The International Baccalaureate and the Transition to STEM Higher Education

Perspectives from an admissions tutor

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UoB current offer

A-level

- BSc: A(maths)+AB
- MSci: A*(maths)+AA or AAA to include maths & further mathematics.

BSc programmes: IB35 with HL Maths 6

MSci programmes:

- IB36 with HL Maths 7
- IB36 with HL Maths 6 and HL Further Maths 6

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G100 entry 2014 to Russell Group

	HL maths	Overall		
University of Birmingham	6	35		
University of Bristol	6	37	6,6,6	+1 preferred subject
University of Cambridge				
Cardiff University	6	34		
Durham University	7	38	7,6,6,	
University of Edinburgh				
University of Exeter	6	38-34		
University of Glasgow	6?	>=34		
Imperial College London	7	39	6 Physics, Chemistry or Economics	
King's College London	6	35	7,6,6	
University of Leeds	6	35		
University of Liverpool	6	33		
London School of Economics & Political Science				
University of Manchester	6	37	18 at HL	
Newcastle University	5	35-37		
University of Nottingham	6	36	or 7 in HL maths + 35	
University of Oxford				
Queen Mary, University of London	7	36		
Queen's University Belfast				
University of Sheffield	6	35		
University of Southampton	6	36	18 at HL	
University College London	7	39-40	20 points in three higher level subjects including 7 in Mathematics	
University of Warwick	6	39	+STEP	
University of York	6	36		

Summary: Russell Group

All require HL 6 or better.

Overall scores

33	1
34	3
35	5
36	4
37	2
38	1
39	3

Could see no reference to SL Further Mathematics.

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Entry to Birmingham

Approx 900 applicants, cohort about 170.

2012

8 applicants, 4 rejected, 3 declined, 1 insurance. Entry: 0.

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13 applicant, 1 rejected, 8 declined, 4 insurances.

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Comparisons are very difficult

Exam papers and mark schemes are very difficult to get.
(see `http://www.freeexampapers.com/`)

Expert Group Report, 2006. The study hours

The study hours for the IB Higher Level were recommended to be 240 – opinion differed as to whether or not this was generally achieved in practice – and for A level around 250-300 hours. It was expected, therefore, that the A level specification would contain more material than the IB Higher Level but this was found to be not the case.

Content

International Baccalaureate
Induction
Complex numbers
Matrices
Kinematic problems
GCE A level Mathematics
Odd, even and periodic functions
Polynomial inequalities
Small angle approximations
Coordinate geometry of circle
Recurrence relationships
Parametric equations of curves
General solution of trigonometric equations
Trapezium and Simpson's rules

It was agreed that the major topics unique to the IB Higher Level needed introduction, assimilation and application, and practice whereas the topics unique to the A level were essentially additional applications of what had been already taught. Taking into account the time needed to cover these unique items the group suggested that the IB Higher Level content specification was between 10 and 20% larger than that of the A level.

Assessments

The IB objectives appear to be more modest than those of A level but detailed examination of the papers suggested that all the IB objectives are tested and some of the A level objectives seem to be over ambitious.

Entrance to R.M.A Woolwich 1880

Apply the second law of motion to prove that the path of a projectile in vacuo is a parabola.

If balls be fired at the same instant from two cannons with equal velocities at angles of elevation, α and β respectively, so that both hit the same mark, and t' the time between their returning to the horizontal plane through the point of projection, prove that

$$t' = 2t\cos^2\left(\frac{\alpha+\beta}{2}\right).$$

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June 1971 “Mathematics"

A projectile is fired with an initial velocity of magnitude V inclined at an angle α above the horizontal. Find the equation of the trajectory referred to the horizontal and vertical axes through the point of projection.

A projectile is fired horizontally from a point O, which is at the top of a cliff, so as to hit a fixed target in the water, and it is observed that the time of flight is T. It is found that, with the same initial speed, the target can also be hit by firing at an angle α above the horizontal. Show that the distance of the target from the point at sea-level vertically below O is $\frac{1}{2}gT^2 \tan\alpha$.

June 2003, “Mechanics 1".

Air resistance should be neglected in this question.

A bottle of champagne is held with its cork $1.5\mathrm{m}$ above a level floor. The cork leaves the bottle at 60^o to the horizontal. The cork has *vertical* component of velocity of $9\mathrm{ms}^{-1}$, as shown in Fig. 4.

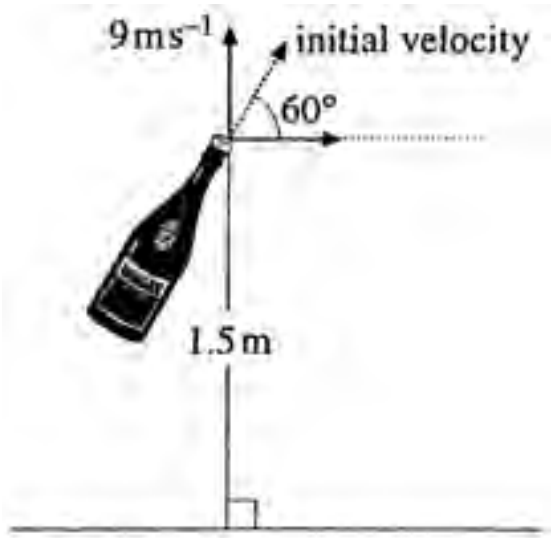

Fig. 4.

1. Show that the initial horizontal component of velocity is 5.20ms^{-1}, correct to three significant figures. [2]
2. Find the maximum height above the floor reached by the cork. [3]
3. Write down an expression in terms of t for the height of the cork above the floor t seconds after projection. [2]

After projection, the cork is in the air for T seconds before it hits the floor.

4. Show that T satisfies the equation $49T^2 - 90T - 15 = 0$.
   Hence show that the cork is in the air for 1.99s, correct to three significant figures.
   Calculate the horizontal distance travelled by the cork before it hits the floor. [5]
5. Calculate the speed with which the cork hits the floor. [3]

Grade comparisons

Instead, it was agreed that the A Level A/B borderline is lower than the IB Higher Level 7/6 borderline (the top of IB level 6 is equivalent to A level grade A). It was agreed that the A/B boundary was not as low as the IB Higher Level 6/5 boundary.

UCAS tariff

IB Diploma points	UCAS Tariff	#As	#A*s	
45	720	6	5.1	
44	698	5.8	5	
43	676	5.6	4.8	
42	654	5.5	4.7	
41	632	5.3	4.5	
40	611	5.1	4.4	
39	589	4.9	4.2	
38	567	4.7	4.1	
37	545	4.5	3.9	
36	523	4.4	3.7	
35	501	4.2	3.6	
34	479	4	3.4	
33	457	3.8	3.3	
32	435	3.6	3.1	
31	413	3.4	3	
30	392	3.3	2.8	A*AA=380
29	370	3.1	2.6	
28	348	2.9	2.5	
27	326	2.7	2.3	
26	304	2.5	2.2	
25	282	2.4	2	
24	260	2.2	1.9	

Conclusion

Birmingham IB offer is in line with Russell Group mathematics.

IB offers unfairly high compared to A-level.