WELCOME TO ADVANCED MATHS 2026-2028

Let the fun, toil and problem solving begin.

Context:

It is possible/likely that over the summer that some of the key areas of GCSE maths crucial to the sixth form courses will become very rusty or in fact may never have been fully understood in the first instance. What follows is a compulsory course which will make sure that the start of your A level in maths goes smoothly. Please make sure you master the techniques and not let them master you in September 2026.

Task Description:

Each section is a topic in maths which you will have studied at GCSE, and the understanding of which is considered important to A-Level. To ensure you have the best possible experience studying Maths, whether AS-Level, A-Level or Further Maths, you need to make sure you are fluent in these topics.

Each section has a set of questions for you to answer, finishing in a **Marked Question.** The other questions you will mark yourself using the answers provided, but the marked question will be marked by your teacher after collecting in these papers.

Please show your calculations on a separate document. The papers will be collected by your teacher on the first week in the Sixth Form in September 2026. We will be looking for 100% completion of all questions, and we will be marking the marked question in each section, so make sure to include all working with that question.

In preparation for you're A-Levels it is important you have the correct calculator for the course. The required calculators are any of the following: Casio fx-991CW or the Casio fx-CG50 Graphic Calculator. Both of these can be bought through Scopay- the 991CW for £20.99, and the CG50 for £69.99 (this is a special price for Edexcel customers, only available through schools).

Good luck.

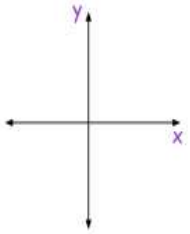
The Maths Faculty

Subject	**INDICES**
Context	Your indices skills will be used throughout the course in almost every topic. They are particularly important in Calculus. Calculus is a new topic for A-level and its two branches (differentiation and integration) will form the majority of the course. In order to differentiate or integrate a polynomial we need it written in the form ax^n so confidence in this skill is key.
Securing	A recap of key GCSE skills: Simplify the following: 1. $a^4 \times a^3$ 2. $\frac{b^3}{b^2}$ 3. $\sqrt{d} \times \frac{1}{\sqrt[3]{d^2}}$ 4. $(x^2)^6$ 5. $\sqrt{9t^4}$ 6. $3r^3 \times 5\sqrt{r}$ 7. $8t^3 \div (2t)^{-1}$ 8. $(5b^2)^2$
Processing	Application to multi-step problems: Simplify the following: 9. $p^{\frac{1}{4}} \div p^{\frac{-1}{5}}$ 10. $\left(3x^{\frac{2}{5}}\right)^2$ 11. $\frac{b^2 \times b^{\frac{1}{4}}}{b^{\frac{1}{2}}}$ 12. $\frac{y^{\frac{1}{2}} \times y^{\frac{1}{3}}}{y}$
Exploring	Now applying this skill to A Level style questions: Write the following as ax^k where a and k are constants: 1. $3x^2 \times 2x$ 2. $\sqrt{100x}$ 3. $\frac{2}{3x}$ 4. $\frac{3}{4\sqrt{x}}$ 5. $\frac{3\sqrt[4]{x^3}}{5}$
Reviewing	**Marked Question**: Write as ax^k where a and k are constants: $3\sqrt{x} \times \left(\frac{2}{5x}\right)^3$

Subject	SURDS
Context	In A-Level Maths we often want to give exact answers, and not lose any marks during our calculations to inaccuracies. Being able to fluently manipulate surds is an important part of this.
Securing	A recap of key GCSE skills: Write as a simplified surd with a rationalized denominator if necessary: 1. $\sqrt{5} \times \sqrt{3}$ 2. $\sqrt{12}$ 3. $\sqrt{12} + \sqrt{75}$ 4. $\frac{\sqrt{5}}{\sqrt{2}}$
Processing	Moving on to rationalizing the denominator: Simplify the following: 5. $\frac{2}{\sqrt{3}}$ 6. $\frac{3}{2\sqrt{5}}$ 7. $\frac{6}{3-\sqrt{2}}$ 8. $\frac{1}{2\sqrt{3}+5}$
Exploring	Now applying this skill to A Level style questions: Question 1: Find the area of each of these rectangles (a) $\sqrt{10}$ cm, $\sqrt{5}$ cm (b) $\sqrt{12}$ cm, $\sqrt{3}$ cm (c) $9\sqrt{2}$ cm, $2\sqrt{2}$ cm Question 2: Find the perimeter of each of these rectangles (a) $10\sqrt{3}$ cm, $5\sqrt{3}$ cm (b) $\sqrt{10}+\sqrt{2}$ cm, $\sqrt{10}-\sqrt{2}$ cm (c) $\sqrt{72}$cm, $\sqrt{18}$ cm
Reviewing	**Marked Question:** Write as a simplified surd $\frac{5}{\sqrt{2}-1} - \sqrt{18}$

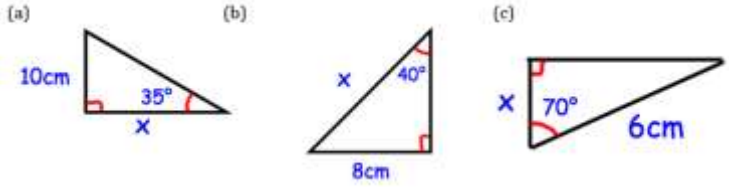
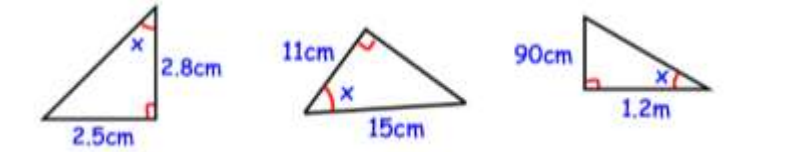
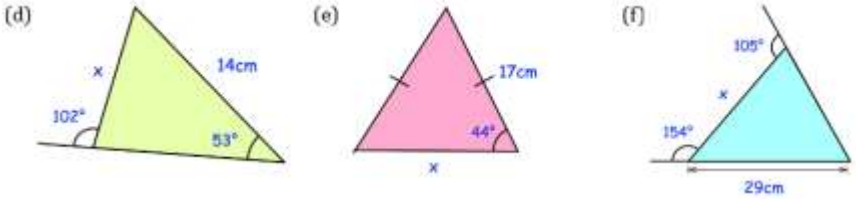
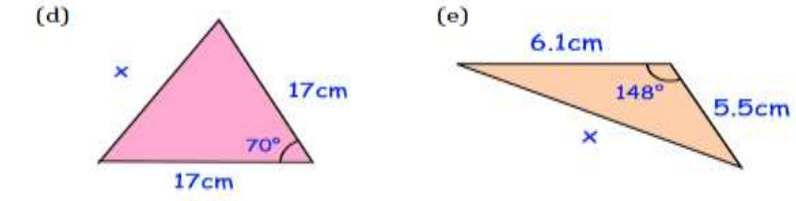
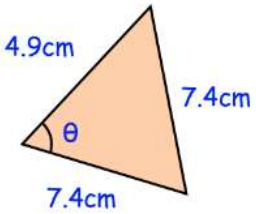
Subject	**FACTORISING**
Context	During your GCSE course you learnt how to factorise and started to use this technique to solve quadratic equations. You have already learnt how to form equations from shapes and worded problems but you will be extending this into more areas during the A-level course. You will need to be able to solve quadratic equations with trigonometric functions and exponentials. As well as this we will explore how to solve cubic and quartic equations which extend the concept of factorisation even further.
Securing	A recap of key GCSE skills: Factorise fully: 1. $x^2 + 4x + 3$ 2. $x^2 + 7x + 10$ 3. $x^2 - x - 2$ 4. $x^2 + 2x - 8$ 5. $x^2 - 2x - 15$ 6. $16 - 10x + x^2$ 7. $x^2 - 16$ 8. $x^2 + 23x + 120$
Processing	Coefficients greater than 1… Factorise fully: 9. $2x^2 + 3x + 1$ 10. $3x^2 - 2x - 1$ 11. $4x^2 + 8x + 3$ 12. $4x^2 + 17x + 4$
Exploring	Now applying this skill to A Level style questions. Solve for x: 1. $x^2 + 6x + 8 = 0$ 2. $x^2 + 4x - 5 = 0$ 3. $x^2 - 7x = 8$ 4. $x^2 - 25 = 0$ 5. $x(x - 1) = 42$ 6. $x^2 = 3x$ 7. $60 - 4x - x^2 = 0$ 8. $2x^2 - 3x + 1 = 0$ 9. $3x^2 + 11x - 4 = 0$ 10. $x - 5 + \frac{4}{x} = 0$ 11. $x - \frac{10}{x} = 3$ 12. $x + 5 = \frac{3}{x+3}$
Reviewing	**Marked Question:** Factorise the following and then solve:

	$\frac{x}{x+2}+\frac{3}{2}=x$
Subject	**COMPLETING THE SQUARE**
Context	Completing the square allows us to quickly solve quadratics that cannot be factorised. In addition to this it also allows us to find maximum height of a ball as it's thrown through the air and minimum depths of water in a harbour. It can also be extended into the set of complex numbers which is studied in detail in further maths.
Securing	A recap of key GCSE skills: Write in the form $(x+a)^2+b$: 1. x^2+2x+4 2. x^2-4x+1 3. $x^2+12x+30$ 4. $18-4x+x^2$ 5. x^2+3x+3 6. $x^2-x-\frac{1}{2}$
Processing	Coefficients greater than 1… Write in the form $(x+a)^2+b$: (a) $2x^2+8x+2$ (b) $2x^2+12x-3$ (c) $3x^2-12x+2$ (d) $4x^2+12x-5$ (e) $2x^2-3x-5$ (f) $5x^2-20x+30$
Exploring	Applying to solving: Solve by completing the square, leaving answers in surd form: 1. $x^2-4x-2=0$ 2. $x^2+2x-2=0$ 3. $x^2-6x+4=0$ 4. $x^2-3x+1=0$
Reviewing	**Marked Question:** Solve by completing the square, leave your answer in surd form. $3-x=x^2-4x$

Subject	QUADRATIC GRAPHS
Context	In GCSE you have learnt the shape of quadratic graphs, and their relations to their equations. Use of graphs is expanded upon greatly in A-Level Maths, and you will be expected to sketch different types of graphs using your algebraic and graphical knowledge. Being able to fluently sketch quadratic graphs is an important foundational skill to have for these.
Securing	A recap of key GCSE skills: Question 1: Emilio wants to sketch the graph of $y = x^2 - 7x + 10$ (a) Find the value of y when $x = 0$ (b) Use your answer to (a) to plot where the graph crosses the y-axis. (c) Solve the equation $x^2 - 7x + 10 = 0$ (d) Use your answers to (c) to help you plot where the graph crosses the x-axis. (e) Sketch the graph of $y = x^2 - 7x + 10$ 
Processing	Use factorising to sketch the following graphs. You must mark the roots and y-intercept of each graph. 1. $y = x^2 - 3x + 2$ 2. $y = x^2 - 9$ 3. $y = x^2 - 2x$
Exploring	Use factorising to sketch the following graphs. You must mark the roots and y-intercept of each graph: 1. $y = x^2 - 10x + 25$ 2. $y = -x^2 + 5x - 4$ 3. $y = 2 + x - x^2$
Reviewing	**Marked Question:** Sketch the following graph, labelling every point the graph crosses an axis. $y + x + 20 = 3x^2 - 6x$

Subject	**SIMULTANEOUS EQUATIONS**
Context	You've already learnt how to solve both linear and quadratic simultaneous equations and have discovered one of the many uses for them, finding intersection points between lines. As you progress through the A-level course you will find that a lot of complex situations can be reduced to a pair of simultaneous equations. They will allow you to find the time and location of particle collisions and the coordinates for the tangential point between a straight line and a circle.
Securing	A recap of key GCSE skills: Question 1: Solve the following simultaneous equations by using elimination. (a) $6x + y = 18$, $4x + y = 14$ (b) $4x + 2y = 10$, $x + 2y = 7$ (c) $9x - 4y = 19$, $4x + 4y = 20$
Processing	Application to harder questions: Question 2: Solve the following simultaneous equations by using elimination. (a) $3x + 2y = 23$, $2x - y = 6$ (b) $3x - 3y = 9$, $2x + y = 12$ (c) $4x + 2y = 34$, $3x + y = 21$
Exploring	Now applying this skill to A Level style questions: Solve the following: 1. $x + 2y = 7; x - 3y = -8$ 2. $3x + 2y = 5; y = x + 1$ 3. $3x - y = 20; 2x + 2y = 16$ 4. $x = 3y - 7; y = 2x + 8$
Reviewing	**Marked Question: Solve the following** $4y = 3x + 26$ $2x = 3y - 19$

Subject	**STRAIGHT LINE GRAPHS**
Context	At A-level we start to link an algebraic expression to its graphical form on the cartesian plane in a much deeper sense than you have experienced at GCSE. You will use your knowledge of straight line graphs to enable you to find the equation of a tangent of any curve at any point. You will use calculus to map how these tangents change in gradient over time and will start to apply them to real life in mechanics. You will also learn about "normal graphs" which are perpendicular to a tangent and come up throughout the course.
Securing	A recap of key GCSE skills: Calculate the gradient of the following: 1. $y = 3x - 2$ 2. $2y = 3x - 2$ 3. $5y + 4x = 12$
Processing	Calculate the gradient of the following: 4. A line passing through (2,5) and (5,1) 5. A line passing through (8,3) and (-3,-3) 6. A line with a y-intercept of 5 and an x-intercept of 8
Exploring	Calculate the gradient of the following: 7. A line perpendicular to $y = 4x - 2$ 8. A line perpendicular to $2y + 3x = 1$
Reviewing	**Marked Question:** Line A passes through (3,3) and (8, 6). Line B is perpendicular to Line A. What is the gradient of Line B?

Subject	TRIGONOMETRY
Context	At A-level we start to link an algebraic expression to its graphical form on the cartesian plane in a much deeper sense than you have experienced at GCSE. You will use your knowledge of straight line graphs to enable you to find the equation of a tangent of any curve at any point. You will use calculus to map how these tangents change in gradient over time and will start to apply them to real life in mechanics. You will also learn about "normal graphs" which are perpendicular to a tangent and come up throughout the course.
Securing	A recap of key GCSE skills: Find the value of x below: 
Processing	Find the value of x below: 
Exploring	Find the value of x below:   

Reviewing	**Marked Question:** A hot air balloon is flying above two point, standing on the ground at points A and B, 600m apart. The hot air balloon is 300m from A and 500m from B. (a) Work out the angle of elevation from point B (b) How high is the hot air balloon from the ground?