How do students enter University?

Application for entry to an English University is made through the Universities & Colleges Admissions Service (UCAS: www.ucas.ac.uk). Students select prospective universities who, based on their application and interview, may make a conditional offer to the student stipulating that they achieve minimum grades (or tariff) in their A-levels (see Annex 1), for instance the standard offer at Durham is AAB[1]. If student subsequently fail to achieve their grade (and that of an insurance place at a second university) they enter into clearing whereby students and university places are matched.

UCAS hold statistics on the numbers of applications which includes the fields (age, male/female, grades achieved etc.) which could be analysed if it is considered to be important.

1 What is an A-level?

There are three examination boards in England:

1. Edexcel: http://www.edexcel.org.uk/
2. OCR: http://www.ocr.org.uk/
3. AQA: http://www.aqa.org.uk/

whose A-level specifications (see examination boards websites) are approved by the QCA. A grade A-E at A-level counts as a pass. The assessment of an A-level in Mathematics is based on six modules taken from the following module

- Pure Mathematics (P1—P7);
- Mechanics (M1—M6);
- Statistics (S1—S6);
- Discrete (D1—D2).

The are many possible combinations but there is a common core of about 50% which are incorporated into the Pure Mathematics modules. The core topics are [James]:

1. **Algebra:** indices and surds, quadratic equations, maniuplation of polynomials (algebraic division, factor and remainder theorems), linear and nonlinear inequalities, $(a+b)^n$ when n is an integer, law of logarithms.

[1] A-Level grade (A,B,C,D,E)=(120, 100, 80, 60, 40) with AS-Level points counting half.

2. **Sequences and series:** sequences including formula for n'th term, arithmetic and geometric series including sum formulae.

3. **Functions:** definition, domain and range, linear and quadratic functions, composition, inverse, modular function, graph plotting including $kf(x)$, $f(x)+k$ and $f(xk)$, exponential and logarithm functions, rational functions and simple partial fractions.

4. **Co-ordinate Geometry:** equations and properties of straight line, general equation of circle, centre and radius, Cartesian and parametric equations of curves.

5. **Trigonometry:** sine and cosine rules, radian measure, arc length, area of sector of circle, trig functions sin, cos, tan, sec, cosec and cot, inverses of sin, cos and tan, simple identities, double angle formulae, compound angle fomulae, solution of simple trig equations.

6. **Differentiation:** derivative and interpretation as slope, derivative of x^n, e^x, $\ln x$, sin, cos and tan, gradient and tangents, derivative of simple composite functions, derivative of sum, product and quotient rules, simple functions defined implicitly or parametrically, equations of tangents and normals.

7. **Integration:** inverse of differentiation, area under curve, integral of x^n, e^x, $1/x$, sin, cos and tan, simple examples using substitution and by parts, integration using simple trig identities, definite integrals and volume by revolution.

8. **Differential equations:** formulation of simple differential equations, solution of first-order equations using separable variables.

9. **Numerical:** roots of $f(x) = 0$ by considering sign changes and simple iterative methods, numerical integration using trapezoidal rule.

10. **Vectors:** vectors in 2 and 3 dimensions, vector addition and subtraction, multiplication by scalar, magnitude, the orthogonal unit vectors, distance between two points, vector line, scalar product.

Achievement

While the actual grades achieved by students entering all universities are not available, Durham achieved better than AAB (343) for the 2002 in-take.

The bibliography

G. James, *Mathematics in schools: Implications for undergraduate courses in engineering and other numerate disciplies*, Mathematics TODAY, **146**, pp. 140—146.