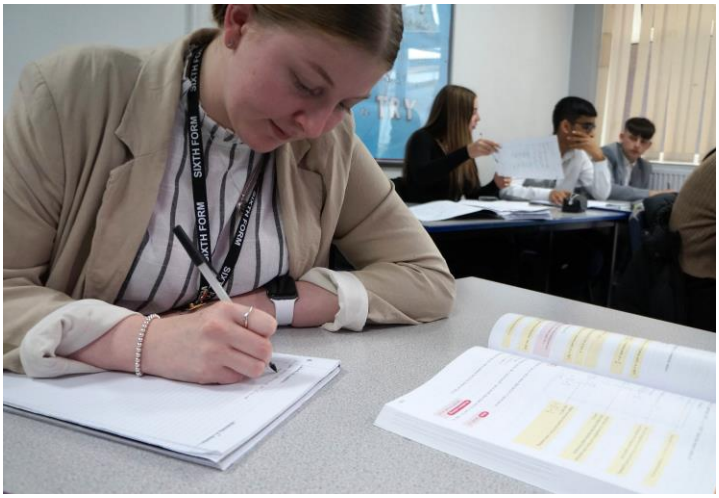
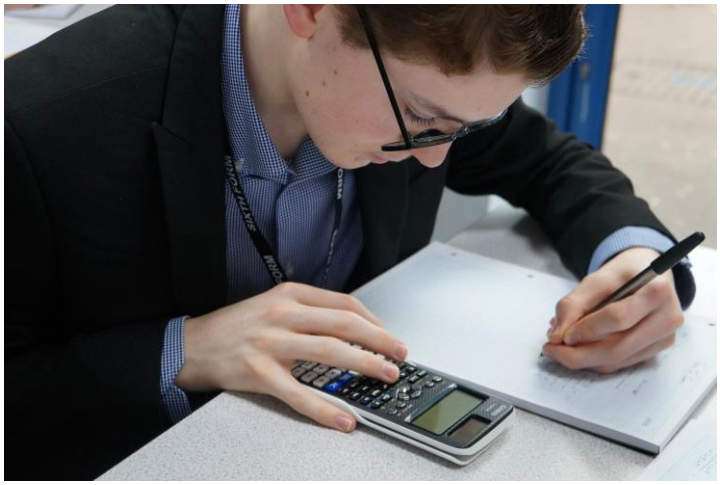
The Friary Sixth Form





A-Level Further Mathematics

Bridging Pack 2025

Course Expectations

Introduction

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 coordinator for this qualification is Mr Thorpe – jthorpe@friaryschool.co.uk

What we expect from you?

- Excellent attendance/punctuality to lessons
- Correct equipment (see list below)
- Correct uniform – smart business wear and lanyard to be worn at all times
- Meet deadlines
- Contribute positively in 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/revisions sessions
- Submitted work will be marked and assessed within 10 days of handing it in

Equipment list

- The recommended calculator for the A-Level Maths course is the, 'CASIO FX-991EX Scientific Calculator'
- A4 folders (x 4 in total for the two years of study)
- A4 note pad (Preferably small squared but lined is acceptable)
- Plastic wallets (for each folder)
- Folder dividers (for each folder)
- Textbooks (provided)
- Pens, pencils, highlighters, rulers

Course Overview

Edexcel – Further Mathematics A-Level

The information provided is taken from the Edexcel specification document

Content and assessment overview

The Pearson Edexcel Level 3 Advanced GCE in Further Mathematics consists of four externally-examined papers. All candidates take Pure Core 1 and Pure Core 2. At the Friary we elect Further Statistics 1 and Decision Mathematics 1 as the optional components.
Students must complete all assessment in May/June in any single year.

Pure Core Mathematics Components

Paper 1: Core Pure Mathematics 1 (*Paper code: 9FM0/01)
Paper 2: Core Pure Mathematics 2 (*Paper code: 9FM0/02)

Each paper is:

1-hour and 30 minutes written examination
25% of the qualification
75 marks

Content overview

Proof
Complex numbers
Matrices
Further algebra and functions
Further calculus
Further vectors
Polar coordinates
Hyperbolic functions
Differential equations

Assessment overview

● Paper 1 and Paper 2 may contain questions on any topics from the Pure Core Mathematics content.
● Students must answer all questions.
● Calculators can be used in the assessment

Optional Component 1

3B: Further Statistics 1

This paper is:

1-hour and 30 minutes written examination
25% of the qualification
75 marks

Content overview

Discrete probability distributions
Poisson & binomial distributions
Geometric and negative binomial distributions
Hypothesis Testing
Central Limit Theorem
Chi Squared Tests
Probability generating functions
Quality of tests

Optional Component 2

3D: Decision Mathematics 1

This paper is:

1-hour and 30 minutes written examination
25% of the qualification
75 marks

Content overview

Algorithms
Graphs and Networks
Algorithms on Graphs
Route Inspection
The Travelling Salesman Problem
Linear Programming
This Simplex Algorithm
Critical Path Analysis

A-Level Further Maths at the Friary

Welcome to A-Level Further Maths at the Friary. Studying Further Maths at A-Level will greatly enhance your understanding and appreciation of the mathematical world while consolidating the fundamentals that are crucial for your Mathematics A-Level.

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 in to exam technique.

The course consists of Pure Mathematics, Further Statistics and Decision. The course is 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 parallel 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 it's 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.

Tasks

In order to prepare for studying A-Level further 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 jthorpe@friaryschool. co.uk.

Good luck

Mr J Thorpe

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: .....

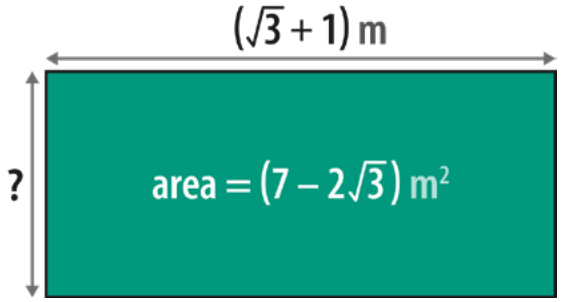
Q3 Given that h is a prime number, rationalise the denominator of $\frac{5h - \sqrt{h}}{\sqrt{h}}$

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: $a =$ ..... $b =$ ..... $c =$ .....

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: $a =$ ..... $b =$ ..... $c =$ ..... $d =$ .....

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.

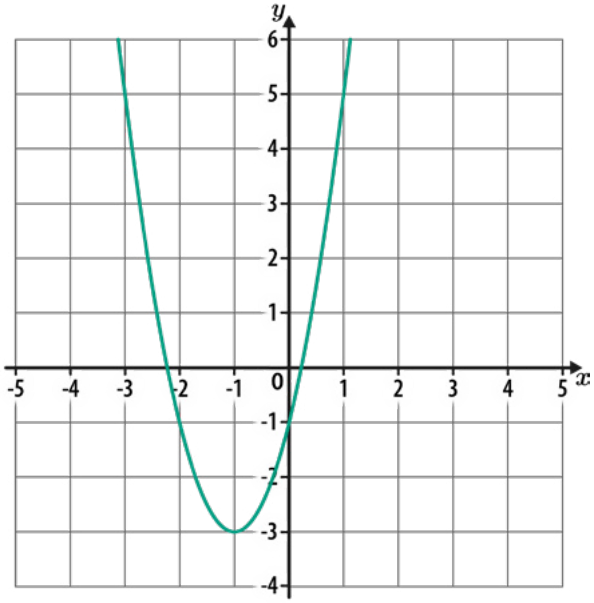
Work out the values of b and c.

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: $x =$ ..... $y =$ .....

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: $x =$ ..... $y =$ ..... $a =$ .....

Q3 Solve the following simultaneous equations:

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

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

Answer: $x =$ ..... $y =$ .....

Q4 Solve the following simultaneous equations:

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

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

Answer: $x =$ ..... $y =$ .....

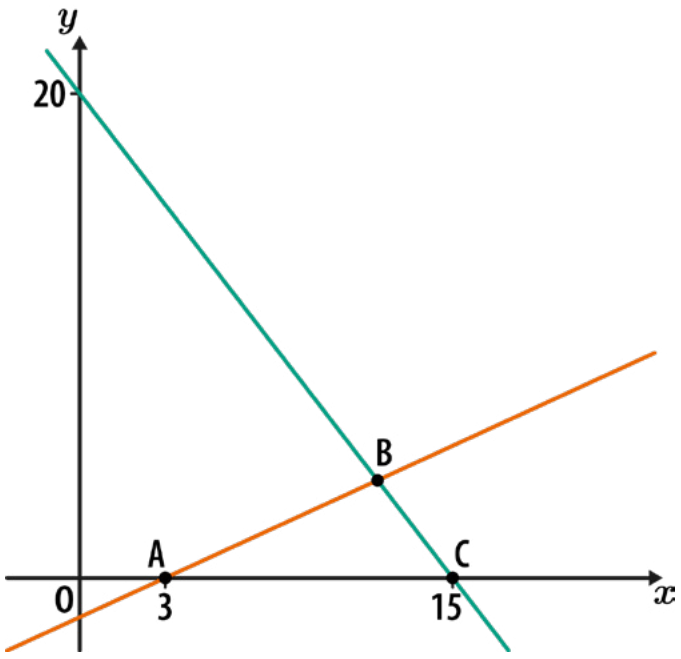
Q1 Write an expression, in terms of h, for the gradient of a line **perpendicular** to the line segment joining $(3h, 20)$ to $(6h, 8)$

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?

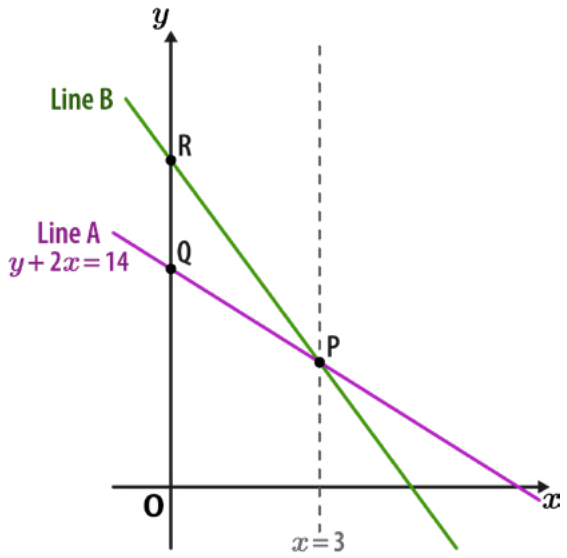


Answer: (..... , ...)

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.

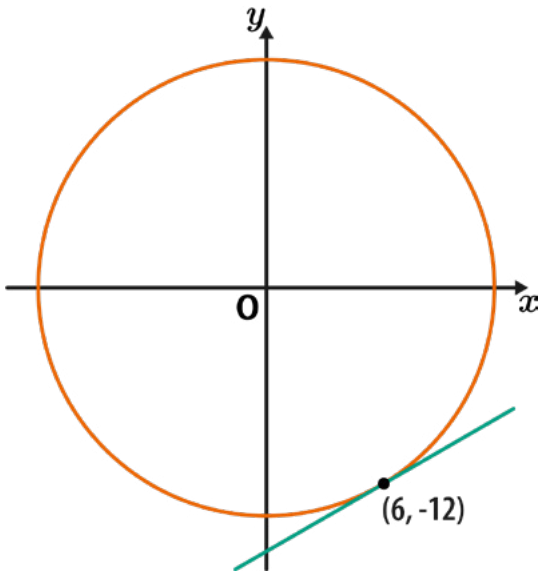


Answer: .....

Q4

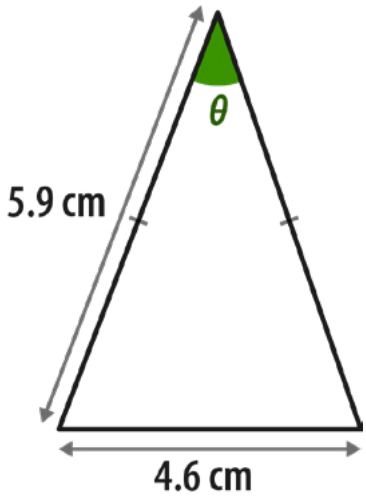
A circle, centre O, passes through the point (6, -12), as shown.

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: .....

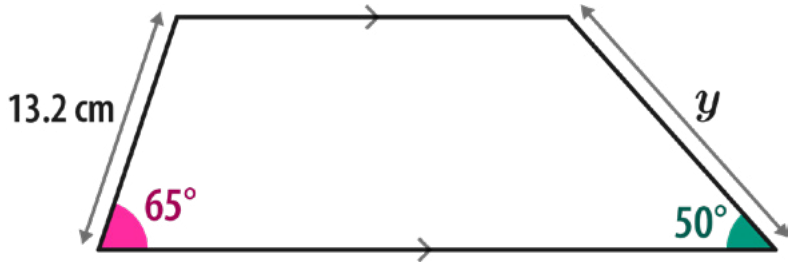
Q1 Calculate the size of angle θ.
Give your answer to 1 d.p.



Not drawn accurately

Answer: ..... °

Q2 Work out the length y.
Give your answer to 2 d.p.



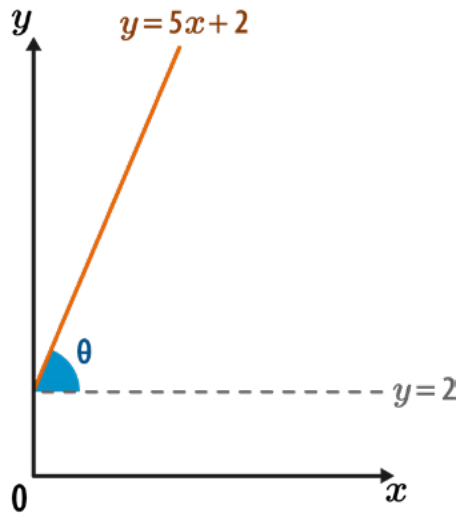
Not drawn accurately

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.



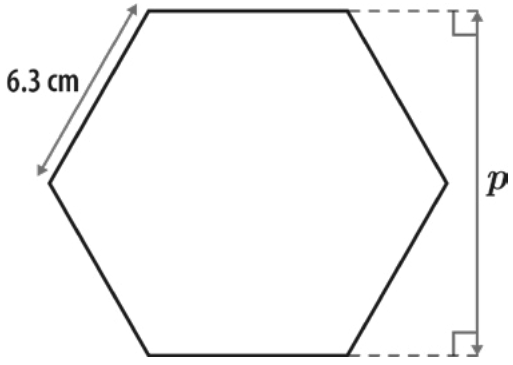
Not drawn accurately

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.

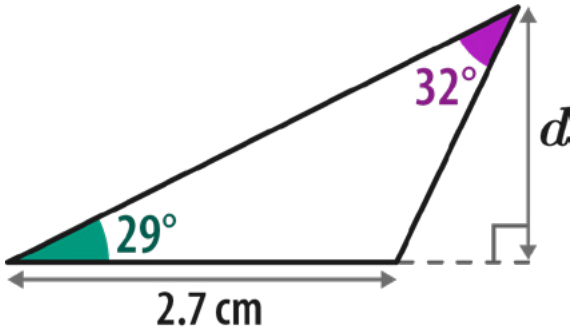


Not drawn accurately

Answer: ..... cm

Q1

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

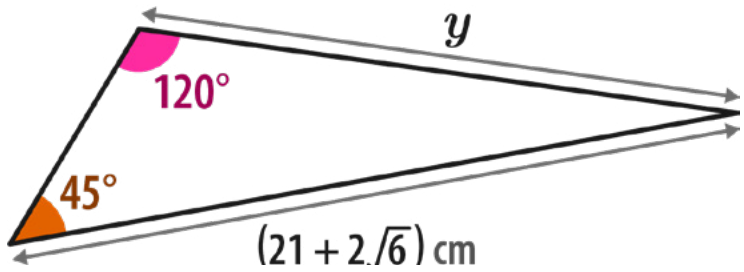


Not drawn accurately

Answer: ..... cm

Q2

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

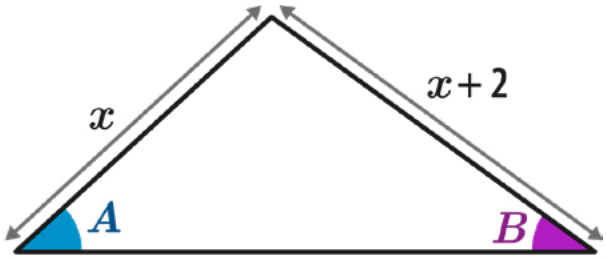


Not drawn accurately

Answer: ..... cm

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

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

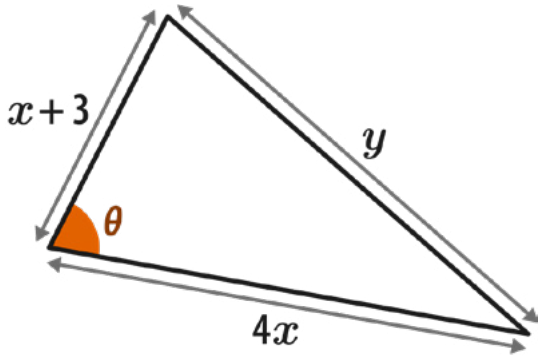


Not drawn accurately

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

The following terms are used in questions and assessments. It is essential that you familiarise yourself with them.

Exact - An exact answer is one where numbers ARE NOT given in rounded form. The answer will often contain an irrational number such as √3, e or π and these numbers should be given in that form. Rigorous (exact) working is expected in the answer to the question.

Hence - When a question uses the word 'hence' it is an indication that the next step should be based on what has gone before. You should start from this statement. Where the phrase "Hence or otherwise" is used, this indicates that whilst the previous work could form the starting point of the solution, learners may be aware of, and could use, an equally valid alternate method.

Show that - Show a result is true. Because you're given the result, your explanation has to be sufficiently detailed to cover every step of your working.

Prove - Provide a formal mathematical argument to demonstrate validity

Verify - Substitute given values to demonstrate the truth of a statement.

Sketch - Draw a diagram, not necessarily to scale, showing the main features of a curve.

Find, solve, calculate - While working may be necessary to answer the question, no justification needs to be given for any results found.

Show detailed reasoning - Give a solution that leads to a conclusion showing a detailed and complete analytical method. Your solution should contain sufficient detail to allow the line of your argument to be followed. This is not a restriction on use of a calculator when tackling the question.

Determine - Justification should be given for any results found, including working where appropriate.

Draw - Draw to an accuracy appropriate to the problem. You are being asked to make a sensible judgement about this.

Additional Reading

As a student who is choosing to study Mathematics at A Level, it is logical to assume that you have an interest in the subject.

With that said, the following books may be of interest to you. These are books that are not directly linked to the course but allow you to further your mathematical intrigue and understanding.

50 Mathematical Ideas You Really Need to Know (Tony Crilly)
Alex's Adventures in Numberland (Alex Bellos)
Cabinet of Mathematical Curiosities (Ian Stewart)
The Calculus Wars **(**Jason Socrates Bardi)
The Code Book (Simon Singh)
The Curious Incident of the Dog in the Night-time by Mark Haddon
How Many Socks Make a Pair?: Surprisingly Interesting Maths (Rob Eastway)
Hello World: How to be Human in the Age of the Machine (Hannah Fry)
Humble Pi: A Comedy of Maths Errors (Matt Parker)
The Life-Changing Magic of Numbers (Bobby Seagull)
The Num8er My5teries (Marcus du Sautoy)

Supporting Resources

- You will be provided with the relevant text books for the Edexcel Further Mathematics A-Level published by Pearson
- The recommended calculator for the A-Level Maths course is the, 'CASIO FX-991EX Scientific Calculator'
- There are supplementary texts available. We recommend the CGP revision guides and workbooks. There will be opportunities to purchase these through the school.