

## Essential Skills – Printable version

### Further information for teachers

Thank you for your interest in this printable version of our popular Essential Skills – Transition to A level materials. These are just a few notes on how to get the most out of these resources and the differences you will find from the online version that you are hopefully already familiar with

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

This transition support package focuses on the consolidation of key Higher tier GCSE skills that underpin progression to AS and A level Maths courses and how they can be applied across a range of topics. It is vitally important that students are fluent and confident in applying these key skills, so they are successful in making the transition to the academic standard required at A level.

The online version was designed for students to work through at home without a teacher, during the time of school closure. Each lesson contained full worked solutions to support students and within the 'Still want more?' sections there were hyperlinks to interesting videos and activities to broaden their experience and to encourage independent learning skills.

The purpose of this printable version, and following requests from teachers, is to make the Essential Skills materials even more flexible. In particular it is designed for you to be able to give the resources to students with limited or no access to a computer or the internet so they are not disadvantaged in any way. These resources will also be available throughout the school year and you can therefore use them within class, give as assignments, however you choose.

### What's the same and what's different?

The resources are organised, titled and contain the same questions as in the original online version – so within each section we incorporate:



A review of skills and a check on understanding



A chance to practise skills and explore the topic



An opportunity to deepen understanding and focus on the purpose of these skills through extension and enrichment resources.

In this printable version there are answers for all tasks but no fully worked solutions, rather students are encouraged to speak to you, their teacher, for support. For example, you could provide them with in class help or give them an opportunity within school to access the full solutions within the online version of the resources.

They are no hyperlinked enrichment activities within the printable resources. We have, however, included all the 'Still want more?' links at the end of this document. We have put them all in one place so you can easily find them and use them how and when you would like with students.

## What is available?

Within each folder you can download and print the following

Folder	Printable content			
<b>Simplifying</b>	Fractions	Indices	Surds	Simplifying Solutions
<b>Expanding</b>	Expanding	Double Brackets	More Brackets	Expanding Solutions
<b>Factorising</b>	Factorising	Further Factorising	Completing the Square	Factorising Solutions
<b>Rearranging</b>	Rearranging	Rearranging and Factorising	Rearranging and Fractions	Rearranging Solutions
<b>Solving</b>	Linear Equations	Quadratic Equations	Other Equations	Solving Solutions
<b>Sketching</b>	Linear Graphs	Quadratic Graphs	Other Graphs	Sketching Solutions

We hope you find the materials interesting and stimulating and that they will help to support your students.




As always we welcome any feedback and requests for any further resources that you would find helpful.

If you would like to contact us then please email [admin@amsp.org.uk](mailto:admin@amsp.org.uk).






### Simplifying




#### Fractions

	<a href="#"><u>Read</u></a> some more about interesting fractions and how fractions are everywhere!
	<a href="#"><u>Discover</u></a> more about fractions and series. This task explores what happens when we add fractions repeatedly
	<a href="#"><u>Watch</u></a> this video to find out one way that fractions connect biology and mathematics.

#### Indices




	<a href="#"><u>Read</u></a> how maths is used in different careers. For indices and exponential growth check out <i>Population Dynamics</i> , <i>Epidemics Analysis</i> and <a href="#"><u>Carbon Dating</u></a> in particular
	<a href="#"><u>Discover</u></a> the power of indices! Here you will see how they could be used to knock down very tall buildings!!
	<a href="#"><u>Watch</u></a> this Numberphile video and learn how to impress friends and family by finding the fifth root of a number in the blink of an eye

#### Surds


	<a href="#"><u>Read</u></a> about how Irrational numbers can “Inspir-al” you! It’s where mathematics and art meet!
	<a href="#"><u>Discover</u></a> the proof, that $\sqrt{2}$ is irrational – without getting murdered like Hippasus.
	<a href="#"><u>Watch</u></a> this video to find out more about the special properties of A4 paper and discover what makes $\sqrt{2}$ one of the most popular surds of all time.



### Expanding

#### Single brackets




	<a href="#"><u>Read</u></a> minds with maths! Have a go at this number trick and then not only impress friends and family but discover how it is done and create your own tricks.
	<a href="#"><u>Discover</u></a> and use algebra to prove why something is true. There is a <a href="#"><u>solution</u></a> if you need it.
	<a href="#"><u>Watch</u></a> more mathematical hocus pocus in this video - <i>you will be astounded!</i> The result you'll discover is used in many area of physics, including string theory, so it's not hocus pocus after all!

#### Double brackets

	<a href="#"><u>Read</u></a> more about how algebra was developed thousands of years ago and how visualisations were used even then!
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	<u>Discover</u> the history of negative numbers and how they were thought of as making dark of mathematics!
	<u>Watch</u> this video to find how there are actually patterns in prime numbers and how simple algebra can show this – with brackets of course!

### More brackets




	<u>Read</u> more about Pascal's triangle, interact with it and find out more about it's heritage and who really discovered it first!
	<u>Discover</u> more expansions linking to geometrical representations. You'll find a <u>hint</u> and a potential <u>solution</u> from other students to help you too.
	<u>Watch</u> this video and encounter the almost endless amount of number patterns contained within Pascal's triangle.

## Factorising




### Factorising

	<u>Read</u> about the amazing properties of prime numbers. Generate large primes for yourself and find out how you can make money from solving prime number problems.
	<u>Discover</u> how you can use place value and factorising to explore number tricks by attempting this nrich problem.
	<u>Watch</u> this video by James Grime. See if you can work out why the trick works.

### Further factorising




	<u>Explore</u> the history of mathematics with this interactive historical timeline -in particular look for at Al-Khwarizmi. Can you find a famous artist and a mathematician whose triangle you met in the Expanding topic?
	<u>Discover</u> how you can use factorising quadratics and apply it to higher powers by this neat trick shown in this nrich task.
	<u>Watch</u> how you can apply difference of two squares to a fun numerical problem.

### Completing the square




	<u>Learn</u> about the history of solving quadratics and completing the square by learning about an Arab mathematician who is considered to be the founder of algebra.
	<u>Discover</u> about removing cubes rather than squares. Does this activity help you consider the challenges involved in 'completing the cube'?
	<u>Watch</u> this clip on parabolic flight. Think about the information you have learnt from completing the square and factorising, and how that links to the parabolic flight.

## Rearranging



### Rearranging

	<u>Read</u> – Ten key reasons why developing algebraic skills is so important!
	<u>Discover</u> more about the graphs of a function and its inverse by exploring this GeoGebra activity.
	<u>Watch</u> and learn how maths, in particular the correct use of brackets, influences music, poetry and even rap!

### Rearranging fractions




	<u>Read</u> about how the rearrangement of algebraic expressions can be used in many real life contexts including proving the quadratic formulae!
	<u>Discover</u> how trigonometry was developed to become the study of algebraic ratios from numeric beginnings by comparing the merkheth (not comparing the meerkat!)
	<u>Play</u> with Lego, visit Paris and do maths all at the same time? It is possible through Helices!

### Rearranging factorising




	<u>Discover</u> how using a graphing app such as <u>Desmos</u> or <u>GeoGebra</u> can help you gain insight into circles, tangents and graphs in general. Gain skills useful for A level maths.
	<u>Watch</u> a TED talk from Dr Hannah Fry which tries to answer the question “Is life too complex?” You will see that you can actually write equations that model human behaviour!

## Solving




### Linear equations

	<u>Read</u> how solving linear equations is an important part of many jobs – including those involving computer graphics, economics and genetics.
	<u>Discover</u> the type of maths that is used when making blockbuster movies and how to do it.
	<u>Watch</u> this animated history of operational research about its origins in the first and second world wars - when maths was used not only to improve operations but to save lives!

### Quadratic equations




	<u>Read</u> about the history of Quadratic equations and how there are 101 uses for them!
	<u>Discover</u> what is meant by a conic section and what on earth quadratics have to do with them.
	<u>Watch</u> this video if you have ever been told that there are no solutions to a particular quadratic equation – because there are! They are not real though - welcome to imaginary maths! You can try a question for yourself <u>here</u> .

## Other equations




	<a href="#"><u>Read</u></a> about early astronomy and the beginnings of a mathematical science. Essentially it is where trigonometry comes in.	
	<a href="#"><u>Discover</u></a> more about 'Trig-om-nom-etry' from the properties of triangles right through to trigonometric function.	
	<a href="#"><u>Watch</u></a> this video and learn how equations are used to help us model the environment we live in and make a difference to our lives.	

## Sketching




### Linear Sketching

	<a href="#"><u>Read</u></a> about different ways of representing straight lines. Some of these representations you will come across at A Level and some offer an insight to mathematics studied at a higher level.	
	<a href="#"><u>Discover</u></a> how electronics can help with graphical linear algebra as it is actually based on circuit diagrams!	
	<a href="#"><u>Watch</u></a> how this robot creates curved art using only straight lines. Why not have a go yourself?	

### Quadratic Sketching

	<a href="#"><u>Download</u></a> the app and challenge yourself to find the mystery graphs with this game from MEI. Will you take your time or compete against the clock?	
	<a href="#"><u>Discover</u></a> more about parabolas and their use, including their use in mirrors and satellite dishes.	
	<a href="#"><u>Watch</u></a> this video and learn how getting your paraboloid wrong can have some very unintended consequences! The video includes a little bit of A Level maths content.	

### Other sketching

	<a href="#"><u>Read</u></a> about Euclid's Axioms and discover how they might be used in this interactivity. Sketches and diagrams help with more than just questions about graphs!	
	<a href="#"><u>Play</u></a> 'Euclidea' to explore more about Euclidean Geometry and constructions.	
	<a href="#"><u>Watch</u></a> this video to see how you can 'graph' art! To see all the finalists in the Desmos Art competition (and get inspiration to enter it yourself in the future) click <a href="#"><u>here</u></a> .	