

The Friary Sixth Form



A-Level Further Mathematics
Bridging Pack 2026

Introduction



A Level Further Mathematics is ideal for students who have a strong aptitude for mathematics and enjoy exploring complex and abstract ideas in greater depth. The course suits learners who are highly motivated, intellectually curious, and confident in applying logical reasoning to challenging problems. Success in Further Mathematics requires perseverance, independent thinking, and a genuine enthusiasm for developing advanced mathematical techniques and concepts.

Studying A Level Further Mathematics provides excellent preparation for degree courses with a significant mathematical component, particularly mathematics, engineering, physics, computer science, economics, and related disciplines. The course develops advanced problem-solving, analytical, and reasoning skills that are highly valued by universities and employers. It is especially beneficial for students considering careers in fields such as engineering, data science, finance, quantitative analysis, software development, and academic research, helping them stand out as strong candidates for competitive courses and professions.

Here at the Friary, our A Level Further Mathematics team have substantial teaching experience. We also have exam markers in the department so we can give you that extra insight into exam technique.

The course consists of Pure Mathematics, Further Statistics and Decision. The course is carefully structured in order that you might progress through the concepts in a rational order. We aim that the course works logically in tandem with the Single Mathematics A Level.

There may be occasions when you need extra support in particular areas. We carefully monitor your progress to help you recognise these areas and facilitate you in addressing your targets.

If you have any questions about studying Further Mathematics at the Friary, then ask one of our teachers or chat to our sixth formers. It's a challenging subject but a rewarding experience. The number of students who turn up to our many after school sessions pays testament to the enthusiasm running through the Friary A Level Maths community.

Course Expectations



This pack contains a programme of activities and resources to prepare you to start your A-Level Further Mathematics course in September. It is aimed to be used after you complete your GCSEs, throughout the remainder of the summer term and over the summer holidays to ensure you are ready to start your new course in September.

The course coordinators for this qualification are:

Mr Simpson (jsimpson@friaryschool.co.uk)

Dr Buxton (dbuxton@friaryschool.co.uk)

What we expect from you

- Excellent attendance/punctuality to lessons
- Correct equipment (see list on next page)
- Correct uniform – smart business wear and lanyard to be always worn
- Meet deadlines
- Contribute positively to lessons

What you can expect from us

- High quality teaching and learning
- Commitment to you as individuals
- Constant support and guidance
- Weekly after school booster/masterclass sessions
- Submitted work will be marked and assessed within 10 days of handing it in

Equipment List



Essential classroom equipment

- Scientific calculator (approved model, e.g. **Casio fx-991EX** or **fx-991CW**)
- Ruler (30 cm, preferably clear plastic for accuracy)
- Pencil (HB for diagrams and working)
- Eraser (for corrections in working)
- Sharpener
- A4 folders (4 in total over two years of study)
- A4 notepad (preferably small squared but lined is acceptable)
- Plastic wallets (for each folder)
- Folder dividers (for each folder)
- Textbooks (provided)

Highly recommended items

- Graph paper (for accurate plotting of functions and data)
- Coloured pens or pencils (to distinguish lines, graphs, or steps)
- Mathematical set (often includes ruler, compass, protractor, set squares)
- Highlighters (for key steps in revision or exam questions)

Optional but useful

- Graphing software or apps (for visualising functions, e.g. Desmos)
- Whiteboard and pens (for practising questions at home)
- Sticky notes (for formulae or key reminders)
- Graphing calculator (has more functionality but is not mandatory, model number **fx-CG100**)

Course Overview



A Level Further Mathematics (Edexcel 9FM0) – Course Summary

Exam board: Pearson Edexcel

Qualification: A Level Further Mathematics (Level 3 Advanced GCE)

Specification code: 9FM0

Linear course: All exams at the end of Year 13

Overall course structure:

Students take **4 exam papers total:**

- **Paper 1 & 2:** Core Pure Mathematics (mandatory)
- **Paper 3 & 4:** Two applied papers (chosen from 8 options)

At the Friary School, we focus on:

- **Core Pure Mathematics**
- **Further Statistics 1 (FS1)**
- **Decision Mathematics 1 (D1)**

Topic breakdown

Core Pure Mathematics (Papers 1 & 2)

Core Pure is the compulsory backbone of the course and includes:

- Proof (including induction)
- Complex numbers
- Matrices and linear transformations
- Further algebra and functions
- Further calculus (integration and differentiation techniques)
- Vectors in 3D
- Polar coordinates
- Hyperbolic functions
- Differential equations
- Sequences and series (advanced methods)
- Roots of polynomials and solving equations

This is the most conceptually demanding part of Further Maths and builds heavily on A Level Maths.

Further Statistics 1

This paper develops advanced probability and statistical modelling:

- Probability distributions (binomial, Poisson, geometric, negative binomial)
- Hypothesis testing and quality of testing
- Chi-squared tests
- Central Limit Theorem
- Combinations of random variables
- Probability generating functions

Focus: deeper statistical theory and more complex inference methods.

Decision Mathematics 1

This option focuses on algorithms and optimisation:

- Algorithms and graph theory
- Route inspection problems
- Shortest path algorithms (e.g. Dijkstra-style methods)
- Minimum spanning trees
- Critical path analysis
- Linear programming
- Sorting and searching algorithms
- The simplex algorithm

Focus: structured problem-solving using algorithms and networks.

Exam structure - Papers

There are 4 exam papers:

Paper 1 – Core Pure 1

1 hour 30 minutes

75 marks

25% of qualification

Paper 2 – Core Pure 2

1 hour 30 minutes

75 marks

25% of qualification

Paper 3 – Further Statistics 1

1 hour 30 minutes

75 marks

25% of qualification

Paper 4 – Decision 1

1 hour 30 minutes

75 marks

25% of qualification

Total assessment

4 exams

300 marks total

100% exam-based

- Calculator allowed in all papers
- Formula booklet provided

Key things to know before starting

1) Very high mathematical difficulty

Further Maths is a significant step up from A Level Maths, especially in:

- Proof
- Complex numbers
- Matrices and transformations
- Advanced calculus

2) Strong dependency on A Level Maths content

You must already be confident in:

- Algebraic manipulation
- Trigonometry
- Differentiation and integration
- Probability basics

3) Abstract thinking is essential

Unlike standard Maths, Further Maths often involves:

- Proof-based reasoning
- Higher-dimensional thinking
- Algorithmic processes (especially in Decision Maths)

Progression and relevance

Further Maths is highly valued for competitive university courses, especially:

- Mathematics
- Engineering
- Physics
- Computer Science
- Economics
- Data Science
- Actuarial Science

It is often recommended (or strongly preferred) by top universities for mathematically intensive degrees.

Tasks



In order to prepare for studying A-Level Mathematics at the Friary School, we have provided the following practice questions.

These should be completed and brought to your first lesson.

If you have any questions about these tasks, please feel free to email me on dbuxton@friaryschool.co.uk.

Good luck!

Dr D Buxton

Coordinator of A-Level Mathematics and Further Mathematics

Q1

Expand and fully simplify $(4 + \sqrt{7})^2 - (4 - \sqrt{7})^2$

Answer:

Q2

Work out the value of x in the equation below.

$$x(\sqrt{11} - 2) = 21$$

Give your answer in the form $a + b\sqrt{11}$, where a and b are integers.

Answer:

Q3

Given that h is a prime number, rationalise the denominator of $\frac{5h - \sqrt{h}}{\sqrt{h}}$

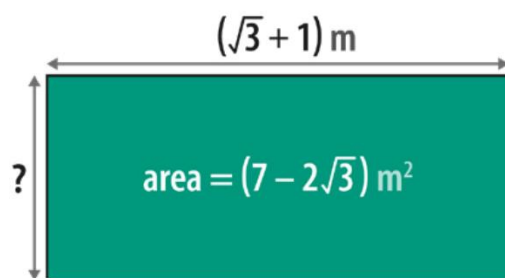
Give your answer in its simplest form.

Answer:

Q4

Calculate the unknown side length, in metres, of the rectangle below.

Give your answer in its simplest form, rationalising the denominator if necessary.



Answer: m

Q1

Expand and fully simplify $(2x + 5)(4x - 3)(5x - 4)$

Answer:

Q2

Work out the values of a , b and c in the identity below.

$$(3x - 1)(x + 2)(ax + b) \equiv 15x^3 + 16x^2 - 25x + c$$

Answer: $a =$ $b =$ $c =$

Q3

Write the following expression in the form $\frac{1}{ax^b} + \frac{1}{cy^d}$ where a, b, c, and d are integers.

$$\left(\frac{1}{5x} + \frac{1}{4y}\right)\left(\frac{1}{25x^2} - \frac{1}{20xy} + \frac{1}{16y^2}\right)$$

Answer:

Q4

Show that $(x^2 + 1)(y^2 + 4) \equiv (xy - 2)^2 + (2x + y)^2$

Q1

Fully factorise $49h^2 - m^2$

Answer:

Q2

Fully factorise $7b - b^2 - 10$

Answer:

Q3

Fully factorise $4k^2 - 25n^2 - (2k - 5n)^2$

Answer:

Q1 Work out the values of a , b and c in the equality below.

$$\frac{2x^{20}y^4 \times 12x^4y^{26}}{(2xy^2)^3} = ax^by^c$$

Answer: $a = \dots\dots\dots$ $b = \dots\dots\dots$ $c = \dots\dots\dots$

Q2 Work out what expression should replace the ? in the equivalent fractions below.

$$\frac{?}{12r^4(t+6)} = \frac{2n}{3r}$$

Answer: ? =

Q3 $\frac{ax^2 + bx + c}{dx^2 - 25}$ simplifies to give $\frac{x - 4}{2x - 5}$

Work out the values of a , b , c and d in the original fraction.

Answer: $a = \dots\dots\dots$ $b = \dots\dots\dots$ $c = \dots\dots\dots$ $d = \dots\dots\dots$

Q1

Fully simplify $\frac{7}{36 - x^2} - \frac{3}{6 + x}$

Give your answer fully factorised.

Answer:

Q2

Write the following as a single fraction in its simplest form:

$$6 - (x + 4) \div \frac{x^2 + 11x + 28}{x - 7}$$

Give your answer fully factorised.

Answer:

Q1

Solve $x(x + 4) - 4(5x + 9) = 0$

Answer:

Q2

Jessica thinks of a positive number, n , which is less than 1
She adds this number to its reciprocal and gets 2.9

Work out the value of n .
Give your answer as a fraction in its simplest form.

Answer:

Q3

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

Answer:

Q4

$$x = \frac{-3 \pm \sqrt{29}}{2}$$

There is only one equation of the form $x^2 + bx + c = 0$ that gives these values of x as solutions.

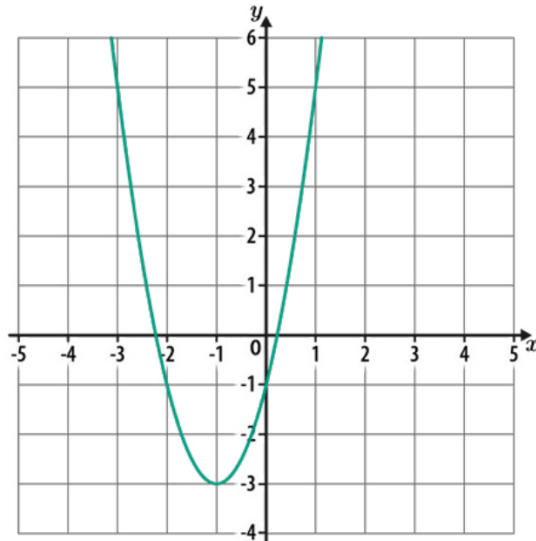
Work out the values of b and c .

Answer: $b =$ $c =$

Q1

The diagram below shows the graph of $y = 2x^2 + 4x - 1$
 The equation $2x^2 + 4x - 1 = k$ has solutions at $x = -3$ and $x = 1$

What is the value of k ?



Answer: $k =$

Q2

A curve has the equation $y = x^2 + ax + b$, where a and b are numbers.
 The turning point of the curve is $(5, 4)$

Work out the values of a and b .

Answer: $a =$ $b =$

Q3

A curve has the equation $y = -x^2 + 16x - 65$

- a) Work out the turning point of the curve.

Answer: a) (..... ,)

- b) By considering the position of the turning point and the shape of the curve, work out how many real roots $y = -x^2 + 16x - 65$ has.

Answer: b)

Q1

Solve the following simultaneous equations:

$$3x = 3 - 4y$$

$$12y + 11 = -5x$$

Answer: $x = \dots\dots\dots$ $y = \dots\dots\dots$

Q2

Find the values of x , y and a by solving the following simultaneous equations:

$$6x - 7y = -10$$

$$12x - 5y = 16$$

$$2x + ay = 10$$

Answer: $x = \dots\dots\dots$ $y = \dots\dots\dots$ $a = \dots\dots\dots$

Q3

Solve the following simultaneous equations:

$$\frac{4}{7x - 4} = \frac{1}{6y}$$

$$\frac{5x}{3y + 2} = 4$$

Answer: $x = \dots\dots\dots$ $y = \dots\dots\dots$

Q4

Solve the following simultaneous equations:

$$2^x = 4^{(7 - 2y)}$$

$$3^{(5x - 13y)} = 81$$

Answer: $x = \dots\dots\dots$ $y = \dots\dots\dots$

Q1

Write an expression, in terms of h , for the gradient of a line **perpendicular** to the line segment joining $(3h, 20)$ to $(6h, 8)$

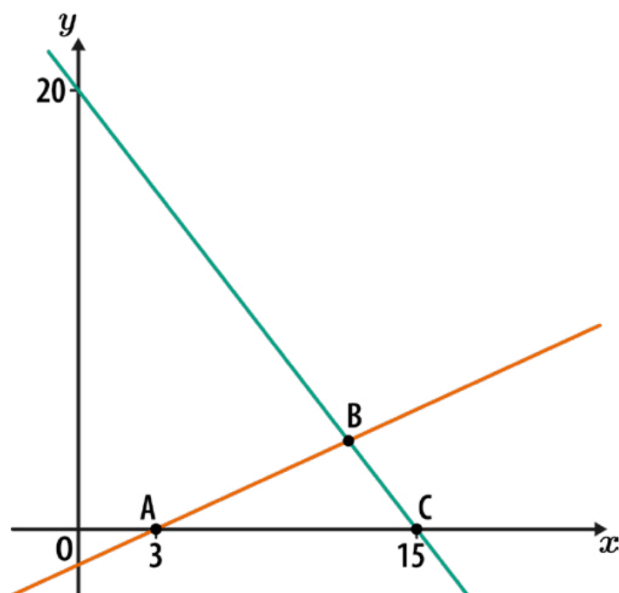
Give your answer as a fully simplified fraction.

Answer:

Q2

The triangle ABC has an area of 24 square units.

What are the coordinates of point B?

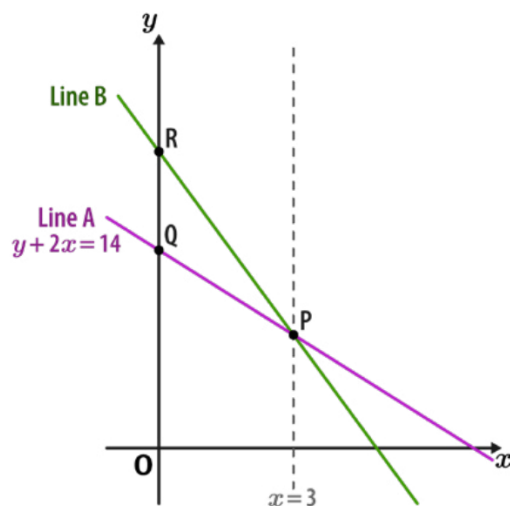


Answer: (..... ,)

Q3

Line A has the equation $y + 2x = 14$
The gradient of line B is twice the gradient of line A.

Work out the ratio of the length of OQ to the length of OR.
Give your answer in its simplest form.

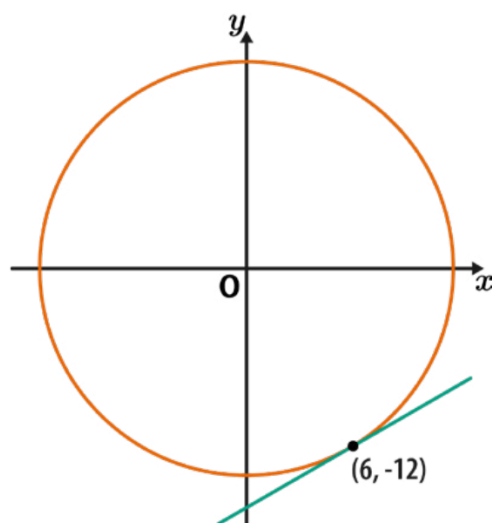


Answer:

Q4

A circle, centre O, passes through the point (6, -12), as shown.

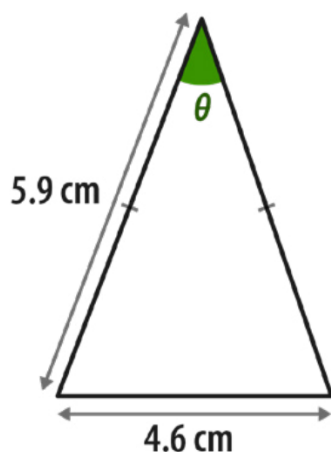
Work out the equation of the tangent to the circle at this point.
Give your answer in the form $y = mx + c$, where m and c are integers or fractions in their simplest form.



Answer:

Q1

Calculate the size of angle θ .
Give your answer to 1 d.p.



Not drawn accurately

Answer:°

Q2

Work out the length y .
Give your answer to 2 d.p.

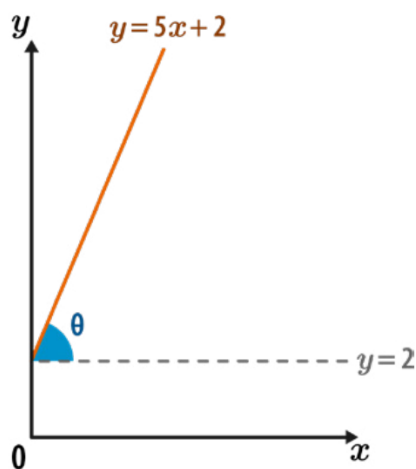


Not drawn accurately

Answer: cm

- Q3** The graph below shows the line with equation $y = 5x + 2$.
The axes both have the same scale.

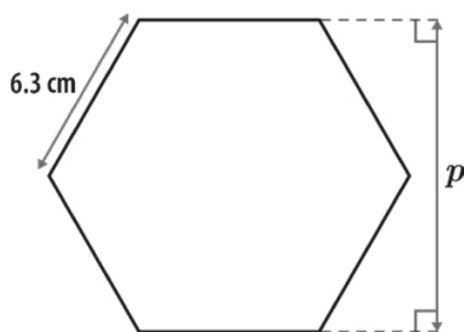
Calculate the size of angle θ .
Give your answer in degrees to the nearest integer.



Not drawn accurately

Answer:°

- Q4** The shape below is a regular hexagon.
Use trigonometry to calculate the distance p .
Give your answer in centimetres to 2 d.p.

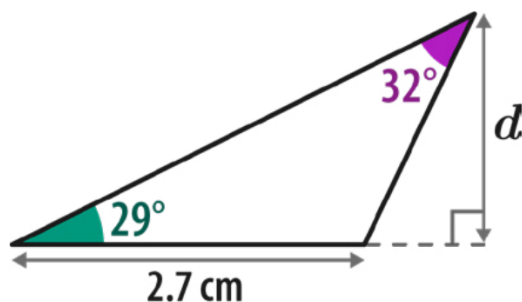


Not drawn accurately

Answer: cm

Q1

Calculate the length d .
Give your answer to 2 s.f.

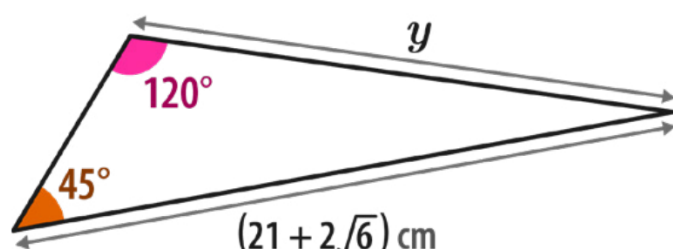


Not drawn accurately

Answer: cm

Q2

Work out the length y in the triangle below.
Give your answer in its simplest form, rationalising the denominator if necessary.

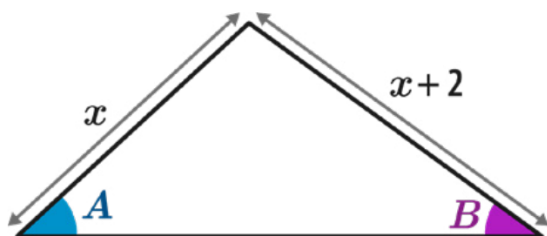


Not drawn accurately

Answer: cm

Q3 Using the information below, work out the value of x .

$$\sin A = \frac{4}{5} \qquad \sin B = \frac{3}{4}$$

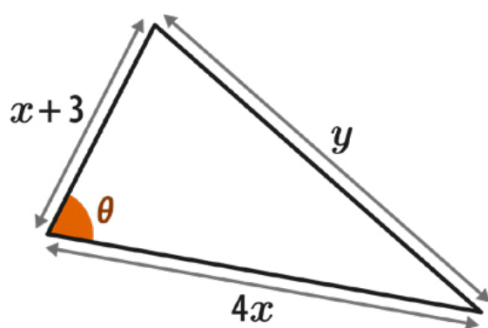


Not drawn accurately

Answer:

Q4 Given that $\cos \theta = \frac{1}{8}$ in the triangle below, show that $y^2 = ax^2 + bx + c$ where a , b and c are numbers.

What are the values of a , b and c ?



Not drawn accurately

Answer: $a =$ $b =$ $c =$

Glossary



These command words are used consistently across Edexcel A Level Mathematics and Further Mathematics papers. Understanding them is important because they determine the depth of working required and the type of response expected for marks.

Calculate – Work out the value using appropriate methods.

Complete – Fill in missing values or steps in given work.

Determine – Find a value using reasoning or calculation.

Evaluate – Find the numerical value of an expression.

Explain – Give mathematical reasons for a result or method.

Find – Obtain the required value or expression.

Hence – Use a previous result to reach a further conclusion.

Hence or otherwise – Use prior result or an alternative valid method.

Identify – Recognise and state the correct answer from information given.

Interpret – Explain the meaning of a result in context.

Prove – Provide a full logical argument showing a statement is always true.

Show that – Demonstrate a given result using clear mathematical working.

Simplify – Rewrite an expression in its most basic form.

Solve – Find values that satisfy an equation or inequality.

State – Give an answer with no working required.

Verify – Check that a result is correct, usually by substitution.

Write down – Give the answer directly, usually without working.

Additional Reading



- 1. Fermat's Last Theorem – *Simon Singh*** A compelling account of one of mathematics' most famous problems and the centuries-long effort to solve it. An excellent introduction to how mathematicians think and work.
- 2. The Music of the Primes – *Marcus du Sautoy*** Explores the mystery of prime numbers and the search to solve the Riemann Hypothesis, one of the greatest unsolved problems in mathematics.
- 3. Infinite Powers – *Steven Strogatz*** A highly readable exploration of calculus and its role in shaping modern science, engineering, and technology.
- 4. Alex's Adventures in Numberland – *Alex Bellos*** Demonstrates the beauty and diversity of mathematics through stories, puzzles, and surprising real-world connections.
- 5. The Number Devil – *Hans Magnus Enzensberger*** Although written for younger readers, it provides an imaginative introduction to many concepts encountered later in advanced mathematics.
- 6. The Man Who Loved Only Numbers – *Paul Hoffman*** The fascinating biography of the brilliant mathematician Paul Erdős, offering insight into the culture and creativity of mathematical research.
- 7. Finding Moonshine – *Marcus du Sautoy*** Explores one of the most surprising discoveries in modern mathematics, showing how seemingly unrelated areas can be connected.
- 8. How Not to Be Wrong – *Jordan Ellenberg*** Demonstrates how mathematical thinking can be applied to everyday decision-making, politics, economics, and society.
- 9. Gödel, Escher, Bach – *Douglas Hofstadter*** A challenging but rewarding exploration of logic, patterns, self-reference, and the nature of intelligence. Suitable for particularly ambitious students.

Optional Challenge Reads

- Flatland – *Edwin A. Abbott*
- Logicomix – *Apostolos Doxiadis and Christos Papadimitriou*
- The Code Book – *Simon Singh*
- Hello World – *Hannah Fry*
- The Drunkard's Walk – *Leonard Mlodinow*

Supporting Resources



- You will be provided with the relevant textbooks for the Edexcel A-Level published by Pearson
- The required calculator for the A-Level Maths course is the **Casio fx-991EX** or **Casio fx-991CW** scientific calculator (**Casio fx-CG100** is optional)
- There are supplementary texts available. We recommend the CGP revision guides and workbooks. There will be opportunities to purchase these through the school.
- A very useful website to discover/consolidate A level topics is Mr Bicen's YouTube channel: www.youtube.com/@BicenMaths.