$$\frac{a+b}{c} x^2 - bey^2 + dy^2 = d$$

What positive whole numbers are x and y?
The values of a, b, c, d and e are to be found
(in order) underlined in blue throughout
this brochure

Send your solution to
maths–puzzle@york.ac.uk

Welcome to the Department of Mathematics at the University of York

Why study mathematics at York?

Mathematics is not only a beautiful and important subject with many applications in the modern world but a degree in mathematics is one of the most sought-after qualifications by key employers, for example in business and the financial industry.
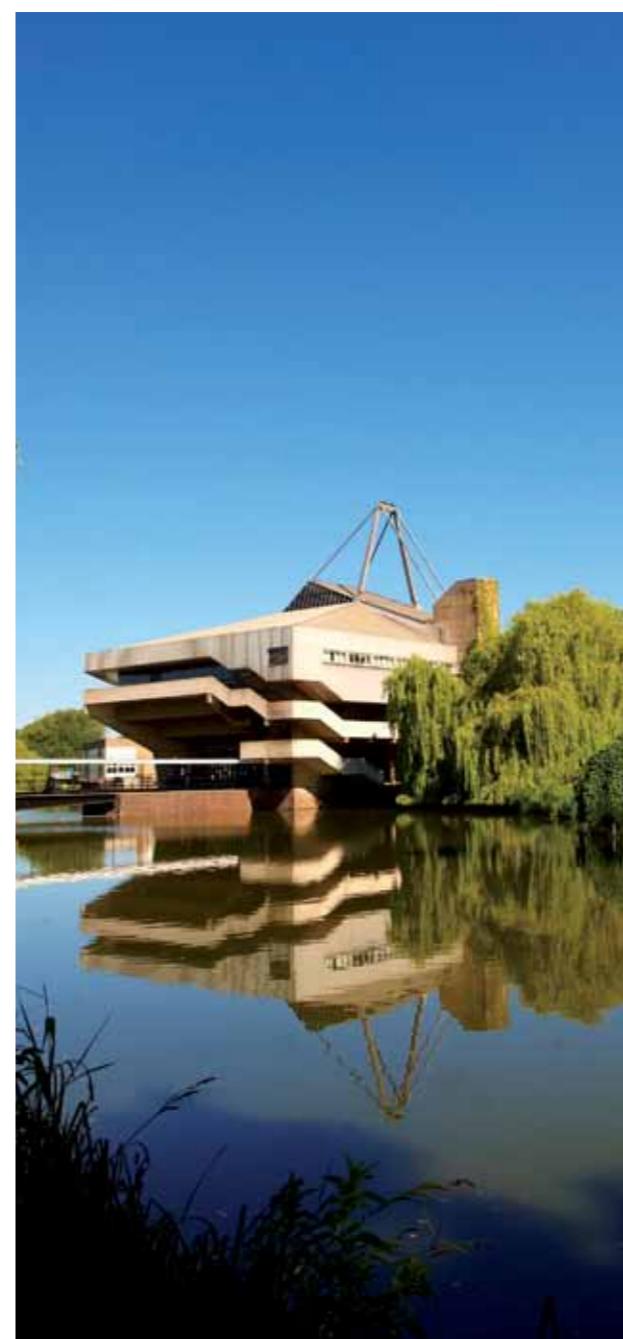
We offer a very wide range of courses at York, from pure mathematics to applied mathematics, mathematical physics and statistics, and a good selection of joint degree courses. Our courses are taught by dedicated staff, all of whom are also engaged in current research and many are world leaders in their field. The excellence of our programmes, taught in a relaxed and friendly atmosphere, together with York's reputation as a top university make a degree in Mathematics at York an outstanding career choice.

Contents

+ **90% student satisfaction rating in the recent National Student Survey**

+ **Small group teaching in a friendly atmosphere**

+ **Offers a comprehensive first year tutorial system to support undergraduates**

+ **Final year options and modules across the full spectrum of the mathematical disciplines**

+ **High employability rates for mathematics graduates**

+ **All 40 of our academic staff are engaged in leading international research across the mathematical spectrum**

+ **Many interdisciplinary connections with other departments**

+ **Opportunity to study abroad through the ERASMUS scheme at European universities**

+ **Thriving community of international students**

What our students say

What our staff say

Jonathan
Mathematics, 2nd year

"The degree is well structured and learning from an enthusiastic lecturer is the best part of the course. Mathematics is a degree highly sought after by graduate employers, and numerate candidates in many fields will have a distinct advantage!"

Alina
Mathematics and Computer Science, 2nd year

"York offers a huge variety of mathematics strands which gives a perfect opportunity to study any topic you like and also get a flavour of 'real' mathematics throughout your degree. I enjoy it very much and every single member of staff I've met is just brilliant."

Stephanie
Mathematics, MMath, 2nd year

"The Maths Department is great with inspiring lectures and the University has a brilliant vibe and is in an amazing city. The college system is also fantastic as you feel like you can contact your College committee about anything."

Dr Niall MacKay
Reader

"One of the most rewarding aspects of my job is supervising the final-year BSc and MMath projects. I think it's great for students to have the chance, at the end of their education, to escape from the exams treadmill and do some original thinking and perhaps reach the research frontier. There are students – some good at exams, some not so good – who really fly at this stage, and produce dissertations which they should be proud of for the rest of their lives."

Dr Samer A Kharroubi
Lecturer

"York is an ideal place to train as a statistician with a solid mathematical background. A well-trained statistician can help advance society's knowledge and welfare. Employment opportunities for such students include all areas – namely, medical statistics, health economics, the environment, biology, astronomy, physics, engineering, psychology, economics, actuarial work, finance, law, politics… and the list goes on!"
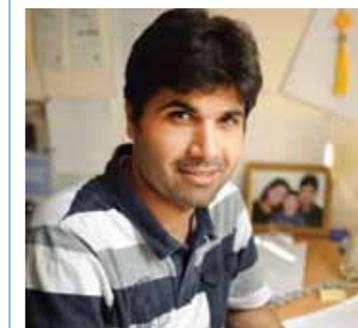
Dr Michael Bate
Lecturer

"It wasn't until I got to university that I properly realised the true scope and range of the subject, and all the possibilities which it opened up. It's a privilege now to be employed to do something I really enjoy. Most aspects of the job are very rewarding, from the pure research side to the teaching of undergraduates. The Department is a very friendly one, with a diverse range of interests and staff, and a good body of undergraduates who are a pleasure to teach."

Course overview

York's three-year mathematics programme provides not only the skills highly sought after by employers but also the mathematical knowledge specifically required for certain careers.

A four-year single programme is also offered, for those who wish to study mathematics to a higher level and prepare for careers as professional mathematicians in industry and research.

The first year provides a solid foundation in pure mathematics, applied mathematics and statistics.

This allows you, from the second year onwards, the opportunity to study the areas that most interest you from a wide choice of modules. These include Group Theory to Classical Mechanics, from Financial Mathematics to Medical Statistics.

In your final year, you spend one third of your time producing a substantial project in an area of your choice.

Courses offered

PROGRAMME	UCAS CODE
Four-year programmes	
Mathematics	G102, MMath/M
Mathematics and Physics (Equal)	GFC3, MMath/MPEQ
Mathematics and Computer Science (Equal)	GG14, MMath/MCS4
Three-year programmes	
Mathematics	G100, Mix/M
Economics and Mathematics (Equal)	LG11, Mix/EcMaEQ
Linguistics and Mathematics (Equal)	QG11, BA/LingM
Mathematics and Philosophy (Equal)	GV15, Mix/MPhiEQ
Mathematics and Physics (Equal)	GF13, Mix/MPhyEQ
Mathematics and Statistics (Equal)	GG13, Mix/MStaEQ
Mathematics and Finance (Equal)	GL11, BSc/MFinEQ
Computer Science and Mathematics (Equal)	GG41, BSc/CSM
Four to five-year sandwich programmes (including a year in industry)	
Computer Science and Mathematics (Equal)	GGK1, BSc/CSMa4
Mathematics and Computer Science (Equal)	GG1K, MMath/MCS5
Four-year programmes (including a year in Europe)	
Mathematics with a year in Europe	G101, Mix/MEu
Mathematics and Physics with a year in Europe (Equal)	GFD3, Mix/MPhyQE

Combined programmes

In addition to the single subject Mathematics programmes, we also offer a range of popular combined programmes. Both subjects are studied in equal proportions, with some available as four or three year programmes.

Economics and Mathematics

This three-year degree provides students with solid training in the fundamental elements of both mathematics and economics, equipping them with the quantitative skills, conceptual understanding and the ability to communicate effectively in both pure mathematics and the language of economics and social science.

Linguistics and Mathematics

Linguistics and mathematics both investigate patterns and structure, approaching the study in a rigorous and systematic manner. In the latter part of the degree, there is a large choice of modules to choose from across the spectrum of language, linguistics and mathematics.

Mathematics and Philosophy

Mathematics and philosophy have the common feature of striving to understand truth through reason and logical argument. The Mathematics degree programme is largely based on lectures and problem-solving whereas the Philosophy degree involves learning to refine and defend your own opinions through group discussions, independent study and essay writing. The joint degree has one foot in both camps, and consequently students are exposed to a variety of teaching methods and develop a broad range of learning skills.

Mathematics and Physics

Mathematics and Physics are natural subjects to combine in a single degree, and particularly so at York, which is one of the few universities with a wide range of theoretical physics in both the Departments of Mathematics and Physics. The Department offers modules up to and including General Relativity and Quantum Field Theory, the twin pillars on which our fundamental understanding of the world rests.

Mathematics and Statistics

This three-year degree is taught entirely in the Department of Mathematics. The latter part of the degree focuses on specialist topics, with a blend of theory and application. They aim to give the student the thorough training in the modelling, analysis and interpretation of real-world data that is required in the worlds of economics, industry, medicine and many other fields.

Mathematics and Finance

Financial firms look for professionals who are capable of carrying out sophisticated economic and financial analyses using statistical and mathematical tools. This degree provides rigorous training in all these areas at a level relevant to practitioners in the modern quantitative finance industry.

Mathematics and Computer Science

Computer Science is the theoretical study of computation, its implementation and practical application. However, even a cursory glance at a computer science textbook will convince the reader that mathematics lies at the heart of the subject, since mathematics provides both the language of computation and the logical tools needed to develop the relevant theories.

A year in industry

Our combined course with Computer Science provides the opportunity to apply the skills you develop on your course directly to a work environment, while you are still studying. Work placements with organisations such as Phillips Research, BAE Systems and Sophos are organised for you by the University, and make for impressive reading on your future CV.

A year in Europe

For students wishing to experience life in a different country and further develop their language skills, this is the perfect option. Year 3 of the four-year course is spent at a university in either Germany, France, Spain or Italy. The experience of learning and living in a different culture adds new dimensions to your time at University, widening your intellectual and social experience.

To find out more about our course options, please refer to the Undergraduate Prospectus and departmental website: **http://maths.york.ac.uk**.

A typical undergraduate module outline

This is an example of a typical set of modules taken by a student on the BSc single subject degree with interests in pure mathematics.

A wide range of options is available in the third year and a different selection would be appropriate for a student interested in Mathematical Physics or Statistics, for example.

For a full range of options visit **http://maths.york.ac.uk**.

Stage 1

Autumn Term	Spring Term	Summer Term
Calculus (30 credits)		
Core Algebra (30 credits)		
Introduction to Probability and Statistics (20 credits)	Introduction to Applied Mathematics (20 credits)	
	Real Analysis (20 credits)	

Stage 2

Autumn Term	Spring Term	Summer Term
Differential Equations (**10**)	Vector Calculus (20)	
Introduction to Number Theory (10)	Complex Analysis and Integral Transforms (20)	
Introduction to Group Theory (10)	Groups, Rings and Fields (20)	
Applied Probability (10)	Linear Algebra (20)	

Stage 3

| Autumn Term	Spring Term	Summer Term
Final Year Project (40)		
Differential Equations (10)	Lebesgue Integration (10)	
Metric Spaces and Topology (10)	Algebraic Number Theory (10)	
Galois Theory (10)	Special Functions (10)	
Mathematical Finance I (10)	Numerical Analysis and Scientific Computing (10)	

Teaching and learning

We provide a variety of modes of teaching throughout your degree, including lectures, group tutorials and seminars.

The group tutorial system we provide in the first year is particularly highly valued by our students. This comprises an informal, small group meeting held once a week with your supervisor to discuss and review the core modules on the course. It provides a great opportunity to get to grips with any queries you have about lecture material, help you work out how to tackle an assignment and develop your skills in understanding, creating and presenting mathematical arguments.

Non-core modules are supported by weekly seminars, which continue into the second year. In the third and fourth years the lecture programmes are mostly in smaller groups and each has a weekly seminar or class.

In a typical week's teaching, you can expect about ten to 12 lectures. With classes, seminars and tutorials you will have a total of about 15 to 18 timetabled hours. Students then spend about the same amount of time on personal and group study.

In addition to the formal structured teaching, we pride ourselves on being an open and friendly team and are always available for advice or an informal chat. Your supervisor in particular is your key point of contact to guide you through your degree programme, to help you get the most out of your studies and answer any questions you may have.
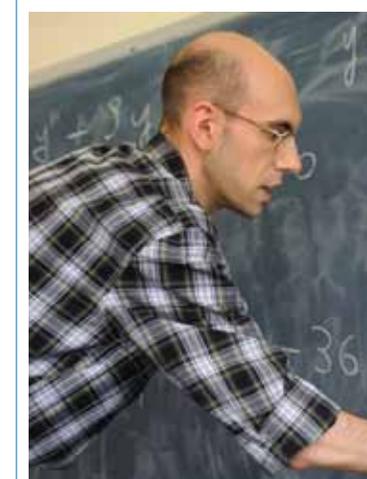
Our global community

The Department and the University welcomes applicants from around the world, and has a thriving international community made up of both students and staff. This community, together with our research links with other academic institutions across the globe, creates a vibrant and cosmopolitan atmosphere.

The University has an International Recruitment Team in Student Recruitment and Admissions which specialises in assisting overseas students with all aspects of studying and living in York, and a popular International Students' Association which organises events throughout the year.

If English is not your first language you will need an English language qualification for admission. The University offers support throughout your course with free, specialised English language tuition in your first year. Details about these and other common questions, including details of our International Foundation Programmes, can be found on the University website.

A range of scholarships is available for suitably qualified overseas students, from both the University and the Department of Mathematics, including a £1,000 a year fee reduction for single subject and Maths/Statistics programmes.

Visit our website for full details at **www.york.ac.uk/ study/international**.

Iphigenia
Mathematics and Statistics, 2002
Financial Auditor
PricewaterhouseCoopers
Washington DC

"When applying to York from Cyprus, I was really attracted to the University because of its amazing academic reputation and it being a beautiful, welcoming, city. As soon as I saw it, I knew that York was the place for me!

"I really enjoyed my Maths with Statistics degree, and the great thing about it is that it can be broadly applied in the workplace.

"I was involved in the Wine Society, the Mediterranean Society and the Hellenic Society at York. One of the fantastic things about York is its diversity and the integration of so many different students. It's a small enough place not to get lost, but a big enough place to have fun.

"The campus environment, combined with the city and its proximity to places such as Leeds and Manchester, make it the ideal place to live, and you really get an experience of proper student life. The city is not far away from the campus, and the community is really friendly."

Research excellence

Reidun Twarock –
fighting infections with symmetry

At York we have a diverse and dynamic range of international and interdisciplinary research interests, covering areas including:

+ **Pure mathematics**
+ **Applied mathematics**
+ **Mathematical biology**
+ **Mathematical physics**
+ **Stochastic analysis**
+ **Mathematical finance and statistics**

Many of the third- and fourth-year modules are directly related to the research interests of the Department and are taught by leaders in the field.

We also have strong collaborative links with other departments within the University, where we are involved in ground-breaking research in areas such as Biology, Computer Science, Chemistry, Electronics, Economics, Health Sciences, Physics, Psychology and Complex Systems Analysis.

Professor Reidun Twarock runs an interdisciplinary research programme which aims to develop new theoretical tools that enable a better understanding of the mechanisms underlying the formation and infectivity of viruses.

Many stages of the viral replication process, such as the formation and structural transitions of the protein containers that encapsulate the viral genomes, are crucially dependent on the geometric properties of viruses. Her research team analyses these geometric features with a range of mathematical techniques, and combines the results with tools from biophysics, bioinformatics and computational chemistry to investigate their impact on how viruses form and infect their hosts.

The overall goal is to use these insights to inform anti-viral strategies that exploit the structural properties of viruses to inhibit their formation and infectivity.

For example, the human papilloma viruses, the major cause of cervical cancer and a factor in other cancers, have a five-fold or pentagonal structure that doesn't match with traditional ideas of symmetry, because a pentagon cannot be built from regular triangles.

Professor Twarock has found a fix based on decades-old pure mathematics. Based on work developed by mathematical physicist Roger Penrose, Professor Twarock has developed Penrose's concept in three dimensions, which has enabled her to model the capsid structure of complicated viruses like human papilloma.

"Modelling the structure of viruses could have enormous ramifications for drug design and the development of new treatments," says Professor Twarock. "Being able to contribute to this development through our research work is both fascinating and hugely rewarding."

Your future — so what can you do with a mathematics degree?

Mathematics graduates are in great demand by a wide range of employers, who value the skills developed over the course of the degree. The ability to communicate and solve complex problems and critically analyse information in a logical way are all much sought after from organisations in both the public and private sectors.

While a number of mathematics graduates choose to pursue careers in research and teaching, over 70% of our most recent graduates have gone on to a range of careers, including:

+ **Banking and financial services**
+ **Computing and IT**
+ **Law**
+ **Engineering**
+ **Accountancy and actuarial work**
+ **Media and creative**
+ **Public administration**
+ **Logistics**
+ **Hospitality and sales**
+ **Telecommunications**

Helen
Computer Science and Mathematics, 2006
Engineer, IBM

"One of the biggest attractions of the Computer Science and Mathematics degree at York is the opportunity to work for a year in industry. This not only helps to boost your CV, but also allows you to try out a job for a year and to think properly about career choices. My sandwich year was an industrial placement at IBM where I now work as a line manager, overseeing projects and people. I developed a lot of technical training on my sandwich year and the experience clearly helped to boost my career."

Sam
Mathematics, 2007
Equity Research,
Sanford C Bernstein

"My degree in Maths gave me the perfect grounding in terms of logical thinking, analysis and modelling, which are all essential elements of my job. When I applied for this job and for my previous role at KPMG, York had a good reputation. It was a very highly-regarded university."

Entry requirements

We are looking for students with mathematical talent and the potential to benefit from, and succeed in, the degree course at York.

Details of our typical offers are available from **http://maths.york.ac.uk/www/admit**. In most cases we make a decision soon after receiving your application. Successful candidates will be invited to visit the University and the Department.

Individual circumstances are always taken into account when deciding whether to modify our typical offer. Occasionally we interview candidates before making an offer, for example mature applicants or those with special needs.

Programme requirements

AAA/AAB including A level grade A in Mathematics or equivalent. For full details please refer to our website and the Undergraduate Prospectus.

Mature applicants

We welcome applications from mature applicants and have many examples of students who have successfully completed our programmes long after they have left school. Normally we ask that you should have studied Mathematics at A level or an equivalent standard in the fairly recent past, but we will not necessarily insist on any particular formal qualifications.

Bursaries and scholarships

The University of York has a range of general scholarships and bursaries available for home students and scholarships for overseas students.

In addition, the Department of Mathematics has available the Annie Curry Williamson scholarships, which provide £2,000 per year of study, plus a number of prizes and scholarships, with a modest financial reward, for outstanding students. For further details on all the above visit **http://maths.york.ac.uk/www/admit**.

The University of York wants to ensure that no-one who has the potential to study here is put off from applying because of costs. Information about fees and financial support is available on our website at **www.york.ac.uk/study/undergraduate/fees-funding**.

Open Days and Visit Days

We'd love you to come along and meet us at one of our Open Days and/or Visit Days when we will be welcoming prospective students to the University and the Department of Mathematics, and showing them what we can offer.

Meet our staff, our students, see the lecture theatres and study rooms, check out the accommodation, have a coffee in one of our cafés and explore our picturesque campus.

See: **www.york.ac.uk/openday** for forthcoming dates.

About the University of York

In less than 50 years, York has powered its way to become one of the top UK universities, performing equally well on teaching and research quality measures – and is ranked in the top 100 universities in the world. York was named University of the Year 2010 by Times Higher Education, the global authority on higher education performance.

Life for all of our students is centred at Heslington on the edge of the historic city of York, where our colleges are set in an attractive landscaped campus. It is compact, easy to get around, and has a safe, friendly atmosphere.

We offer you:

+ **A very high–quality academic experience**
+ **A commitment to enhancing your employability**
+ **A strong reputation for student support**
+ **Affordable and plentiful accommodation**
+ **A lively and stimulating environment**
+ **A beautiful location in one of Europe's finest cities**

… with easy access from anywhere.

For further information about student life on campus visit **www.york.ac.uk/study/ student-life**.

About the city of York

Life in York – historic city by day, buzzing hotspot by night – is varied, colourful and lively. A diverse range of shops, galleries, clubs, cafés, museums, music groups and sports clubs means that the city really does offer something for everyone. With a population of 190,000, York is big enough to feel cosmopolitan but small enough not to be overwhelming. It is a friendly place you can settle into quickly, but which still feels fresh and exciting once you get to know it well.

York was recently voted Britain's favourite small City in a Rough Guide poll, and its historic streets bustle with visitors from all around the world. There is plenty to impress, from the famously soaring Gothic Minster and winding medieval streets, to a packed calendar of cultural activities including festivals, concerts and sporting events.

York is also one of Britain's best connected cities, offering great transport links to other major cities as well as the wealth of beautiful countryside and coastline offered in Yorkshire.

For further information about student life in the city of York visit **www.york.ac.uk/study/ student-life**.

THE UNIVERSITY *of York*

Department of Mathematics

For full details of all the courses available and information about the Department please see our website at **http://maths.york.ac.uk** or the Undergraduate Prospectus at **www.york.ac.uk/study/undergraduate/prospectus**.

Contact details
Departmental Admissions Administrator
Tel: +44 (0)1904 323070
Email: maths-undergraduate-admissions@york.ac.uk

We offer world–class pure and applied courses in a dynamic and friendly environment, taught by leading academics and researchers in the discipline. Flexible course options, a high level of student support and a commitment to excellence produces graduates in demand from a wide range of employers and institutions.

2010
THE AWARDS
UNIVERSITY OF THE YEAR