

Durham Johnston  
Mathematics  
Department

An introduction to  
A Level Mathematics.

# Notes

## An introduction to A level mathematics at DJCS.

Thank you for choosing to study Mathematics at Durham Johnston. We follow the new OCR linear specification, Mathematics A – H230/H240 and Further Mathematics A – H235/H245.

All mathematics students at Durham Johnston will sit AS mathematics exams at the end of Year 12. If you also opt for further maths you will sit AS exams in further maths too.

Algebra is the language of mathematics and your success in the examinations next year is dependent upon your fluency in basic number work and in algebraic manipulation as well as your ability to write clear, coherent and detailed solutions to problems. You must be willing to perfect a range of skills that you have already met at GCSE such as simplifying surds, working with indices and rearranging formulae.

In week 3 of your course you will take a basic algebra test. The pass mark for this test is 60%. If you do not pass this test you will be interviewed by the Subject Leader, to discuss your next steps and your parent/guardian will be informed. You will be given a programme of additional work to complete and you will take a second test immediately after the October half term holiday. This second test will take place at the end of a school day.

A mock test is provided in this booklet.

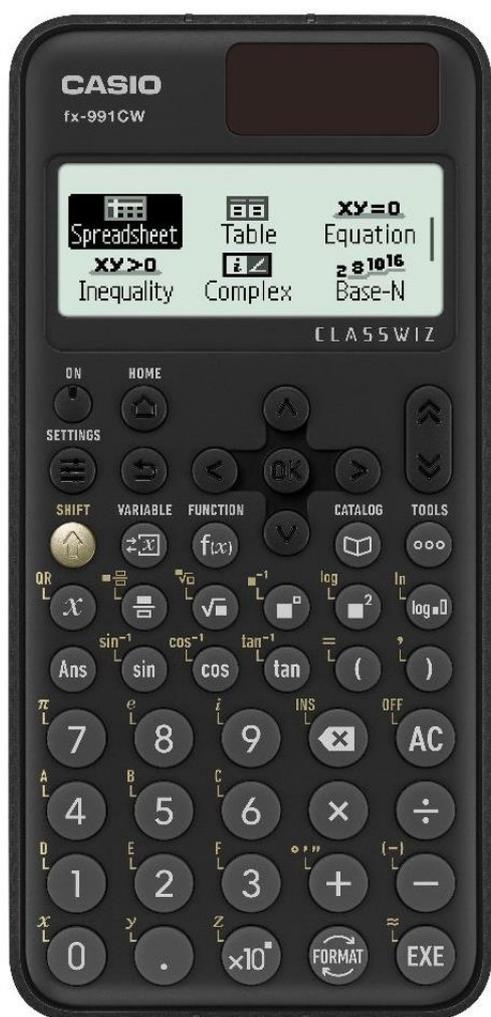
It is important to cultivate good study skills from the very beginning of your course. Organise your notes and examples in a folder and make sure that you take an active part in every lesson. Complete every set task and meet deadlines. You must persevere when the going gets tough and take action when you need help. The teachers in the mathematics department at Durham Johnston are very experienced and are always willing to provide support and guidance.

Mrs Urwin

Subject Leader for Mathematics

## Calculators and Computers

The current linear A level specifications all require an advanced calculator with built-in statistical distribution functions. The calculator you used for GCSE and the "advanced" calculators available in the shops will often not be good enough. There are two current non-graphical calculators that are suitable. **The Casio Fx-991 Classwiz is our preferred calculator. The new model is the Fx-991CW Classwiz, which is the replacement for the Fx-991EX Classwiz** (The 991EX may still be available second hand). Other calculators that have the necessary built-in statistical distributions are the **TI-30X Pro** and most graphical calculators. Remember to check the supermarket "back to school" displays.



You should also have the facility to draw graphs and manipulate statistical data to aid your learning throughout the course. There's no need to purchase expensive equipment or software for this. We recommend the excellent and free **Geogebra**. You should download their graphing calculator app to your phone/tablet (iOS or Android) and install Geogebra Classic on your Windows machine or Mac.

## Further help

- The exam board, OCR, provides a very useful bridging guide. This contains detailed examples and exercises for you to work through. It can be found on the website at <http://www.ocr.org.uk/Images/373371-bridging-the-gap-between-gcse-and-as-a-level-mathematics-a-student-guide.docx> .
- A very useful source of help is Khan Academy [www.khanacademy.org](http://www.khanacademy.org)

You will need to register and create a username and password.

- You may also find the following books useful:

Head Start to A-Level Maths Published by CGP Workbooks ISBN: 978 1 78294 792 9 £5.95	AlphaWorkbooks Preparation for AS/A level Mathematics Available from the website below <a href="http://www.alphaworkbooks.co.uk">www.alphaworkbooks.co.uk</a>
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## Suggested Reading List

**Alex's Adventures in Numberland** by Alex Bellos

**Professor Stewart's Cabinet of Mathematical Curiosities** by Ian Stewart

**Fermat's Last Theorem** by Simon Singh

**The Number Mysteries** by Marcus du Sautoy

**How Many Socks Make a Pair? Surprisingly Interesting Maths** by Rob Eastway

**The Curious Incident of the Dog in the Night-time** by Mark Haddon

**The Penguin Dictionary of Curious & Interesting Numbers** by David Wells

**The Code Book** by Simon Singh

**50 Mathematical Ideas You Really Need to Know** by Tony Crilly

**Gödel's Proof** by Ernest Nagel and James R. Newman

**Gödel, Escher, Bach: An Eternal Golden Braid** by Douglas R. Hofstadter

**The Pleasures of Counting** by T. W. Körner

## How to be a successful mathematics student

<p>Don't expect the teacher to notice you are stuck – ask for help.</p>	<p>Take an active role in your learning. Those who get highest marks are often those who ask lots of questions and discuss their work with others.</p>
<p>Set work out in exactly the same way as your teacher does – there is always a good reason for this.</p>	<p>Write equals signs underneath each other. Remember to answer the question and say what it is you've calculated.</p>
<p>Be intrigued if you're wrong – work out why.</p>	<p>Mathematicians are people who don't necessarily get the right answer straight away – but they are interested in why their answer is wrong and they PERSEVERE to correct it. Mathematics is about trial and improvement – not right and wrong.</p>
<p>If you can't explain something to someone else, you're not sure enough – do more work on it.</p>	<p>EXPECT to have to work at something and for it to take several goes. This may feel different to GCSE where perhaps you didn't have to.</p>
<p>Mark your own work using the answers in the back of the text book.</p>	<p>Using the answer to help you to understand isn't cheating. When handing in work, tick the work that is correct, make corrections when you can and annotate any remaining wrong answers to help your teacher to see where you are having difficulties.</p>
<p>Rewrite work – don't expect the teacher to plough through lots of incorrect working.</p>	<p>Make your work neat and easy to read – take pride in its appearance.</p>
<p>Show all the steps of your method.</p>	<p>Communicating your ideas is an important skill to practise.</p>
<p>Deadlines are important so don't ignore them.</p>	<p>You can't miss them at university or at work, so get into good habits now.</p>
<p>If you miss a lesson, find a way to catch up.</p>	<p>A good way is to ask someone who was in the lesson to explain it to you – that's good for them too. Copy up notes carefully – and read them!</p>
<p>Always do your corrections and get them checked...</p>	<p>...otherwise there is no point in doing them.</p>



# DJCS Mathematics Department

## GCSE to AS induction - practice exercise.

1. Evaluate

$$10^2 \qquad 64^{1/2} \qquad 8^{-4/3}$$

2. Express as a power of 3

$$3^2 \times 3^5 \qquad 3^{10} \div 3^2 \qquad (3^2)^3 \qquad 3^2 \times 9^4$$

3. The points A, B and C have the following coordinates: A (7, 5), B (3, -3) and C (-1, 9).

- Find the gradient of AB, BC and CA.
- What type of triangle is triangle ABC?
- Find the area of triangle ABC
- Find the equation of the line parallel to AB, passing through the point D(1,4)

4. Expand and simplify:

- $(5x + 3)^2 + (3x + 1)^2$
- $(5x + 3)^2 - (3x + 1)^2$
- $3(5x + 3)^2 + 2(3x + 1)^2$
- $3(5x + 3)^2 - 2(3x + 1)^2$

5. Simplify

$$\sqrt{75} \qquad \sqrt{72} \qquad \sqrt{48} \qquad \sqrt{80} \qquad \sqrt{98}$$

6. Express in the form  $a\sqrt{b}$

$$\sqrt{75} + \sqrt{48} \qquad \sqrt{98} - \sqrt{72}$$

7. Rationalise

$$\frac{10}{\sqrt{5}}$$

$$\frac{12}{\sqrt{3}}$$

$$\frac{4}{1+\sqrt{7}}$$

$$\frac{42}{5-\sqrt{2}}$$

$$\frac{10}{2-\sqrt{3}}$$

8. Solve the following, leaving your answers in surd form where necessary.

- $x^2 + x - 12 = 0$
- $2x^2 + 5x - 3 = 0$
- $16 - x^2 = 0$
- $3x^2 + 10x - 5 = 0$

9. Solve the following inequalities

- $2x + 10 \leq 17$
- $x^2 + x - 12 \leq 0$
- $2x^2 + 5x - 3 \geq 0$