

Pearson Edexcel IGCSE



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Toomates Coolección vol. 33



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Compendium de pruebas Edexcel IGCSE Mathematics A:

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Compendium de pruebas Edexcel IGCSE Mathematics B:

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Compendium de pruebas Edexcel IGCSE Further Pure Mathematics:

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I Contexto.

Equivalencia Reino Unido vs. España:

- GCSE equivale a ESO español.
- AS Level equivale a 1º bachillerato español.
- A Level equivale a 2º bachillerato español.

¿Qué son GCSE y IGCSE?

Las siglas GCSE corresponden a General Certificate of Secondary Education. Se traduce al español como Certificado General de Educación Secundaria y da lugar a una serie de títulos de educación oficiales británicos. Para poder conseguirlos, los estudiantes de centros de enseñanza de carácter secundario de 15 y 16 años deben someterse a unos exámenes. Esta certificación se emite dentro de las fronteras de Inglaterra, Gales e Irlanda del Norte, además de en el resto de territorios británicos, entre los que se incluyen la excolonia de Sudáfrica y Gibraltar. En Escocia, sin embargo, los alumnos estudian para los denominados Standard Grades. Cuando se realiza un programa de año escolar en UK, hay que tener en cuenta estos exámenes ya que son como una revalida para pasar de curso y no se puede convalidar si no se prueban.

Las instituciones habilitadas como certificadoras son cinco:

1. AQA,
2. Edexcel,
3. OCR (Oxford, Cambridge, and RSA),
4. WJEC (Welsh Joint Education Committee)
5. CCEA

Los IGCSE son la versión internacional del GCSE. La selección de materias es similar a la GCSE, pero la IGCSE incluye idiomas extranjeros adicionales y se ofrece para más de 70 materias en total. Las asignaturas básicas son English, Maths, and Sciences, y los alumnos deben cursar de 5 a 14 asignaturas.

II Información general sobre el Edexcel IGCSE (9–1) Math.

Pruebas:

Mathematics A (Foundation Tier).

Levels 1 – 5

2 similar papers with approximately 20 – 25 questions on each paper, with varying marks – those more challenging questions at the end of the paper generally have 6 marks maximum

Paper 1F: 2-hour examination (50% of the qualification), targeted at grades 5–1.

Paper 2F: 2-hour examination (50% of the qualification), targeted at grades 5–1.

Mathematics A (Higher Tier).

Levels 4 – 9) with an allowable level 3.

2 similar papers with approximately 20 – 25 questions on each paper, with varying marks – those more challenging questions at the end of the paper generally have 6 marks maximum

Paper 1H: 2-hour examination (50% of the qualification), targeted at grades 9–4 with 3 allowed.

Paper 2H: 2-hour examination (50% of the qualification), targeted at grades 9–4 with 3 allowed.

Mathematics B.

Higher tier only (levels 4 – 9) with an allowable level 3.

Paper 1: 1 hour 30 mins (33%)
26 – 30 questions with varying marks

Paper 2: 2 hour 30 mins (66%)
11–12 questions with varying mark allocations; those at the end can have several parts amounting to 10 – 16 marks as the total for the question

Further Pure Mathematics:

Higher Tier only (targeted at grades 9–4, with 3 allowed).

Paper 1: 2-hour examination, 50% of the qualification.

Paper 2: 2-hour examination , 50% of the qualification.

Comparativa entre temarios.

(esta sección está en construcción...)

Mathematics A (Foundation)	Mathematics A (Higher)	Mathematics B
No Cumulative frequency	Cumulative frequency	No cumulative frequency
No matrices		Matrices
No factor theorem or algebraic division of a cubic by a linear factor, Can be asked to expand eg $(x + 3)(x + 2)(x - 1)$		Factor theorem and algebraic division of a cubic by a linear factor
	Sequences; know and use n th term $= a + (n - 1)d$ and find sum of first n terms of an arithmetic series (S_n)	Sequences - Being able to recognise sequences with a common difference or common integer sequences, and to continue a given sequence
	Apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$, $y = f(ax)$, $y = f(x + a)$, $y = af(x)$ for linear, quadratic, sine and cosine functions & interpret and analyse transformations of functions and write the functions algebraically	Functions but not transformations of graphs
No Calculus		Calculus
	cyclic quadrilaterals	
		conditional probability

Contenidos exclusivos de Further Pure Mathematics:

Logarithmic functions.

(falta por completar...)

III Contenidos en Mathematics A (Foundation Tier).

AO1 Demonstrate knowledge, understanding and skills in number and algebra: • numbers and the numbering system. • calculations. • solving numerical problems. • equations, formulae and identities. • sequences, functions and graphs.	57–63%
AO2 Demonstrate knowledge, understanding and skills in shape, space and measures: • geometry and trigonometry. • vectors and transformation geometry.	22–28%
AO3 Demonstrate knowledge, understanding and skills in handling data: • statistics. • probability.	12–18%
	TOTAL 100%

AO1 Numbers and algebra.

1.1 Integers.

- A understand and use integers (positive, negative and zero).
- B understand place value.
- C use directed numbers in practical situations, e.g. temperatures.
- D order integers.
- E use the four rules of addition, subtraction, multiplication and division.
- F use brackets and the hierarchy of operations.
- G use the terms ‘odd’, ‘even’, ‘prime numbers’, ‘factors’ and ‘multiples’.
- H identify prime factors, common factors and common multiples.

1.2 Fractions.

- A understand and use equivalent fractions, simplifying a fraction by cancelling common factors.
- B understand and use mixed numbers and vulgar fractions.
- C identify common denominators.
- D order fractions and calculate a given fraction of a given quantity.
- E express a given number as a fraction of another number.
- F use common denominators to add and subtract fractions and mixed numbers.
- G convert a fraction to a decimal or a percentage.
- H understand and use unit fractions as multiplicative inverses.
- I multiply and divide fractions and mixed numbers.

1.3 Decimals.

- A use decimal notation.
- B understand place value.
- C order decimals.

- D convert a decimal to a fraction or a percentage. Terminating decimals only.
- E recognise that a terminating decimal is a fraction.

1.4 Powers and roots.

- A identify square numbers and cube numbers.
- B calculate squares, square roots, cubes and cube roots.
- C use index notation and index laws for multiplication and division of positive and negative integer powers including zero.
- D express integers as a product of powers of prime factors.
- E find highest common factors (HCF) and lowest common multiples (LCM).

1.5 Set language and notation.

- A understand the definition of a set.
- B use the set notation $\cup$, $\cap$ and $\in$ and $\notin$.
- C understand the concept of the universal set and the empty set and the symbols for these sets.
- D understand and use the complement of a set.
- E use Venn diagrams to represent sets.

1.6 Percentages.

- A understand that 'percentage' means 'number of parts per 100'.
- B express a given number as a percentage of another number.
- C express a percentage as a fraction and as a decimal.
- D understand the multiplicative nature of percentages as operators.
- E solve simple percentage problems, including percentage increase and decrease
- F use reverse percentages.
- G use compound interest and depreciation.

1.7 Ratio and proportion.

- A use ratio notation, including reduction to its simplest form and its various links to fraction notation.
- B divide a quantity in a given ratio or ratios.
- C use the process of proportionality to evaluate unknown quantities.
- D calculate an unknown quantity from quantities that vary in direct proportion.
- E solve word problems about ratio and proportion. Including maps and scale diagrams.

1.8 Degree of accuracy.

- A round integers to a given power of 10.
- B round to a given number of significant figures or decimal places.
- C identify upper and lower bounds where values are given to a degree of accuracy.
- D use estimation to evaluate approximations to numerical calculations.

1.9 Standard form.

- A calculate with and interpret numbers in the form $a \times 10^n$ where n is an integer and $1 \leq a < 10$.

1.10 Applying number.

- A use and apply number in everyday personal, domestic or community life.

B carry out calculations using standard units of mass, length, area, volume and capacity.

C understand and carry out calculations using time, and carry out calculations using money, including converting between currencies.

1.11 Electronic calculators.

A use a scientific electronic calculator to determine numerical results.

2 Equations, formulae and identities.

2.1 Use of symbols.

A understand that symbols may be used to represent numbers in equations or variables in expressions and formulae.

B understand that algebraic expressions follow the generalised rules of arithmetic.

C use index notation for positive and negative integer powers (including zero).

D use index laws in simple cases.

2.2 Algebraic manipulation.

A evaluate expressions by substituting numerical values for letters.

B collect like terms C multiply a single term over a bracket.

D take out common factors.

E expand the product of two simple linear expressions.

F understand the concept of a quadratic expression and be able to factorise such expressions (limited to $x^2 + bx + c$).

2.3 Expressions and formulae.

A understand that a letter may represent an unknown number or a variable.

B use correct notational conventions for algebraic expressions and formulae.

C substitute positive and negative integers, decimals and fractions for words and letters in expressions and formulae.

D use formulae from mathematics and other real-life contexts expressed initially in words or diagrammatic form and convert to letters and symbols.

E derive a formula or expression.

F change the subject of a formula where the subject appears once.

2.4 Linear equations.

A solve linear equations, with integer or fractional coefficients, in one unknown in which the unknown appears on either side or both sides of the equation.

B set up simple linear equations from given data.

2.5 Proportion.

Higher Tier only.

2.6 Simultaneous linear equations.

A calculate the exact solution of two simultaneous equations in two unknowns.

2.7 Quadratic equations.

A solve quadratic equations by factorisation (limited to $x^2 + bx + c = 0$).

2.8 Inequalities.

- A understand and use the symbols $>$, $<$, $\geq$ and $\leq$.
- B understand and use the convention for open and closed intervals on a number line.
- C solve simple linear inequalities in one variable and represent the solution set on a number line.
- D represent simple linear inequalities on rectangular Cartesian graphs.
- E identify regions on rectangular Cartesian graphs defined by simple linear inequalities.

3 Sequences, functions and graphs.

3.1 Sequences.

- A generate terms of a sequence using term-to-term and position-to-term definitions of the sequence.
- B find subsequent terms of an integer sequence and the rule for generating it.
- C use linear expressions to describe the n th term of arithmetic sequences.

3.2 Function notation.

Higher Tier only.

3.3 Graphs.

- A interpret information presented in a range of linear and non-linear graphs.
- B understand and use conventions for rectangular Cartesian coordinates.
- C plot points (x, y) in any of the four quadrants or locate points with given coordinates.
- D determine the coordinates of points identified by geometrical information.
- E determine the coordinates of the midpoint of a line segment, given the coordinates of the two end points.
- F draw and interpret straight line conversion graphs.
- G find the gradient of a straight line. Gradient $= (\text{increase in } y) \div (\text{increase in } x)$.
- H recognise that equations of the form $y = mx + c$ are straight line graphs with gradient m and intercept on the y -axis at the point $(0, c)$.
- I recognise, generate points and plot graphs of linear and quadratic functions.

3.4 Calculus

Higher Tier only.

AO2 Shape, space and measure.

4 Geometry.

4.1 Angles, lines and triangles.

- A distinguish between acute, obtuse, reflex and right angles.
- B use angle properties of intersecting lines, parallel lines and angles on a straight line.
- C understand the exterior angle of a triangle property and the angle sum of a triangle property.
- D understand the terms 'isosceles', 'equilateral' and 'right-angled triangles' and the angle properties of these triangles.

4.2 Polygons.

- A recognise and give the names of polygons.
- B understand and use the term 'quadrilateral' and the angle sum property of quadrilaterals.
- C understand and use the properties of the parallelogram, rectangle, square, rhombus, trapezium and kite.
- D understand the term 'regular polygon' and calculate interior and exterior angles of regular polygons.
- E understand and use the angle sum of polygons.
- G understand that two or more polygons with the same shape and size are said to be congruent to each other.

4.3 Symmetry.

- A identify any lines of symmetry and the order of rotational symmetry of a given two-dimensional figure.

4.4 Measures.

- A interpret scales on a range of measuring instruments.
- B calculate time intervals in terms of the 24-hour and the 12-hour clock. Use am and pm.
- C make sensible estimates of a range of measures.
- D understand angle measure including three-figure bearings.
- E measure an angle to the nearest degree.
- F understand and use the relationship between average speed, distance and time.
- G use compound measure such as speed, density and pressure.

4.5 Construction.

- A measure and draw lines to the nearest millimetre.
- B construct triangles and other two-dimensional shapes using a combination of a ruler, a protractor and compasses.
- C solve problems using scale drawings.
- D use straight edge and compasses to: (i) construct the perpendicular bisector of a line segment (ii) construct the bisector of an angle.

4.6 Circle properties.

- A recognise the terms 'centre', 'radius', 'chord', 'diameter', 'circumference', 'tangent', 'arc', 'sector' and 'segment' of a circle.
- B understand chord and tangent properties of circles.

4.7 Geometrical reasoning.

- A give informal reasons, where required, when arriving at numerical solutions to geometrical problems.

4.8 Trigonometry and Pythagoras' theorem.

- A know, understand and use Pythagoras' theorem in two dimensions.
- B know, understand and use sine, cosine and tangent of acute angles to determine lengths and angles of a right-angled triangle.
- C apply trigonometrical methods to solve problems in two dimensions.

4.9 Mensuration of 2D shapes.

- A convert measurements within the metric system to include linear and area units.
- B find the perimeter of shapes made from triangles and rectangles.
- C find the area of simple shapes using the formulae for the areas of triangles and rectangles.
- D find the area of parallelograms and trapezia.
- E find circumferences and areas of circles using relevant formulae; find perimeters and areas of semicircles.

4.10 3D shapes and volume.

- A recognise and give the names of solids To include cube, cuboid, prism, pyramid, cylinder, sphere and cone.
- B understand the terms 'face', 'edge' and 'vertex' in the context of 3D solids
- C find the surface area of simple shapes using the area formulae for triangles and rectangles.
- D find the surface area of a cylinder.
- E find the volume of prisms, including cuboids and cylinders, using an appropriate formula.
- F convert between units of volume within the metric system.

4.11 Similarity.

- A understand and use the geometrical properties that similar figures have corresponding lengths in the same ratio but corresponding angles remain unchanged.
- B use and interpret maps and scale drawings.

5 Vectors and transformation geometry.

5.1 Vectors.

- Higher Tier only.

5.2 Transformation geometry.

- A understand that rotations are specified by a centre and an angle.
- B rotate a shape about a point through a given angle.
- C recognise that an anti-clockwise rotation is a positive angle of rotation and a clockwise rotation is a negative angle of rotation.
- D understand that reflections are specified.
- E construct a mirror line given an object and reflect a shape given a mirror line.
- F understand that translations are specified by a distance and direction.
- G translate a shape.
- H understand and use column vectors in translations.
- I understand that rotations, reflections and translations preserve length and angle so that a transformed shape under any of these transformations remains congruent to the original shape.
- J understand that enlargements are specified by a centre and a scale factor.
- K understand that enlargements preserve angles and not lengths.
- L enlarge a shape given the scale factor With or without a centre given.
- M identify and give complete descriptions of transformations.

AO3 Handling Data.

6 Statistics and probability.

6.1 Graphical representation of data.

- A use different methods of presenting data Pictograms, bar charts and pie charts, and only two-way tables.
- B use appropriate methods of tabulation to enable the construction of statistical diagrams.
- C interpret statistical diagrams.

6.2 Statistical measures.

- A understand the concept of average Data could be in a list or tabulated form.
- B calculate the mean, median, mode and range for a discrete data set Includes simple problems using these measures.
- C calculate an estimate for the mean for grouped data.
- D identify the modal class for grouped data.

6.3 Probability.

- A understand the language of probability Outcomes, equal likelihood, events, random.
- B understand and use the probability scale $P(\text{certainty}) = 1$, $P(\text{impossibility}) = 0$.
- C understand and use estimates or measures of probability from theoretical models.
- D find probabilities from a Venn diagram.
- E understand the concepts of a sample space and an event, and how the probability of an event happening can be determined from the sample space.
- F list all the outcomes for single events and for two successive events in a systematic way.
- G estimate probabilities from previously collected data.
- H calculate the probability of the complement of an event happening.
- I use the addition rule of probability for mutually exclusive events.
- J understand and use the term 'expected frequency'.

IV Contenidos en Mathematics A (Higher Tier).

Questions will assume knowledge from the Foundation Tier subject content.

AO1 Number and algebra.

1 Numbers and the number system.

1.1 Integers.

See Foundation Tier.

1.2 Fractions.

See Foundation Tier.

1.3 Decimals.

A convert recurring decimals into fractions.

1.4 Powers and roots.

A understand the meaning of surds.

B manipulate surds, including rationalising a denominator.

C use index laws to simplify and evaluate numerical expressions involving integer, fractional and negative powers.

1.5 Set language and notation.

A understand sets defined in algebraic terms, and understand and use subsets.

B use Venn diagrams to represent sets and the number of elements in sets.

C use the notation $n(A)$ for the number of elements in the set A.

D use sets in practical situations.

1.6 Percentages.

A use repeated percentage change.

B solve compound interest problems.

1.7 Ratio and proportion.

See Foundation Tier.

1.8 Degree of accuracy.

A solve problems using upper and lower bounds where values are given to a degree of accuracy.

1.9 Standard form.

A solve problems involving standard form.

1.10 Applying number.

See Foundation Tier.

1.11 Electronic calculators.

See Foundation Tier.

2 Equations, formulae and identities.

2.1 Use of symbols.

A use index notation involving fractional, negative and zero powers.

2.2 Algebraic manipulation.

A expand the product of two or more linear expressions.

B understand the concept of a quadratic expression and be able to factorise such expressions.

C manipulate algebraic fractions where the numerator and/or the denominator can be numeric, linear or quadratic.

D complete the square for a given quadratic expression.

E use algebra to support and construct proofs.

2.3 Expressions and formulae.

A understand the process of manipulating formulae or equations to change the subject, to include cases where the subject may appear twice or a power of the subject occurs.

2.4 Linear equations.

See Foundation Tier.

2.5 Proportion.

A set up problems involving direct or inverse proportion and relate algebraic solutions to graphical representation of the equations.

2.6 Simultaneous linear equations.

A calculate the exact solution of two simultaneous equations in two unknowns.

B interpret the equations as lines and the common solution as the point of intersection.

2.7 Quadratic equations.

A solve quadratic equations by factorisation.

B solve quadratic equations by using the quadratic formula or completing the square.

C form and solve quadratic equations from data given in a context.

D solve simultaneous equations in two unknowns, one equation being linear and the other being quadratic.

2.8 Inequalities.

A solve quadratic inequalities in one unknown and represent the solution set on a number line.

B identify harder examples of regions defined by linear inequalities.

3 Sequences, functions and graphs.

3.1 Sequences.

A understand and use common difference (d) and first term (a) in an arithmetic sequence.

B know and use n th term $= a + (n-1)d$.

C find the sum of the first n terms of an arithmetic series (S_n).

3.2 Function notation.

A understand the concept that a function is a mapping between elements of two sets.

B use function notations of the form $f(x) = \dots$ and $f : x \rightarrow \dots$

C understand the terms 'domain' and 'range' and which values may need to be excluded from a domain.

D understand and find the composite function fg and the inverse function f^{-1} .

3.3 Graphs.

A recognise, plot and draw graphs with equation:

$y = Ax^3 + Bx^2 + Cx + D$ in which:

(i) the constants are integers and some could be zero

(ii) the letters x and y can be replaced with any other two letters or:

$y = Ax^3 + Bx^2 + Cx + D + E/x + F/x^2$ in which:

(i) the constants are numerical and at least three of them are zero

(ii) the letters x and y can be replaced with any other two letters or:

$y = \sin x$, $y = \cos x$, $y = \tan x$ for angles of any size (in degrees)

B apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$, $y = f(ax)$, $y = f(x + a)$, $y = af(x)$ for linear, quadratic, sine and cosine functions.

C interpret and analyse transformations of functions and write the functions algebraically.

D find the gradients of non-linear graphs.

E find the intersection points of two graphs, one linear (y_1) and one non-linear (y_2), and recognise that the solutions correspond to the solutions of $(y_2 - y_1) = 0$.

F calculate the gradient of a straight line given the coordinates of two points

G find the equation of a straight line parallel to a given line; find the equation of a straight line perpendicular to a given line.

3.4 Calculus.

A understand the concept of a variable rate of change.

B differentiate integer powers of x .

C determine gradients, rates of change, stationary points, turning points (maxima and minima) by differentiation and relate these to graphs.

D distinguish between maxima and minima by considering the general shape of the graph only.

E apply calculus to linear kinematics and to other simple practical problems.

AO2 Shape, space and measures.

4 Geometry and trigonometry.

4.1 Angles, lines and triangles.

See Foundation Tier.

4.2 Polygons.

See Foundation Tier.

4.3 Symmetry.

See Foundation Tier.

4.4 Measures.

See Foundation Tier.

4.5 Construction.

See Foundation Tier.

4.6 Circle properties.

A understand and use the internal and external intersecting chord properties.

B recognise the term 'cyclic quadrilateral'.

C understand and use angle properties of the circle including:

(i) angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the remaining part of the circumference

(ii) angle subtended at the circumference by a diameter is a right angle

(iii) angles in the same segment are equal

(iv) the sum of the opposite angles of a cyclic quadrilateral is 180°

(v) the alternate segment theorem

Formal proof of these theorems is not required

4.7 Geometrical reasoning.

A provide reasons, using standard geometrical statements, to support numerical values or angles obtained in any geometrical context involving lines, polygons and circles.

4.8 Trigonometry and Pythagoras' theorem.

A understand and use sine, cosine and tangent of obtuse angles.

B understand and use angles of elevation and depression.

C understand and use the sine and cosine rules for any triangle.

D use Pythagoras' theorem in three dimensions.

E understand and use the formula $\frac{1}{2} ab \sin C$ for the area of a triangle.

F apply trigonometrical methods to solve problems in three dimensions, including finding the angle between a line and a plane.

4.9 Mensuration.

A find perimeters and areas of sectors of circles.

4.10 3D shapes and volume.

A find the surface area and volume of a sphere and a right circular cone using relevant formulae.

4.11 Similarity.

A understand that areas of similar figures are in the ratio of the square of corresponding sides.

B understand that volumes of similar figures are in the ratio of the cube of corresponding sides.

C use areas and volumes of similar figures in solving problems.

5 Vectors and transformation geometry.

5.1 Vectors.

A understand that a vector has both magnitude and direction.

B understand and use vector notation including column vectors.

C multiply vectors by scalar quantities.

D add and subtract vectors.

E calculate the modulus (magnitude) of a vector.

F find the resultant of two or more vectors.

G apply vector methods for simple geometrical proofs.

5.2 Transformation geometry.

See Foundation Tier.

6 Statistics and probability.

6.1 Graphical representation of data.

A construct and interpret histograms For continuous variables with unequal class intervals.

B construct cumulative frequency diagrams from tabulated data.

C use cumulative frequency diagrams.

6.2 Statistical measures.

A estimate the median from a cumulative frequency diagram.

B understand the concept of a measure of spread.

C find the interquartile range from a discrete data set The terms ‘upper quartile’ and lower quartile’ may be used.

D estimate the interquartile range from a cumulative frequency diagram.

6.3 Probability.

A draw and use tree diagrams.

B determine the probability that two or more independent events will occur.

C use simple conditional probability when combining events.

D apply probability to simple problems.

V Contenidos en Mathematics B.

Mathematics (Specification B) content

- 1: Number
- 2: Sets
- 3: Algebra
- 4: Functions
- 5: Matrices
- 6: Geometry
- 7: Mensuration
- 8: Vectors and transformation geometry
- 9: Trigonometry
- 10: Statistics and probability

1 Number.

- A The ordinary processes of number manipulation
- B Prime numbers, factors, multiples To include finding HCF and LCM in simple cases.
- C Indices, powers and roots. Use index notation and index laws for multiplication and division involving integer, fractional and negative powers
- D Simple manipulation of surds
- E Rationalising the denominator.
- F Natural numbers, integers and rational and irrational numbers
- G Weights, measures and money.
- H Fractions, decimals, ratio, proportion and percentage
- I Expressing numbers to a given degree of accuracy.
- J Solve problems using upper and lower bounds where values are given to a degree of accuracy.
- K Numbers in standard form.

2 Sets.

- A The idea of a set.
- B Set language and notation.
- C Union and intersection of sets.
- D Number of elements in a set.
- E Complementary sets.
- F Subsets.
- G Universal set, null set.
- H Venn diagrams and their use in simple logical problems.
- I Use of symbols to represent sets.

3 Algebra.

- A The basic processes of algebra.
- B The construction, interpretation and use of formulae and their manipulation.
- C The factorisation of simple algebraic expressions.
- D Use of the factor theorem.

- E Algebraic division of a cubic by a linear factor.
- F The manipulation of simple algebraic fractions, the denominators being numerical, linear or quadratic.
- G Solution of equations of 1st, 2nd and 3rd degree containing one unknown quantity.
- H Solution of linear simultaneous equations in two unknowns.
- I Solve simultaneous equations in two unknowns, one equation being linear and the other being quadratic.
- J Solution of linear inequalities, and the representations of solutions on the number line and two-dimensional space.
- K Solve quadratic inequalities in one unknown and represent the solution set on a number line.
- L The idea of a sequence.

4 Functions.

- A The idea of a function of a variable.
- B Function as a mapping or as a correspondence between the elements of two sets.
- C Use functional notations of the form $f(x) = \dots$ and $f: x \rightarrow \dots$
- D Domain and range of a function.
- E Composite functions. 'fg' will mean 'do g first then f'
- F Inverse functions.
- G Variation, direct and indirect proportion.
- H Rectangular Cartesian co-ordinates.
- I Recognise that equations of the form $y = mx + c$ are straight-line graphs with gradient m and intercept on the y -axis at the point $(0, c)$
- J Graphs and graphical treatment of the equation: $y = Ax^3 + Bx^2 + Cx + D + E/x + F/x^2$ in which the constants are numerical and at least three of them are zero.
- K The gradients of graphs above by drawing.
- L Differentiation of integer powers of x .
- M Determination of gradients, rates of change, maxima and minima, stationary points and turning points.
- N Applications to linear kinematics and to other simple practical problems.

5 Matrices.

- A Representation of data by a matrix.
- B Addition and multiplication of matrices.
- C Multiplication of a matrix by a scalar.
- D Unit (identity) matrix and zero (null) matrix.
- E Determinants and inverses of non-singular 2×2 matrices
- F Transformations of the plane associated with 2×2 matrices.
- G Combination of transformations .

6 Geometry.

- A Geometrical properties of Euclidean space, as listed below. In solving any problem or rider, students may use any knowledge they possess Solutions may be by traditional methods (e.g. congruent triangles), vectors, the use of transformations such as translation, reflection, rotation and enlargement, or a mixture of these Formal proofs of theorems will not be required

- B Geometrical reasoning.
- C Angle properties of parallel lines, triangles and polygons, including regular polygons Angles on a straight line, angles around a point. Angles measured anticlockwise will be taken as positive; clockwise as negative
- D Properties of the parallelogram, rectangle, square, rhombus, trapezium and kite
- E Symmetry about a point, line or plane Recognise line and rotational symmetry. Complete shapes with a given axis of symmetry and order of rotational symmetry.
- F Use of Pythagoras' theorem in 2D and 3D Including its use in any acute-angled triangle where an altitude is given or constructed. The angle bisector theorems are excluded.
- G Similarity: areas and volumes of similar figures. Understanding how scale factors are related to area and volume.
- H Prove the similarity of two triangles.
- I Congruent shapes.
- J Understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles.
- K Chord, angle and tangent properties of circles. To include knowledge of the intersecting chord properties (both internal and external) and the alternate segment theorem.
- L Properties of a cyclic quadrilateral.
- M Loci in two dimensions 'Tracing paper' methods will not be acceptable
- N Constructions of bisector of an angle and of perpendicular bisector (mediator) of a straight line. Constructions using only ruler and compasses.

7 Mensuration

- A Length, area, and volume.
- B Mensuration of two-dimensional shapes, rectangle, parallelogram, trapezium, triangle, circle.
- C Mensuration of three-dimensional shapes, right circular cylinder, right circular cone and sphere, cuboid, pyramid, prism.
- D Length of an arc, area of a sector of a circle. Radian measure is excluded

8 Vectors and transformation geometry.

- A Scalar and vector quantities Vectors will be in two dimensions only.
- B Understand and use vector notation.
- C Representation of a vector by a directed line segment.
- D Parallel vectors, unit vectors and position vectors.
- E Sum and difference of two vectors.
- F Modulus (magnitude) of a vector.
- G Multiplication of a vector by a scalar.
- H Find the resultant of two or more vectors.
- I Apply vector methods to simple geometrical problems. The problems may involve colinearity, parallel lines and concurrency.
- J Transformations of the plane. Reflections in any line, rotations about any point translations, enlargements.
- K Combination of transformations.
- L Multiplication of a vector by a matrix.

9 Trigonometry.

- A Use of sine, cosine and tangent of angles up to 180° . Angles will be measured in degrees and decimals of a degree.
- B Solution of problems in two and three dimensions by calculation and by drawing.
- C Angles of elevation and depression.
- D Bearings.

10 Statistics and probability.

- A Graphical representation of numerical data To include bar charts, pie charts and histograms. Cumulative frequency graphs are excluded.
- B Determination of the mean, median and mode for a discrete data set.
- C Calculation of an estimate of the mean of a larger number of quantities given in grouped frequencies
- D Determination of a modal class and the class containing the median for grouped data.
- E Understand the language and basic concepts of probability. To include the probability scale, sample spaces, relative frequency, probabilities and complements.
- F Use of addition rule for two or more mutually exclusive events.
- G Use of product rule for two or more independent events.
- H Determination of the probability of two or more independent events. The use of tree diagrams will be expected.
- I Using simple conditional probability for combined events.
- J Finding very simple conditional probability. The notation $P(A|B)$ will not be used.
- K Understand and use the term 'expected frequency'.

VI Contenidos en Further Pure Mathematics.

1 Logarithmic functions and indices.

- A The functions a^x and $\log_b x$ (where b is a natural number greater than one). A knowledge of the shape of the graphs of a^x and $\log_b x$ is expected, but not a formal expression for the gradient.
- B Use and properties of indices and logarithms, including change of base.
- C Simple manipulation of surds.
- D Rationalising the denominator.

2 The quadratic function.

- A The manipulation of quadratic expressions.
- B The roots of a quadratic equation.
- C Simple examples involving functions of the roots of a quadratic equation.

3 Identities and inequalities.

- A Simple algebraic division.
- B The factor and remainder theorems.
- C Solutions of equations, extended to include the simultaneous solution of one linear and one quadratic equation in two variables.
- D Simple inequalities, linear and quadratic.
- E The graphical representation of linear inequalities in two variables.

4 Graphs.

- A Graphs of polynomials and rational functions with linear denominators. The concept of asymptotes parallel to the coordinate axes is expected.
- B The solution of equations and transcendental functions by graphical methods.

5 Series.

- A Use of the $\sum$ notation.
- B Arithmetic and geometric series.

6 The binomial series.

- A Use of the binomial series $(1 + x)^n$.

7 Scalar and vector quantities.

- A The addition and subtraction of coplanar vectors and the multiplication of a vector by a scalar.
- B Components and resolved parts of a vector.
- C Magnitude of a vector.
- D Position vector.
- E Unit vector.
- F Use of vectors to establish simple properties of geometrical figures.

8 Rectangular Cartesian coordinates.

- A The distance between two points. The distance between two points.
- B The point dividing a line in a given ratio.
- C Gradient of a straight line joining two points.
- D The straight line and its equation.
- E The condition for two lines to be parallel or to be perpendicular.

9 Calculus.

A Differentiation and integration of sums of multiples of powers of x (excluding integration of $1/x$), $\sin ax, \cos ax, e^{ax}$.

B Differentiation of a product, quotient and simple cases of a function of a function.

C Applications to simple linear kinematics and to determination of areas and volumes

D Stationary points and turning points.

E Maxima and minima. Maxima and minima problems may be set in the context of a practical problem. Justification of maxima and minima will be expected.

F The equations of tangents and normals to the curve $y = f(x)$

G Application of calculus to rates of change and connected rates of change.

10 Trigonometry.

A Radian measure, including use for arc length and area of sector.

B The three basic trigonometric ratios of angles of any magnitude (in degrees or radians) and their graphs. To include the exact values for sine, cosine and tangent of $30^\circ, 45^\circ, 60^\circ$ (and the radian equivalents), and the use of these to find the trigonometric ratios of related values such as $120^\circ, 300^\circ$

C Applications to simple problems in two or three dimensions (including angles between a line and a plane and between two planes)

D Use of the sine and cosine formulae. The area of a triangle in the form: $\frac{1}{2} ab \sin C$ is expected to be known.

E The identity $\cos^2\theta + \sin^2\theta = 1$.

F Use of the identity $\tan \theta = \sin\theta / \cos\theta$.

G The use of the basic addition formulae of trigonometry.

H Solution of simple trigonometric equations for a given interval.

VII Uso de calculadoras.

Students will be expected to have access to a suitable electronic calculator for all examination papers.

Foundation Tier.

The electronic calculator to be used by students attempting Foundation Tier examination papers (1F and 2F) should have these functions as a minimum:

$+$, $-$, $\times$, $\div$, x^2 , $\sqrt{x}$, memory, brackets, x^y , $x^{1/y}$, $\dot{x}$, $\sum x$, $\sum fx$, sine, cosine, tangent and their inverses

Higher Tier.

The electronic calculator to be used by students attempting Higher Tier examination papers (1H and 2H) should have these functions as a minimum:

$+$, $-$, $\times$, $\div$, x^2 , $\sqrt{x}$, memory, brackets, x^y , $x^{1/y}$, $\dot{x}$, $\sum x$, $\sum fx$, standard form, sine, cosine, tangent and their inverses

Prohibitions

Calculators with any of the following facilities are prohibited in all examinations:

- databanks
- retrieval of text or formulae
- QWERTY keyboards
- built-in symbolic algebra manipulations
- symbolic differentiation or integration.