

June 2016

Dear Fresher

I write to congratulate you on your A-Level results and to advise about the steps that you will need to take in order to prepare yourself for your first year reading Mathematics or one of its joint schools at Queen's.

All the courses that you will take are designed on the assumption that you are familiar only with the core A-level Mathematics syllabus. However, the material in the early part of the courses is covered at a fast pace and you will be wise to familiarise yourself with rather more than the core syllabus. We will expect Queen's students to be familiar with the material given on the list below.

**General:** The method of proof by induction;  
The meaning of "if and only if" and of "necessary and sufficient condition".

**Calculus:** Differentiation and integration techniques;  
Linear differential equations with constant coefficients;  
Complementary functions and particular integrals;  
Integrating factors for differential equations;  
Curve sketching;  
Properties of trigonometric, exponential, hyperbolic and logarithmic functions;  
Infinite series;  
Taylor and Maclaurin expansions.

**Geometry:** Plane analytical geometry of lines and conics;  
Properties of parabolas, hyperbolas and ellipses;  
Vector methods including scalar and vector products.

**Algebra:** Arithmetic and geometric progressions;  
Simultaneous linear equations.

**Mechanics:** Newton's equations of motion;  
Motion of a particle in one and two dimensions;

**Probability:** Permutations and combinations.

Attached are a few problems on these subjects which you are expected to complete before you arrive in Oxford.

Introductory books for the first year course are listed below. You may find some of them useful in tackling the problems.

- D.L. Johnson:            *Elements of Logic via Numbers and Sets* (Springer)
- T.S. Blyth &  
E.F. Robertson:        *Basic Linear Algebra*, (Springer)
- Geoff Smith:            *Introductory Mathematics: Algebra and Analysis* (Springer)
- M.B. Glauert:           *Principles of dynamics* (Routledge & Kegan Paul)
- S. Ross                    *A first course in probability*, Chapters I-IV (Collier McMillan)

I look forward to seeing you well prepared, in October.

**Dr Panagiotis Papazoglou & Dr Yves Capdeboscq**  
**Fellows & Praeceptors in Mathematics**