

## A Level Mathematics

### Why do I need to complete a bridging activity?

The purpose of this activity is to aid your preparation for advanced level study and make the transition from GCSE study as smooth as possible. Some activities are written pieces of work, some are research-based and some are practical. They should be completed to the best of your ability and they will give you the opportunity to start to showcase your talent for your chosen subjects. As these are compulsory activities, it is vital that you put in the time and effort to ensure they are completed to the highest standard.

### When should I hand this in?

You should complete this activity for the start of your first lesson in September.

### How will I be given feedback?

Feedback appropriate to the task will be given to you by your teacher.

### Summary of the activity

You need to read through the information at the start of the booklet so that you are fully aware of what will happen at the beginning of your course. There are then some questions you must answer to the best of your ability: these are to help you practise those GCSE maths skills that are essential in order to begin A Level Maths.

You should only use a calculator when indicated to do so: this is so you can see which calculator and non-calculator skills are required of you.

Student Name (to be completed by the student)

# Bridging Activity for September 2017



## A Level Mathematics

### Welcome to A Level Maths!

Congratulations on applying to study A Level Maths at Huddersfield New College!

You are joining us at an interesting time for maths students. Not only are you the first students to take the new 9-1 GCSE Maths exam, you will also be the first students to sit brand new linear AS and A Level exams in Maths.

AS Maths has been designed to follow on from the new, harder GCSE in Maths, as a course for students who enjoy and are successful in Higher tier GCSE algebra topics. We need to ensure that you understand which topics the course will assume you already know, and give you the chance to practise these over the summer holiday so you can get off to a flying start when you arrive.

The aim of this booklet is to make sure you understand exactly what the first few weeks will look like, as well as allow you to complete some work which will make your start with us much, much easier. By the time you have carefully read through these pages and completed the questions you should have a pretty good idea about what lies ahead!

**You should have this booklet completed to the best of your ability so that you can hand it in to your teacher during your first AS Maths lesson in September.** The completed booklet will form a significant part of your assessment during your first few weeks with us.

Wishing you the best of luck for your GCSE results and looking forward to meeting you in September,

*Mark Webber*

*Head of Department, Mathematics*

[m.webber@huddnewcoll.ac.uk](mailto:m.webber@huddnewcoll.ac.uk)

### What is studying AS and A Level Maths like?

Studying A Levels is very different from taking GCSEs. On all courses, the pace will be much faster than what you are used to at school, meaning that homework is very important just so you can keep up with the course. The amount of homework you have to do will be much more than at school, and if you are stuck you will be expected to actively seek out help so that you can hand in completely finished homework by the deadline, for instance by sending your teacher an email or arranging to see them during a study period, lunchtime or before or after college.

You will need to get into some good habits to become a successful A Level Maths student, and completing this booklet is the first step!

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### Who should study AS and A Level Maths?

Many students pick AS Maths because they have enjoyed GCSE Maths, but without researching all the options available to them. We have four different courses for students who want to continue maths beyond GCSE, and it is important that we match you with the course that best fits your skills and interests.

<p>Level 3 Core Maths</p>	<p>This course is equivalent to an AS Level, and is for students who enjoyed most of the topics in GCSE Maths and now want to learn how to apply maths to the real-world.</p> <p>Students study this as a fourth subject, and it makes a great addition to any combination of subjects.</p> <p>This course is great for demonstrating to universities and employers that they have maths skills beyond GCSE level, without having to take A Level Maths or Statistics as one of your options.</p>
<p>AS and A Level Statistics</p>	<p>This course is about <b>data handling</b> and <b>probability</b>. It is for students who are successful in these topics at GCSE, and who enjoy applying maths to real-life situations.</p> <p>This is especially popular amongst students hoping to take Business, Economics, Sciences, Geography or Psychology at university.</p> <p>You can take this instead of AS Maths, or alongside it as one of your other subjects.</p>
<p>AS and A Level Maths</p>	<p>This focuses almost entirely on <b>algebra</b>. Students who take this enjoy and are successful at solving the most difficult equations at GCSE.</p> <p>This is mainly taken by students who want to study traditional subjects at university like Maths, Physics, Computer Science, or Economics.</p>
<p>AS and A Level Further Maths</p>	<p>Like AS and A Level Maths, this course is for students with strong skills in <b>algebra</b>, and who enjoy finding out about areas of maths that others might not meet until starting university.</p> <p>Further Maths is taken alongside AS and A Level Maths, mainly taken by students who want to study maths-based subjects at university, e.g. Maths or Physics.</p>

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To find out more about these courses visit the college website and click through to our course pages, try the Pre-Course Activity for AS Statistics, or send me an email at [m.webber@huddnewcoll.ac.uk](mailto:m.webber@huddnewcoll.ac.uk).

If you want to change your mind about which course you want to do, you can speak to us when you come to enrol.

### What will happen when I arrive in September?

Your first couple of weeks will begin by going over the higher tier GCSE algebra topics that are **essential** for being able to study AS Maths. You will be able to get a feel for whether AS Maths is right for you, or whether you would be better suited to AS Statistics or Core Maths.

You will be given tests over this time and we will also look at your attendance, your reliability in handing in homework, the quality of the work you submit and how well you are doing in your other subjects. All of these will be taken into consideration to find the best way forward for you.

### What will I study in AS Maths?

Just over two-thirds of the course is algebra, with the remaining topics split between statistics and mechanics. An outline of the topics solved is:

Algebra Topics	Statistics Topics	Mechanics Topics
<ul style="list-style-type: none"><li>• Surds and indices</li><li>• Quadratic functions</li><li>• Simultaneous equations</li><li>• Equations of lines, curves and circles</li><li>• The Factor Theorem</li><li>• Binomial Expansions</li><li>• Transformations of graphs</li><li>• Trigonometry and trigonometric equations</li><li>• Differentiation and integration</li><li>• Logarithms</li><li>• Exponential models</li><li>• Vectors</li></ul>	<ul style="list-style-type: none"><li>• Sampling</li><li>• Measure of central tendency and spread</li><li>• Histograms, scatter diagrams, box and whisker diagrams</li><li>• Probability</li><li>• The binomial distribution</li><li>• Hypothesis testing</li></ul>	<ul style="list-style-type: none"><li>• Travel graphs</li><li>• Speed, velocity, time, displacement and constant acceleration</li><li>• Variable acceleration</li><li>• Forces</li></ul>

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### How will I be assessed?

We use the AQA exam board. With no coursework involved, the grade you get for AS Maths will be entirely down to two 90 minute exams at the end of the year.


Your grade for A Level Maths will be entirely from three two hour papers sat at the end of your second year: your grade for AS Maths will not count towards your grade for A Level Maths, but will be looked at by universities and employers.

### What if I am stuck and really struggle with this task?

During your time at Huddersfield New College we want you to develop as independent learners. That means researching topics you are struggling with in your own time so that you can keep up with the lessons, and seeking out help from your teachers if you are unsure of anything, and seeking out help from your teachers if you are unsure of anything.

Every exercise in this task also lists some handy websites you can go to if you are stuck and need some extra help.

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Essential GCSE Skill 1: Surds		
Non-Calculator	From GCSE you should be able to:	For more help:
	<p>Simplify surds without a calculator, e.g.</p> <ul style="list-style-type: none"> <li><math>\sqrt{32} = 4\sqrt{2}</math></li> </ul> <p>Rationalise the denominator, e.g.</p> <ul style="list-style-type: none"> <li><math>\frac{20}{\sqrt{5}} = 4\sqrt{5}</math></li> </ul> <p>Write answers in terms of surds.</p>	<p><b>YouTube</b></p> <ul style="list-style-type: none"> <li>Type "Hegarty Maths surds"</li> </ul> <p><b>MyMaths</b></p> <ul style="list-style-type: none"> <li>Login: HNC</li> <li>Password: triangle</li> <li>Type "surds" in the search box.</li> </ul>

**Q1** Write  $\sqrt{75}$  in the form  $k\sqrt{3}$ , where  $k$  is an integer.

..... (2)

**Q2** Expand  $(1 + \sqrt{2})(3 - \sqrt{2})$   
 Give your answer in the form  $a + b\sqrt{2}$  where  $a$  and  $b$  are integers.

..... (2)

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**Q3** Write  $(5 - \sqrt{5})^2$  in the form  $a + b\sqrt{5}$ , where  $a$  and  $b$  are integers.

..... (2)

**Q4** Rationalise the denominator of  $\frac{14}{\sqrt{7}}$ . Give your answer in its simplest form.

.....  
(2)

**Q5.**

(a) Rationalise the denominator of  $\frac{5}{\sqrt{2}}$ .

.....

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(2)

(b) Expand and simplify  $(2 + \sqrt{3})^2 - (2 - \sqrt{3})^2$ .

.....

(2)

**Q6**

(a) Express  $5\sqrt{27}$  in the form  $\sqrt{n}$ , where  $n$  is a positive integer.

.....

(2)

(b) Rationalise the denominator of  $\frac{21}{\sqrt{3}}$ .

.....

(2)



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**Q7** Rationalise the denominator of  $\frac{(6-\sqrt{5})(6+\sqrt{5})}{\sqrt{31}}$ . Give your answer in its simplest form.

.....

(2)

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Essential GCSE Skill 2: Indices		
Non-Calculator	From GCSE you should be able to:	For more help:
	<p>Work with integer indices, e.g.</p> <ul style="list-style-type: none"> <li><math>2^3 = 8</math></li> <li><math>5^{-2} = \frac{1}{5^2} = \frac{1}{25}</math></li> <li><math>17^0 = 1</math></li> </ul> <p>Work with fractional indices, e.g.</p> <ul style="list-style-type: none"> <li><math>64^{\frac{1}{2}} = \sqrt{64} = 8</math></li> <li><math>81^{\frac{3}{4}} = \sqrt[4]{81^3} = 3^3 = 27</math></li> <li><math>100^{-\frac{1}{2}} = \frac{1}{100^{\frac{1}{2}}} = \frac{1}{10}</math></li> </ul>	<p><b>YouTube</b></p> <ul style="list-style-type: none"> <li>Type "Hegarty Maths indices"</li> </ul> <p><b>MyMaths</b></p> <ul style="list-style-type: none"> <li>Login: HNC</li> <li>Password: triangle</li> <li>Type "indices" in the search box.</li> </ul>

**Q1.** Write these numbers in order of size. Start with the smallest number.

$5^{-1}$        $0.5$        $-5$        $5^0$

.....

(2)

**Q2.**

(a) Write down the value of  $7^0$

.....

(1)

(b) Write down the value of  $2^{-4}$

.....

(1)

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**Q3.**

(a) Write down the reciprocal of 5

.....  
(1)

(b) Evaluate  $3^{-2}$

.....  
(1)

**Q4.**

(a) Write down the value of  $10^{-1}$

.....  
(1)

(b) Find the value of  $27^{\frac{2}{3}}$

.....  
(2)

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Q5.

(a) Find the value of  $5^\circ$

.....

(1)

(b) Find the value of  $27^{1/3}$

.....


(1)

(c) Find the value of  $2^{-3}$

.....

(1)

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Essential GCSE Skill 3: Linear Equations		
Calculator	From GCSE you should be able to:	For more help:
	Solve equations with the unknown on both sides.	<b>YouTube</b> <ul style="list-style-type: none"> <li>Type "Hegarty Maths equations"</li> </ul> <b>MyMaths</b> <ul style="list-style-type: none"> <li>Login: HNC</li> <li>Password: triangle</li> <li>Type "equations" in the search box.</li> </ul>

**Q1.** Solve  $\frac{5w-8}{3} = 4w + 2$

$w = \dots\dots\dots$

(3)

**Q2.**

Solve  $\frac{4x-1}{5} + \frac{x+1}{2} = 3$

$x = \dots\dots\dots$

(3)

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**Q3.**

Solve  $\frac{4(8x-2)}{3x} = 10$

.....  
(3)

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Essential GCSE Skill 4: Quadratic Equations		
Calculator	From GCSE you should be able to:	For more help:
	Solve quadratic equations <ul style="list-style-type: none"> <li>• By using the formula</li> <li>• By factorising</li> <li>• By completing the square</li> </ul>	<b>YouTube</b> <ul style="list-style-type: none"> <li>• Type “Hegarty Maths quadratic equations”</li> </ul> <b>MyMaths</b> <ul style="list-style-type: none"> <li>• Login: HNC</li> <li>• Password: triangle</li> <li>• Type “quadratic equations” in the search box.</li> </ul>

**Q1.**

Solve  $3x^2 - 4x - 2 = 0$  using the quadratic formula, giving your solutions correct to 3 significant figures.

.....

(3)

**Q2.**

Solve  $2x^2 + 5x - 3 = 0$  by factorising.

.....

(3)

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**Q3.**

Solve  $6x^2 + 19x + 10 = 0$  by **factorising**.

.....

(3)

**Q4.**


Solve  $x^2 + 3x - 10 = 0$  by **completing the square**.

.....

(3)



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Essential GCSE Skill 5: Simultaneous Equations		
Calculator	From GCSE you should be able to:	For more help:
	<p>Solve</p> <ul style="list-style-type: none"> <li>• Two linear simultaneous equations</li> <li>• Two simultaneous equations where one is linear and one is quadratic</li> </ul>	<p><b>YouTube</b></p> <ul style="list-style-type: none"> <li>• Type “Hegarty Maths simultaneous equations”</li> </ul> <p><b>MyMaths</b></p> <ul style="list-style-type: none"> <li>• Login: HNC</li> <li>• Password: triangle</li> <li>• Type “simultaneous equations” in the search box.</li> </ul>

**Q1.**

Solve the simultaneous equations

$$\begin{aligned} 5x + 2y &= 11 \\ 4x - 3y &= 18 \end{aligned}$$

$x = \dots\dots\dots$

$y = \dots\dots\dots$

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**Q2.**

Solve the simultaneous equations

$$\begin{aligned}4x + y &= 25 \\ x - 3y &= 16\end{aligned}$$

$$\begin{aligned}x &= \dots\dots\dots \\ y &= \dots\dots\dots\end{aligned}$$

(3)

**Q3.**

Solve the simultaneous equations

$$\begin{aligned}x^2 + y^2 &= 9 \\ x + y &= 2\end{aligned}$$

Give your answers correct to 2 decimal places.

$$\begin{aligned}x &= \dots\dots\dots y = \dots\dots\dots \\ \text{or } x &= \dots\dots\dots y = \dots\dots\dots\end{aligned}$$

(6)

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**Q4.**

Find the coordinates of intersection of the circle  $x^2 + y^2 = 25$  and the straight line  $y = 2x + 5$ .

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### What else can I do to prepare?

The questions in this booklet give you a flavour of the starting point the AS course assumes you have from GCSE. **But there is more you can do!**

### MyMaths

Go to the mymaths website ([www.mymaths.co.uk](http://www.mymaths.co.uk)) and login using

Login: HNC

Password: triangle

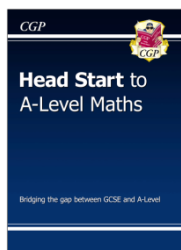
On the menu on the left select **Booster Packs** then choose **A2A\***. All the topics here are assumed knowledge for AS Level maths. The more of these you attempt, the more successful your start to the year will be.

### The Internet

You will find a number of useful resources just by searching with the terms 'A Level Maths' 'bridge the gap' and 'step up'.

One particularly good site is <http://www.cimt.org.uk/projects/mepres/step-up/index.htm> (or search for 'CIMT Step Up') which contains examples and practise questions.

### Books



There are a number of excellent titles you can buy in most bookstores or online, to prepare for the huge step-up from GCSE. In particular the CGP book 'Head Start to A Level Maths', which costs £5.95