



Woolwich Polytechnic  
Sixth Form

## Mathematics

### Home Learning Pack Challenges

Please find attached a pack of work to help prepare you for Sixth Form.

I am delighted that you have shown an interest in Business Studies. In order to get you thinking about the subject, I have drawn up a **challenge pack** to help you prepare for studies in the 6<sup>th</sup> form such as business research activities, books to read, films to watch on a rainy afternoon, useful websites to browse when Snapchat, Instagram gets dull.

**For a look at the syllabus:**

<https://qualifications.pearson.com/content/dam/pdf/A%20Level/Mathematics/2017/specification-and-sample-assesment/a-level-l3-mathematics-specification-issue4.pdf>

**Useful websites/apps- register now:**

- <https://sites.google.com/site/tlmaths314/home/a-level-maths-2017>
- <https://www.examsolutions.net/>
- <https://amsp.org.uk/>

Please email me ([bpsanar@woolwichpoly.co.uk](mailto:bpsanar@woolwichpoly.co.uk)) if you have any queries or questions.

In the meantime, I want to say a big thank you for your hard work and I am so very sorry you have lost your opportunity to complete the exams. During these unprecedented times it's important to keep going and know we will be back to normal soon.

Kind regards

**Mr B Panesar**

Head of Key Stage 5 Mathematics

Woolwich Polytechnic Sixth Form

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## Home Activities

### AMSP Transition Materials

The Advanced Mathematics Support Program is a charity that aims to improve Mathematics in the UK. They are releasing the following resources that are designed to help you in making the transition from GCSE to AS and A level Mathematics.

Many students say that they find the initial transition from GCSE challenging and so we have tried to focus on key skills that will be used across the whole spectrum of AS and A level Mathematics. For the six essential skills we have covered, we have included in each section, a skills check, a chance to practise and explore and some enrichment ideas which you may want to investigate further.

There will be six sets of resources and each set should provide about 3 hours of work. If you really get engaged by the enrichment activities, you may want to spend longer than this. Each set is fully resourced with either written worked solutions, video solutions or links to websites. Each week we will be releasing new resources and the new material will be spread out over six weeks. We hope you find these resources useful and that they add depth to your understanding. We also hope that they help you make a smooth and successful transition to AS and A level Mathematics.

<https://amsp.org.uk/resource/gcse-alevel-transition-resources>

The screenshot shows a web browser window with the URL <https://amsp.org.uk/resource/gcse-alevel-transition-resources>. The page content is as follows:

- Simplifying**  
Simplifying numerical and algebraic expressions is an essential component in maths. Here we look at the key skill of simplifying and how it is applied to fractions, indices and surds in particular.
- Fractions**
  - Presentation
  - Solutions
- Indices**
  - Presentation
  - 'Where does it belong?' hint
  - 'Where does it belong?' solution
- Surds**
  - Presentation
  - 'Wheel of Theodorus' solutions
  - 'Take a sheet of A4' solutions
- Expanding**  
These resources will be available week commencing 11 May
- Factorising**  
These resources will be available week commencing 18 May
- Rearranging**  
These resources will be available week commencing 25 May
- Solving**  
These resources will be available week commencing 1 June

## Further Mathematics GCSE

Over the past 2 years we have use the Further Mathematics GCSE for students who are achieving grades 8/9 and/or intending to do Further Mathematics A-Level.

With the exception of Matrices all other topics will appear in your A-Level Mathematics. The majority of students who completed this course went on to get an A\* in their Mathematics A-Level.

<http://mrbartonmaths.com/students/aqa-level-2-certificate-in-further-mathematics/index.html>

AQA Level 2 Certificate in Further Mathematics

I have had the pleasure of teaching this qualification from AQA each year since it started in 2012, and I love it. Here are some materials to help you with the teaching and learning of it.



We recommend you start with the videos orange box, pause them and attempt the questions prior to watching the answers. The order they are in currently, is recommended as the course gets gradually harder but also builds on prior knowledge.

- Algebra and Number Basics
- Brackets and Factorising
- Functions
- Equations
- Co-ordinate Geometry
- Calculus
- Matrices
- Angles and Geometry
- Trigonometry

Some of the topics you will find harder than others and some maybe new to you. In either case your first port of call should be to search YouTube looking for a video explanation this level of independent thinking will prove extremely useful in sixth form and beyond.

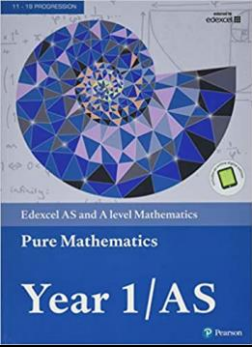
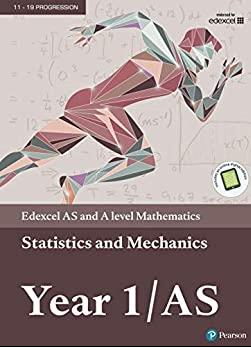
If you are struggling to find a video or there is a specific area you are finding difficult then email both [bpanesar@woolwichpoly.co.uk](mailto:bpanesar@woolwichpoly.co.uk) & [mmcguinness@woolwichpoly.co.uk](mailto:mmcguinness@woolwichpoly.co.uk) and one of them will get back to you as soon as possible.

Once you have completed the 9 (or 8 if you choose to ignore Matrices) then you are ready to move onto past papers blue box. There are written solutions and videos to each paper. The site hasn't been updated post 2015 so if you finish all of this get in contact with [bpanesar@woolwichpoly.co.uk](mailto:bpanesar@woolwichpoly.co.uk) & [mmcguinness@woolwichpoly.co.uk](mailto:mmcguinness@woolwichpoly.co.uk) and they will be able to send you more.

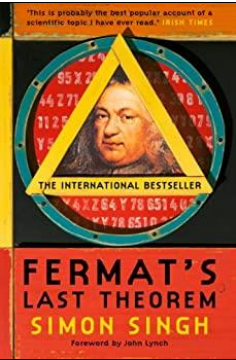
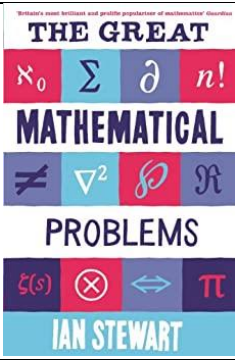
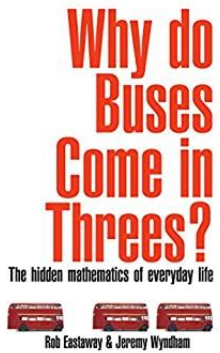
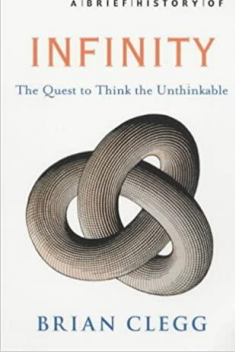
Please use this pack if you are interested in continuing studying Mathematics or Further Mathematics

## READING

### Text Books

	
<p>Edexcel AS and A level Mathematics Pure Mathematics Year 1/AS Textbook + e-book</p>	<p>Edexcel AS and A level Mathematics Statistics &amp; Mechanics Year 1/AS Textbook + e-book</p>

### Reading Books

	
<p>Fermat's Last Theorem</p>	<p>The Great Mathematical Problems</p>
	
<p>Why Do Buses Come in Threes?: The Hidden Maths of Everyday Life</p>	<p>Brief History of Infinity: The Quest to Think the Unthinkable</p>

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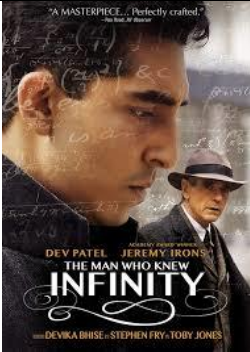




## FILMS

 <p>A MASTERPIECE... Perfectly crafted. —The Irish Times</p> <p>DEV PATEL JEREMY IRONS THE MAN WHO KNEW INFINITY with DEVIKA BHISE, STEPHEN FRY, TOBY JONES</p>	 <p>Jim Sturgess Kate Winslet with Laurence Fishburne and Kevin Spacey</p> <p>21 Kevin Spacey and a gifted ace look to win big at the Monte Carlo Casino.</p>
<p>The Man Who Knew Infinity</p>	<p>21</p>
 <p>BASED ON THE BESTSELLING TRUE STORY</p> <p>HIDDEN FIGURES</p> <p>WILL YOU BELIEVE THE STORY OF A WOMAN WHO WAS CALLED "MOTHER" BY HER BOSS?</p>	 <p>THE OXFORD MURDERS</p> <p>CONDUCTED BY MUSIC OF LA BIOLINA</p> <p>CAN YOU KNOW THE TRUTH?</p> <p>"WONDERFULLY COMPELLING" —The New York Times</p>
<p>Hidden Figures</p>	<p>The Oxford Murders</p>
 <p>NO ONE HAS EVER WON THE ACADEMY AWARD FOR BEST DIRECTOR WHO ONLY COULD HAVE MANAGED</p> <p>RUSSELL CROWE A BEAUTIFUL MIND COURTESY</p>	 <p>GOOD WILL HUNTING</p>
<p>A Beautiful Mind</p>	<p>Good Will Hunting</p>
 <p>A MASTERFUL WORK OF HEARTBREAKING ARTISTRY AND PERFECTION</p> <p>THEORY OF EVERYTHING THEY SAY LOVE IS THE ONLY TRUTH WE CAN BELIEVE IN</p> <p>EDDIE REDMAYNE FELICITY JONES</p>	 <p>THE IMITATION GAME</p>
<p>The Theory of Everything</p>	<p>Imitation Games</p>



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**TV Programs**

	
<p>Numb3rs</p>	<p>Scorpion</p>
	
<p>The Story of Maths</p>	<p>Horizon - 1995-1996: Fermats Last Theorem</p>
	
<p>Person of Interest</p>	<p>Youtube Channel: Numberphile</p>

## Revision Notes

These ideas appear at GCSE and will be needed during your first year of A-Level Mathematics, it would be beneficial to learn these formulas and even more so to find out where they come from.

### Quadratic equations

The roots of the equation  $ax^2 + bx + c = 0$  are  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ .

The discriminant is  $(b^2 - 4ac)$

Discriminant  $> 0$ : 2 real roots  
 Discriminant  $= 0$ : 1 repeated root  
 Discriminant  $< 0$ : No real roots

### Indices

$$a^m \times a^n = a^{m+n} \qquad a^m \div a^n = a^{m-n} \qquad a^0 = 1$$

$$a^{-m} = \frac{1}{a^m} \qquad a^{\frac{1}{n}} = \sqrt[n]{a} \qquad (a^m)^n = a^{mn}$$

### Straight lines

The line joining  $(x_1, y_1)$  to  $(x_2, y_2)$  has:

Gradient  $m = \frac{y_2 - y_1}{x_2 - x_1}$       Length  $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Equation  $\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$       Mid-point  $\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Other formulae for the equation of a straight line:

Through  $(0, c)$  with gradient  $m$ :  $y = mx + c$

Through  $(x_1, y_1)$  with gradient  $m$ :  $y - y_1 = m(x - x_1)$

Through  $(a, 0)$  and  $(0, b)$ :  $\frac{x}{a} + \frac{y}{b} = 1$

Perpendicular lines: The product of their gradients  $m_1 m_2 = -1$



**Circles**

The circle with centre  $(a, b)$  radius  $r$  has equation  $(x - a)^2 + (y - b)^2 = r^2$

**Trigonometric ratios of some angles**

$\theta$	$0^\circ$	$30^\circ$	$45^\circ$	$60^\circ$	$90^\circ$	$180^\circ$
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	0
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	-1
$\tan \theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	-	0

**Trigonometric identities**

$$\frac{\sin \theta}{\cos \theta} = \tan \theta \quad \sin^2 \theta + \cos^2 \theta = 1$$

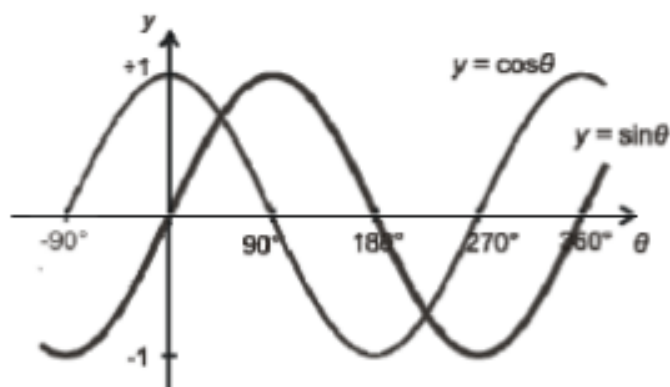
**Triangles**

$$\text{Area} = \frac{1}{2} ab \sin C = \frac{1}{2} bc \sin A = \frac{1}{2} ca \sin B$$

$$\text{Sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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### Trigonometrical relationships



$$\sin(-\theta) = -\sin \theta$$

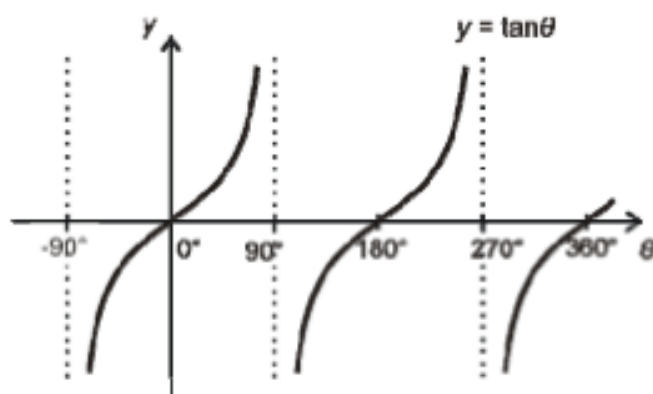
$$\cos(-\theta) = \cos \theta$$

$$\sin(\theta + 90^\circ) = \cos \theta$$

$$\cos(\theta + 90^\circ) = -\sin \theta$$

$$\sin(\theta + 180^\circ) = -\sin \theta$$

$$\cos(\theta + 180^\circ) = -\cos \theta$$



$$\tan(-\theta) = -\tan \theta$$

$$\tan(\theta + 180^\circ) = \tan \theta$$