE16** Use ***spreadsheets*** to investigate problems. **AVIATION/AEROSPACE LINKS** ->Investigate wind as a force using a wind tunnel.	
-Application of the above to: Vertical motion under gravity with and without air resistance.	-Describe vertical motion under gravity. -Using derivatives and integrals, develop functions for displacement, velocity, and acceleration in terms of vertical motion. -Apply functions to practical vertical motion situations.	**SLE5** Model vertical motion under gravity alone; investigate the effects of the inclusion of drag on the motion. **AVIATION/AEROSPACE LINKS** ->Explore aviation/aerospace examples of vertical motion such as rockets and parachutes. ->Create models, such as rockets and parachutes, to demonstrate vertical motion.	
-Application of the above to: Projectile motion without air resistance.	-Describe projectile motion. -Define trajectory and angle/speed of projection. -Using derivatives and integrals, develop functions for displacement, velocity, and acceleration in terms of projectile motion. -Apply functions to practical projectile motion situations.	**SLE8** Model the path of a projectile without air resistance, using the vector form of the equations of motion where upwards is positive. **SLE9** Use the parametric facility of a ***graphing calculator*** or ***Maths Helper Plus*** to model the flight of a projectile. **SLE10** Investigate the flow of water from a hose held a varying angles, and model the path of the water. **AVIATION/AEROSPACE LINKS** ->Explore and create models of aviation/aerospace related projectiles (rockets, missiles).	
-Application of the above to: Simple harmonic motion.	-Recall SHM terms from previous work. -Describe simple harmonic motion. -Using derivatives and integrals, develop functions for displacement, velocity, and acceleration in terms of SHM. -Apply functions to practical SHM situations.	**SLE11** Investigate the motion of a simple pendulum with varying amplitudes. ->Use a ***graphing calculator*** or ***Maths Helper Plus*** to model SHM. ->Create models to demonstrate SHM. **AVIATION/AEROSPACE LINKS** ->Investigate dynamic longitudinal stability as an application of SHM.	
-QCS: Calculation and estimation with and without instruments; Basic algebraic manipulations			

RELATED ASSESSMENT

ITEM 9: SUPERVISED TEST	ITEM 10: EXTENDED MODELLING AND PROBLEM-SOLVING TASK/REPORT
POSSIBLE TECHNIQUES: Short items, Practical exercises, Response to stimulus TECHNOLOGY: Graphics calculator TIME: 2-2.5 hours exam block CONDITIONS: Supervised exam with no source materials	POSSIBLE THEME: Aerospace applications (satellites, comets, telescopes, rockets) including paragraph response technique UNIT LINK: Develop functions to describe aviation/aerospace-based simulation of vertical, projectile, or simple harmonic motion TECHNOLOGY: Graphing software; Excel; Internet; Roland TIME: ~3 weeks CONDITIONS: Individual work, with some supervised classwork

SAMPLE UNIT OF WORK **UNIT 18: CORE TOPIC--- ADVANCED DIFFERENTIAL CALCULUS** **SYLLABUS TOPICS: CALCULUS (10h)**

SUBJECT MATTER	CONTENT	LEARNING EXPERIENCES	RESOURCES
-Life-related applications of simple, linear, first-order differential equations with constant coefficients	-Apply differential equations to: --Errors in measurement; --Displacement, velocity, and/or acceleration in various physical situations; --Energy storage and momentum; --Growth and decay situations such as half-life, population growth, compound interest; --Pressure on liquids & gases and chemical reactions; --Electronics and avionics. --Heating and cooling situations; --Epidemics; --Vertical motion of particles under gravity with and without air resistance including terminal velocity. -Explore aviation/aerospace contexts for the above applications.	**SLE3** Investigate life-related situations that can be modelled by simple differential equations such as growth of bacteria, cooling of a substance. **SLE8** Investigate the motion of falling objects, where resistance is proportional to the velocity, by considering a differential equation. **SLE13** Find an expression for the pressure, *P*, as a function of altitude in an isothermal atmosphere where the rate of decrease of atmospheric pressure with increasing altitude is proportional to the to the density of the air pressure (p), density (*R*) and temperature (*T*) such that *P=R* p*T*. **SLE14** Find an expression for the amount of the desired product Pu_{239} present, as a function of time after start up in a breeder reactor where U_{238} is converted to Pu_{239} at a constant rate and Pu_{239} is converted to Pu_{240} at a rate proportional to the amount of Pu_{239} present. ->Use ***Excel*** and ***Maths Helper Plus*** produce tables and graphs of differential equations. ->Use ***data loggers*** and ***sensors*** to model situations, such as heating & cooling. **AVIATION/AEROSPACE LINKS** **->**Explore aviation/aerospace applications which can be modelled by differential equations such as motion, fuel use, oxygen tanks, avionics. ->Model a skydiver with differential equations.	**Textbook:** *New QMaths 12C* Chapter 11 **Print Resources**: *Quest 12C* *Flight Theory-Dole Ch. 15* Aviation Library **Technology**: -Graphics Calculators -Maths Helper Plus -Excel -See **Aviation** -Measuring Equipment -Data loggers and Sensors **Aviation:** -Industry Partners -Print Resources -Wind tunnel -Rockets & Parachutes -Electronics Equipment
-Solution of simple, linear, first-order differential equations with constant coefficients	-Recall differential rules from previous work. -Approximate small changes and possible error in functions using differentials. -Use differentials to solve equations including the forms: $\frac{df}{dx} = kf$, $\frac{df}{dx} = kf + c$, and separable variables.	**SLE15** Use tables of integrals or ***computer software*** to evaluate a given integral.	
QCS: Calculation and estimation with and without instruments			

RELATED ASSESSMENT

ITEM 10: EXTENDED MODELLING AND PROBLEM-SOLVING/REPORT	SUPERVISED TEST
POSSIBLE THEME: Satellite aviation/airport industries including paragraph response technique UNIT LINK: Develop differential equations to explore aviation/aerospace situations TECHNOLOGY: Graphing software; Excel; Internet research TIME: ~3 weeks CONDITIONS: Individual work, with some supervised classwork; Small group data collection	POSSIBLE TECHNIQUES: Short items, Practical exercises, Stimulus response TECHNOLOGY: Graphics calculator TIME: ~2-2.5 hours (or 2x1 hr 15 min) CONDITIONS: Supervised exam with no source material

INTENDED ASSESSMENT PLAN:

SEM	ITEM	SUBJECT MATTER	GENERAL OBJECTIVES	CATEGORY: DESCRIPTION AND CONDITIONS
1	**1**	**UNITS 1, 2, 3**	KAP MAPS CAJ	**SUPERVISED TEST** POSSIBLE TECHNIQUES: Short items, Practical exercises, Stimulus response TECHNOLOGY: Graphics calculator TIME: ~2.5 hours (or 2x1 hr 15 min) CONDITIONS: Supervised test with no source materials
1	**2**	**UNITS 1, 2, 3 and/or 4**	KAP MAPS CAJ	**EXTENDED MAPS TASK/REPORT** POSSIBLE THEME: Sets of numbers with aviation/aerospace applications; Report on aviation maintenance supply chain simulation including paragraph response technique TECHNOLOGY: Excel TIME:~ 3 weeks CONDITIONS: Lessons on Excel and Maths Helper; Small group data simulation; Individual with some supervised classwork
1	**3**	**UNITS 4, 5**	KAP MAPS CAJ	**SUPERVISED TEST** POSSIBLE TECHNIQUES: Short items, Practical exercises, Stimulus response TECHNOLOGY: Graphics calculator TIME: ~2-2.5 hour block exam CONDITIONS: Supervised test with no source materials
2	**4**	**UNITS 6, 7, 8**	KAP MAPS CAJ	**SUPERVISED TEST** POSSIBLE TECHNIQUES: Short items, Practical exercises, Stimulus response TECHNOLOGY: Graphics calculator TIME: ~2.5 hours (or 2x1 hr 15 min) CONDITIONS: Supervised test with no source materials
2	**5**	**UNITS 9, 10**	KAP MAPS CAJ	**EXTENDED MAPS TASK/REPORT** POSSIBLE THEME: Navigation and engineering applications including paragraph response technique TECHNOLOGY: Internet research; Maths Helper Plus; Roland TIME: ~3 weeks CONDITIONS: Individual with some supervised classwork
2	**6**	**UNITS 9, 10, 11**	KAP MAPS CAJ	**SUPERVISED TEST** POSSIBLE TECHNIQUES: Short items, Practical exercises, Stimulus response TECHNOLOGY: Graphics calculator TIME: ~2-2.5 hour block exam CONDITIONS: Supervised test with no source materials
MONITORING				
3	**7**	**UNIT 12**	KAP MAPS CAJ	**EXTENDED MAPS TASK/REPORT** POSSIBLE THEME: Aerospace applications (satellites, comets, telescopes, rockets) including paragraph response technique TECHNOLOGY: Graphing software; Excel; Internet; Roland TIME: ~3 weeks CONDITIONS: Individual work, with some supervised classwork
3	**8**	**UNITS 12, 13,14**	KAP MAPS CAJ	**SUPERVISED TEST** POSSIBLE TECHNIQUES: Short items, Practical exercises, Stimulus response TECHNOLOGY: Graphics calculator TIME: ~2.5 hours (or 2x1 hr 15 min) CONDITIONS: Supervised exam with no source materials
3	**9**	**UNITS 15,16,17**	KAP MAPS CAJ	**SUPERVISED TEST** POSSIBLE TECHNIQUES: Short items, Practical exercises, Stimulus response TECHNOLOGY: Graphics calculator TIME: ~2-2.5 hour block exam CONDITIONS: Supervised exam with no source materials
4	**10**	**UNITS 16,17,18**	KAP MAPS CAJ	**EXTENDED MAPS TASK/REPORT** POSSIBLE THEME: Satellite aviation/airport industries including paragraph response technique TECHNOLOGY: Graphing software; Excel; Internet research TIME: ~3 weeks CONDITIONS: Individual work, with some supervised classwork; Small group data collection
4	**11**	**UNITS 18,19,20**	KAP MAPS CAJ	**SUPERVISED TEST** POSSIBLE TECHNIQUES: Short items, Practical exercises, Stimulus response TECHNOLOGY: Graphics calculator TIME: ~2-2.5 hours (or 2x1 hr 15 min) CONDITIONS: Supervised exam with no source material
VERIFICATION				
4	**12**	**UNITS 21,22, 20***	KAP MAPS CAJ	**SUPERVISED TEST** POSSIBLE TECHNIQUES: Short items, Practical exercises, Stimulus response TECHNOLOGY: Graphics calculator; Excel/Maths Helper TIME: ~2 hour exam block CONDITIONS: Supervised exam with no source materials;
EXIT				

***** Unit 20 should be completed prior to verification.
However, time constraints may require a small amount of content to be carried over to 4B and assessed on item 12.

LEVEL OF ACHIEVEMENT GUIDELINES

1. *Each assessment item is to be marked using the* **MATHEMATICS C CRITERIA GRID.** *Task/question specific marking information will appear on answer keys.*

MATHEMATICS C CRITERIA GRID

Knowledge and Procedures	STANDARD				
Student work characteristics:	**A**	**B**	**C**	**D**	**E**
Recall, access, selection of mathematical definitions, rules, procedures					
Application of mathematical definitions, rules, procedures					
Numerical calculations, spatial sense, algebraic facility					
Selection and use of technology					
Knowledge of the nature of and use of mathematical proof					

KAP STANDARD ACHIEVED	**INDICATIVE %:**	**STANDARD:**
The standard is evidenced by student work characteristics and is usually suggested by the % cut-off.	% Cut-Off: **/##** A ≥ 85 B ≥ 70 C ≥ 50 D ≥ 25 (+/-5) **%**	

Modelling and Problem-Solving	QUESTION																								
Student work characteristics:	**Q**					**Q**					**Q**					**Q**					**Q**				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Problem-solving strategies to interpret, clarify, analyse																									
Identification of assumptions and effects, parameters and/or variables																									
Use of data and mathematical models																									
Interpretation of results and validation of arguments																									
Refinement of mathematical models																									
MAP STANDARD INDICATORS The indicators suggest achievement on each item and must be compiled as evidence to support a standard.																									

Communication and Justification	STANDARD				
Student work characteristics:	**A**	**B**	**C**	**D**	**E**
Mathematical terminology, symbols, conventions					
Organisation and presentation					
Analysis and translation					
Mathematical reasoning					
Justification of procedures, decisions, results					
Reasonableness of results					
Supporting arguments in the form of proof					
CAJ STANDARD ACHIEVED The standard is evidenced by student work characteristics.					

2. *Results for each assessment item are recorded on the* **MATHEMATICS C STUDENT PROFILE***.*

MATHEMATICS C STUDENT PROFILE

STUDENT NAME:_____

TEACHER/S: _____ _____ **200___ - 200___**

Assessment Instruments (Units)		Mathematics C Assessment Criteria			Level of Achievement
		Criterion KAP	Criterion MAP	Criterion CAJ	
Semester 1 Formative	1. Test: Units 1-3	B	B C D	C	
	2. Ext.MAPS/Report: Units 1-3	B	A B C	B	
	3. Test: Units 4-5	C	B C D D	C	
	Semester 1 Summary	**B**	**C**	**C**	**C**
Semester 2 Formative	4. Test: Units 6-8	C	A B B C	B	
	5. Ext.MAPS: Units 9-10	A	B C D	B	
	6. Test: Units 9-11	A	B C C D	B	
	Semester 2 Summary	**B**	**C**	**B**	**B**
Monitoring Semesters 1&2		**B**	**C**	**B**	**HA**
Semester 3 Summative	7. Ext.MAPS/Report: Unit 12	C	C D D	C	
	8. Test: Units 12-14	A	A A B B	A	
	9. Test: 15-17	C	B C D E	C	
	Semester 3 Summary	**C**	**C**	**C**	**C**
Semester 4 Summative	10. Ext.MAPS: Units 16-18	C	C C D	C	
	11. Test: Units 18-20	C	C C C E	C	
	Verification Semesters 3&4	**C**	**C**	**C**	**SA**
	12.Test: Units 21-22, 20*	D	D D E	D	
	Semester 4 Summary	**C**	**D**	**C**	**C**
Exit Semesters 3&4		**C**	**D**	**C**	**SA**
SAI					**###**

3. *At the end of each semester and at monitoring/verification/exit, the student folios will be reviewed and a standard will be determined for each criteria*(KAP, MAP, CAJ).

Within each criterion, an A to E standard will be awarded. This standard will match demonstrated work characteristics to the full range of minimum syllabus standard descriptors. Consideration will be given to the relative contribution of each assessment item with respect to subject matter, conditions, and fullest/latest.

For the MAP criterion, MAP indicators on the profile suggest achievement on each question/task but do not individually reflect the entire range of work characteristics required by the syllabus. Sufficient MAP opportunities will be provided by the assessment package, usually within each assessment item, to allow students to demonstrate the full range over time. Therefore, the MAP indicators can be compiled as evidence to support a standard.

The table below will be used to propose a likely standard in each criteria (KAP, MAP, and CAJ).

STANDARD	PROFILE (KAP results, MAP indicators, CAJ results)
A	Consistently **A**'s
B	Consistently **B**'s or better, with the remainder generally **C**'s
C	Consistently **C**'s or better, with the remainder generally **D**'s
D	Consistently **D**'s or better
E	Consistently **E**'s

Note: Trade-offs might be applied; A, B, C, D, A, A, could equate to a B standard.

The proposed standard may be altered to ensure that the work characteristics displayed in the student folio match the syllabus descriptors. However, the syllabus states that: "When determining a standard for each criterion, it is not always necessary for the folio to display each descriptor for a particular standard. The standard awarded should be informed by how the work qualities match the descriptors overall. The typical standards are applied to the **summative** body of work selected for review."

4. *At the end of each semester and at monitoring/verification/exit, the standards for the criteria will be combined to determine an overall level of achievement.*

The table, taken from the syllabus, indicates the **minimum** combination of standards across the criteria for awarding each level of achievement.

VHA	Standard *A* in any two criteria and no less than a *B* in the remaining criterion
HA	Standard *B* in any two criteria and no less than a *C* in the remaining criterion
SA	Standard *C* in any two criteria, *one of which must be the* Knowledge and procedures *criterion,* and no less than a *D* in the remaining criterion
LA	At least Standard *D* in any two criteria, *one of which must be the* Knowledge and procedures *criterion*
VLA	Standard *E* in the three criteria (Not meeting the minimum requirements for LA.)