Subject	Further Maths

Title/Topic	Format	Length	WC
Paper 1 : Pure	Written Assessment	1hr 15mins	
Paper 2 : Modelling with Algorithms	Written Assessment	1hr 15mins	
Paper 3 : Stats A	Written Assessment	1hr 15mins	

In this Advent assessment I will be asked to show I can…

Modelling with Algorithms (Y413)
Contents

Algorithms	In covering this section of the specification, learners should understand: what an algorithm is; iterative processes; what kind of problems are susceptible to an algorithmic approach; how to compare algorithms, including complexity; the importance of proving that an algorithm works and of the use of heuristic algorithms when this is not possible; the need for an algorithmic approach and computing power to solve problems of the size often met in the real world. Other algorithms are used for modelling in the Networks section; this section emphasises that algorithms can be analysed in their own right.
Networks	Network algorithms are used for modelling a range of real-world problems. Formulating the problems as LP problems allows them to be addressed using technology.
Linear Programming (LP)	This topic introduces constrained optimisation. In some cases LP problems can be interpreted and solved graphically. The simplex method gives an algebraic approach, but using this by hand is limited. The use of a simplex method optimisation routine in a spreadsheet package or other software is introduced, which enables problems of a more realistic size to be tackled. The crucial skills are then setting up the problem in a way suitable for the software and interpreting the output. These are precisely the modelling skills most useful in the real world. Linear programming unifies this content; a wide range of apparently unrelated problems can be formulated as LP problems, and so solved using technology.

Core Pure (Y410)
Contents

Proof	Proof by induction is introduced for formulae for simple sequences, sums of simple series and powers of matrices.
Complex numbers	Complex numbers and their basic arithmetic are introduced, including in modulus-argument form. They are used to solve polynomial equations with real coefficients and to define loci on the Argand diagram.
Matrices and transformations	Matrix arithmetic is introduced and applied to linear transformations in 2-D, and some in 3-D. Inverses of matrices (which may be found using a calculator in the 3×3 case) are used to solve matrix equations and related to inverse transformations.
Vectors and 3-D space	Scalar products are introduced, and used to form the equation of a plane. How planes intersect in 3-D space is considered, and matrices are used to find the point(s) of intersection.
Algebra	Relationships between roots of and coefficients of polynomials are explored.
Series	Standard formulae and the method of differences are used to calculate the sum of the given series.

Statistics a (Y412)
Contents

Sampling	A short section about the importance of sampling methods.
Discrete random variables	The binomial distribution is introduced for modelling discrete univariate data in AS Level Mathematics. This content extends the range of models available to include the (discrete) uniform, geometric and Poisson distributions. The link between the binomial and Poisson distributions is explored, though the use of the Poisson as an approximation to the binomial distribution for calculation purposes is not included; technology renders it largely obsolete. Some theoretical work on discrete probability distributions, including mean and variance and some of their properties, is introduced and applied to these models.
Bivariate data	Different types of bivariate data are considered. Where appropriate, Pearson's product moment correlation coefficient and Spearman's rank correlation coefficient are used to test for correlation and association, respectively, for bivariate numerical data. The different underlying assumptions are explored. Linear regression as a model for bivariate numerical data is introduced; residuals provide an informal way of looking at the appropriateness of the model.
Chi-squared tests	The hypothesis testing work in AS Level Mathematics - based on the binomial distribution and, informally, on correlation coefficients - is extended in this unit to include χ^2 tests and a more formal approach to tests based on correlation coefficients. This gives learners an understanding of a range of tests, including the concept of degrees of freedom, which should allow them to pick up quickly any hypothesis tests they encounter in other subjects. The product moment correlation coefficient is also considered, informally, as an effect size; this serves as an example of a widely-used approach which is complementary to hypothesis testing. The χ^2 test for goodness of fit is used to test whether a particular distribution is appropriate to model a given data set. For bivariate categorical data, the χ^2 test for association, using data given in a contingency table, is introduced.

In other words, the whole AS Further Mathematics syllabus.

What should I do to revise and prepare for this assessment?

To prepare for this assessment:

1. Review the work you have completed in class this term. Work through the practice questions you have been provided after each lesson again so that you have a deep understanding of all the topics covered.

2. Complete and revisit the integral assessments for the first two units covered this year.

3. Complete questions from your text book.

What useful websites/resources could I use to help me prepare?

www.integralmaths.org

Course Text Book

https://sites.google.com/view/tlmaths/home/a-level-further-maths/teaching-order-year-1

- Please be aware that the teaching order is different on the final link, but if you search for the topics there are useful videos.