edexcel

Edexcel International Lower Secondary Curriculum

Mathematics

Specification

First examination June 2012

Edexcel International Award in Lower Secondary Mathematics (LMA01)

ALWAYS LEARNING

PEARSON

Pearson Education Limited is one of the UK's largest awarding organisations, offering academic and vocational qualifications and testing to schools, colleges, employers and other places of learning, both in the UK and internationally. Qualifications offered include GCSE, AS and A Level, NVQ and our BTEC suite of vocational qualifications, ranging from Entry Level to BTEC Higher National Diplomas.

Through initiatives such as onscreen marking and administration, Pearson is leading the way in using technology to modernise educational assessment, and to support teachers and learners.

Acknowledgements

This specification has been produced by Edexcel on the basis of consultation with teachers, examiners, consultants and other interested parties. Edexcel would like to thank all those who contributed their time and expertise to its development.

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Publications Code PL033389

Introduction

Key aims of the Edexcel International Curriculum

The Edexcel International Curriculum:

- **is excellent preparation for International GCSE and GCE A Level or equivalent –** through a structured curriculum for English, maths and science
- **provides a solid benchmark of achievement,** with externally-marked achievement tests and certification at the end of Year 9 that meet rigorous international standards
- **allows you to track pupils' progress and identify barriers to learning** through a variety of age specific progress and achievement tests
- **is easy to implement and administer,** with free training and a fully-flexible structure that allows you to teach it alongside other curricula
- **offers a comprehensive, well-structured and up-to-date learning platform** to ease the transition to upper secondary education
- **offers unrivalled and unique delivery support,** with detailed suggestions of published resources embedded within each unit to help you implement the curriculum
- **gives you and your pupils a seamless and cohesive teaching and learning experience,** especially when used alongside other Edexcel qualifications for ages 8–19.

Key features and benefits of the achievement test

The achievement test:

- gives pupils a tangible record of achievement to use when progressing to International GCSE or equivalent
- enables pupils to gain experience of the standards required for International GCSE and equivalent examinations
- is externally marked by Edexcel so you can be assured of the level of achievement of your pupils
- complies with rigorous global standards
- provides certification at the end of Year 9.

Contents

Specification at a glance

The Edexcel International Award in Lower Secondary Mathematics comprises one test.

Test	**Paper code LMA01/01**
• Externally assessed • Availability: June series • First assessment: June 2012	
Overview of content **Number** • Arithmetic and rounding • Numbers • Fractions and decimals • Percentages • Ratio and proportion **Algebra** • Expressions and formulae • Manipulation • Equations • Inequalities • Index laws • Sequences • Graphs and functions **Geometry and Measures** • Measurements and units • Angles • Transformations • Perimeter and area • 2-D representation **Statistics** • Data • Charts and diagrams • Using statistics • Probability	
Overview of assessment • Section A consists of 30 multiple-choice questions. • Section B consists of 50 marks of short-answer questions. • The test duration is 1 hour and 20 minutes. • Questions target levels P3/S1, S2, S3 and S4.	

Award content

This Edexcel International Award in Lower Secondary Mathematics requires pupils to demonstrate knowledge, understanding and application of the following learning objectives drawn from Years 7, 8 and 9 of the International Curriculum.

Some learning objectives are not explicit in the International Curriculum and are therefore not referenced. They should nevertheless be covered in preparing for the test.

Number

Level	Curriculum learning objectives	Curriculum reference
	Arithmetic and rounding	
P3/S1	Round to two decimal places	
S2	Add, subtract, multiply and divide integers and decimals	Y9 Unit 7
S2	Use the order of operations, including brackets and indices	Y9 Unit 3
S2	Use known facts to derive unknown facts	Y9 Unit 3
S2	Use calculators efficiently	Y9 Unit 7
S2	Round to a given number of decimal places	Y9 Unit 7
S3	Round to a given number of significant figures	Y9 Units 3, 7
S3	Estimate answers to calculations	Y9 Unit 3
S3	Convert between standard form and ordinary numbers	Y9 Unit 7
S3	Use standard form on a calculator	Y9 Unit 7
S4	Solve problems using standard form	Y9 Unit 7
S4	Find the upper and lower bounds for discrete data	Y9 Unit 7

Level	Curriculum learning objectives	Curriculum reference
	Numbers	
P3/S1	Find the HCF and LCM of two numbers	
S2	Find the HCF and LCM of three numbers less than 100	Y9 Unit 8
S2	Find the prime factor decomposition of a whole number	Y9 Unit 8
S3	Find the HCF and LCM of a group of numbers from their prime factor decomposition	Y9 Unit 8
S3	Solve problems using multiples and factors	Y9 Unit 8

Level	Curriculum learning objectives	Curriculum reference
	Roots	
S3	Find square roots and cube roots using factors	Y9 Unit 8
S3	Use index laws $a^m \times a^n = a^{m+n}$ and $a^m \div a^n = a^{m-n}$ to simplify numerical expressions	Y9 Unit 8
S4	Use index laws $(am)^n = a^{mn}$ to simplify numerical expressions	Y9 Unit 8
S4	Use index laws with fractional and/or negative powers to simplify numerical expressions	Y9 Unit 8

Level	Curriculum learning objectives	Curriculum reference
	Fractions and decimals	
P3/S1	Simplify fractions	
P3/S1	Convert terminating decimals to fractions	
P3/S1	Calculate fractions of quantities	
P3/S1	Convert between fractions, decimals and percentages	
S2	Compare and order decimals, fractions and percentages	Y9 Unit 3
S2	Convert fractions to recurring decimals	Y9 Unit 7
S2	Express one number as a fraction of another number	Y9 Unit 3
S2	Add and subtract fractions	Y9 Unit 3
S2	Multiply and divide an integer by a fraction	Y9 Unit 3
S2	Multiply and divide by decimals	Y9 Unit 3
S3	Add and subtract mixed numbers	Y9 Unit 3
S3	Multiply and divide fractions and mixed numbers	Y9 Unit 3
S3	Convert a recurring decimal to a fraction using an algebraic method	Y9 Unit 7

Level	Curriculum learning objectives	Curriculum reference
	Percentages	
P3/S1	Find percentages of quantities	
S2	Express one number as a percentage of another number	Y9 Unit 3
S2	Find a percentage increase or decrease	Y9 Unit 3
S3	Use multipliers for percentage increase or decrease	Y9 Unit 3
S3	Find an original amount after a percentage increase or decrease using an inverse operation	Y9 Unit 3
S3	Calculate compound interest	Y9 Unit 3

Level	Curriculum learning objectives	Curriculum reference
	Ratio and proportion	
P3/S1	Use the unitary method to solve problems using direct proportion	
P3/S1	Write a ratio in its simplest form	
P3/S1	Understand the relationship between ratio and proportion	
P3/S1	Divide a quantity into 2 parts in a given ratio	
S2	Divide a quantity into 3 parts in a given ratio	Y9 Unit 3
S2	Write a ratio in the form 1 : m or m : 1	Y9 Unit 3
S3	Recognise and use direct proportion in worded problems	Y9 Unit 3
S4	Recognise and use inverse proportion in worded problems	Y9 Unit 3

Algebra

Level	Curriculum learning objectives	Curriculum reference
	Expressions and formulae	
P3/S1	Write down simple expressions	
P3/S1	Write down simple formulae	
P3/S1	Substitute positive integers into simple expressions and formulae	
S2	Use notation and symbols correctly	Y9 Unit 2
S2	Distinguish between expressions, identities and equations	Y9 Unit 2
S2	Derive an expression	Y9 Units 2, 11
S2	Substitute numbers into an expression involving powers and/or brackets	Y9 Units 3, 11
S2	Derive a formula	Y9 Unit 11
S3	Use a formula and find the value of a letter which is not the subject	Y9 Unit 11
S3	Change the subject of a formula	Y9 Unit 11
S4	Change the subject of a more complex formula	Y9 Unit 11

Level	Curriculum learning objectives	Curriculum reference
	Manipulation	
P3/S1	Simplify expressions	
P3/S1	Multiply a single term over a bracket (positive integer coefficients)	
S2	Multiply a single term (could be a negative number) over a bracket and simplify	Y9 Units 2, 11
S2	Factorise expressions involving a single bracket	Y9 Unit 11
S3	Expand and simplify more complex expressions	Y9 Units 2, 11
S3	Fully factorise algebraic expressions	Y9 Unit 11
S4	Multiply out brackets of the form $(x \pm a)(x \pm b)$	Y9 Unit 11
S4	Factorise simple quadratic expressions, including $x^2 - a^2$	Y9 Unit 11
S4	Simplify algebraic fractions	Y9 Unit 8
S4	Use factorisation to simplify simple algebraic fractions	Y9 Unit 11

Level	Curriculum learning objectives	Curriculum reference
	Equations	
P3/S1	Form and solve simple equations	
S2	Form linear equations with the variable on one or both sides	Y9 Unit 2
S2	Solve linear equations with the variable on one or both sides	Y9 Unit 2
S2	Solve linear equations that include brackets and/or involve multiplying a bracket by a negative number	Y9 Unit 2
S2	Use trial and improvement to solve quadratic and cubic equations	Y9 Unit 2
S3	Solve simultaneous equations with two variables using algebra	Y9 Unit 2

Level	Curriculum learning objectives	Curriculum reference
	Inequalities	
S2	Understand inequality signs	Y9 Unit 11
S3	Identify and represent inequalities on a number line	Y9 Unit 11
S3	Solve inequalities in one variable	Y9 Unit 11
S4	Show the solution set, as a shaded region, of several inequalities on a graph	Y9 Unit 11

Level	Curriculum learning objectives	Curriculum reference
	Index laws	
S3	Know and use index laws; $a^m \times a^n = a^{m+n}$ and $a^m \div a^n = a^{m-n}$	Y9 Unit 8
S4	Know and use $(am)^n = a^{mn}$	Y9 Unit 8
S4	Know that $a^0 = 1$	Y9 Unit 8
S4	Understand and use all index laws with fractional and negative powers	Y9 Unit 8

Level	Curriculum learning objectives	Curriculum reference
	Sequences	
P3/S1	Continue a sequence	
P3/S1	Find a term in a sequence using position-to-term in words, positive numbers only	
S2	Find a term in a sequence using term-to-term rules with positive and negative numbers	Y9 Unit 1
S2	Find terms in an arithmetic or quadratic sequence given the nth term	Y9 Unit 1
S2	Find the next term in a sequence by looking at the pattern of differences	Y9 Unit 1
S2	Find the nth term of an arithmetic sequence	Y9 Unit 1
S3	Use spatial patterns to deduce nth terms and express terms as a series	Y9 Unit 1
S3	Find the nth term of a quadratic sequence of the form $T(n) = an^2$	Y9 Unit 1
S4	Find the nth term of a quadratic sequence of the form $T(n) = an^2 + bn$ or $T(n) = an^2 + bn + c$ by using the pattern of second differences	Y9 Unit 1

Level	Curriculum learning objectives	Curriculum reference
	Graphs and functions	
P3/S1	Plot and read coordinates in all four quadrants	
P3/S1	Recognise straight lines that are parallel to the x- or y-axis	
P3/S1	Generate sets of positive value coordinates from a linear function and use these to draw a graph	
S2	Express simple functions using symbols	Y9 Unit 1
S2	Plot graphs of linear functions in all four quadrants	Y9 Units 1, 2, 8
S2	Find the inverse of simple linear functions	Y9 Unit 1
S2	Given the coordinates of *A* and *B* (find the midpoint of *AB*)	Y9 Unit 10
S3	Know that all linear functions in x and y can be rearranged in the form $y = mx + c$, understand the meaning of m and c	Y9 Unit 8
S3	Draw a straight line graph using the gradient and intercept	Y9 Unit 8
S3	Use graphs to find the solution of a pair of simultaneous equations	Y9 Unit 2
S3	Construct tables of values for quadratic and cubic functions $(y = ax^3)$ and draw their graphs	Y9 Unit 8
S3	Interpret and draw graphs from real-life situations	Y9 Unit 8
S4	Recognise when lines are parallel and where a line crosses the y- axis from the equation of the line	Y9 Unit 8
S4	Know the gradient of a line perpendicular to $y = mx + c$	Y9 Unit 8
S4	Recognise graphs of the functions of the form $y = ax^2 + b$ and $y = ax^3$	
S4	Find the line of symmetry and the turning point of a quadratic function from its graph	Y9 Units 1, 8

Geometry and Measures

Level	Curriculum learning objectives	Curriculum reference
	Angles	
P3/S1	Know and use the sum of angles at a point, on a straight line and in a triangle and recognise vertically opposite angles	
P3/S1	Use angle properties of right-angled, isosceles and equilateral triangles and special quadrilaterals	
S2	Identify alternate and corresponding angles	Y9 Units 4, 14
S2	Understand proofs that the sum of the angles in a triangle is 180^o and the sum of the angles in a quadrilateral is 360^o	Y9 Unit 4
S2	Identify the properties of quadrilaterals	Y9 Unit 4
S2	Understand a proof that the exterior angles of a triangle is equal to the sum of the two interior opposite angles	Y9 Unit 4
S2	Calculate interior and exterior angles of triangles and quadrilaterals	Y9 Units 4, 14
S2	Solve problems using the properties of triangles and quadrilaterals	Y9 Unit 4
S2	Give reasons when solving problems	Y9 Units 4, 14
S2	Know and use the fact that the sum of the exterior angles of a polygon is always 360^o	Y9 Unit 4
S2	Find and use the sum of the interior angles of polygons	Y9 Unit 4
S3	Use the interior and exterior angles of polygons to solve problems	Y9 Unit 4

Level	Curriculum learning objectives	Curriculum reference
	Constructions	
P3/S1	Use a ruler and protractor to construct a triangle given two sides and the included angle or two angles and the included side	
S2	Use a straight edge and compasses to construct the perpendicular bisector of a line and of an angle, the perpendicular to a line, and a triangle	Y9 Unit 4
S2	Visualise and use 2-D representations of 3-D objects including plans and elevations	Y9 Unit 14

Level	Curriculum learning objectives	Curriculum reference
	Similarity and congruence	
S2	Understand congruence and be able to identify congruent shapes	Y9 Unit 10
S3	Understand the difference between a practical demonstration and a proof	Y9 Unit 10
S3	Know that if two 2-D shapes are similar, corresponding angles are equal and corresponding sides are in the same ratio	Y9 Unit 10
S4	Apply the conditions SSS, SAS, ASA or RHS to establish the congruence of triangles	Y9 Unit 10

Level	Curriculum learning objectives	Curriculum reference
	Transformations	
P3/S1	Carry out translations, rotations and reflections	
P3/S1	Describe translations, rotations and reflections	
S2	Transform 2-D shapes using combinations of rotations, reflections and translations	Y9 Unit 10
S2	Know that translations, rotations and reflections preserve length and angle and map objects onto congruent shapes	Y9 Unit 10

Level	Curriculum learning objectives	Curriculum reference
	Circles and tangents	
S2	Know and name the parts of a circle	Y9 Unit 4
S2	Know and use the formula for the circumference of a circle	Y9 Unit 6
S2	Know and use the formula for the area of a circle	Y9 Unit 6
S3	Find the perimeter and/or area of compound shapes involving circles	Y9 Unit 6
S4	Know that the tangent at any point to a circle is perpendicular to the radius at any point	Y9 Unit 4
S4	Find the length of an arc of a circle	Y9 Unit 6
S4	Find the area of a sector of a circle	Y9 Unit 6

Level	Curriculum learning objectives	Curriculum reference
	Pythagoras and trigonometry	
S3	Know, understand and use Pythagoras's theorem in 2-D	Y9 Units 4, 14
S3	Calculate the length of a line segment using Pythagoras's theorem	Y9 Unit 4
S4	Use sine, cosine and tangent in right-angled triangles to solve problems in two dimensions	Y9 Units 10, 14

Level	Curriculum learning objectives	Curriculum reference
	Area	
P3/S1	Solve problems using perimeter	
P3/S1	Find the area of shapes made from rectangles or rectangles and triangles	
S2	Deduce and use the formulae for the areas of triangles, parallelograms and trapeziums	Y9 Unit 6
S2	Calculate the surface area of cubes and cuboids and shapes made from cuboids	Y9 Unit 6
S3	Calculate the surface area of prisms	Y9 Units 6, 14
S4	Calculate the surface area of cylinders	Y9 Units 6, 14
S2	Convert between measures of area	Y9 Unit 6
S4	Find the area of a shape following an enlargement	Y9 Unit 3

Level	Curriculum learning objectives	Curriculum reference
	Volume	
S2	Calculate the volume of cubes and cuboids and shapes made from cuboids	Y9 Unit 6
S3	Calculate the volume of prisms	Y9 Units 6, 14
S4	Calculate the volume of cylinders	Y9 Units 6, 14
S2	Convert between measures of volume	Y9 Unit 6
S4	Find the area of a shape following an enlargement	Y9 Unit 3

Level	Curriculum learning objectives	Curriculum reference
	Compound measures	
S3	Solve problems using compound measure including speed and density	Y9 Unit 6
S3	Convert simple units of compound measures	Y9 Unit 6

Level	Curriculum learning objectives	Curriculum reference
	Bounds	
S3	Identify the upper and lower bounds of a measurement	Y9 Unit 6
S4	Calculate the upper and lower bounds of an area	Y9 Unit 6
S4	Calculate the upper and lower bounds of compound measures	Y9 Unit 6

Statistics

Level	Curriculum learning objectives	Curriculum reference
	Data	
S2	Identify and interpret primary and secondary data	Y9 Units 5, 13
S3	Identify bias in a sample or questionnaire	Y9 Units 5, 13

Level	Curriculum learning objectives	Curriculum reference
	Charts and diagrams	
S2	Construct tables for discrete data	Y9 Unit 5
S2	Construct tables for continuous data	Y9 Unit 5
S2	Design and use two-way tables	Y9 Unit 5
S2	Construct stem and leaf diagrams	Y9 Unit 5
S2	Draw and interpret line graphs	Y9 Unit 5
S2	Draw and interpret pie charts	Y9 Unit 5
S2	Draw and interpret frequency diagrams and frequency polygons	Y9 Unit 5
S2	Construct and interpret scatter graphs	Y9 Unit 13
S2	Understand and use correlation	Y9 Unit 13
S3	Identify misleading graphs and statistics	Y9 Unit 13
S3	Interpret graphs and charts drawing conclusions from data interpretation	Y9 Unit 13
S3	Compare two distributions using the shape of the distribution	Y9 Unit 13
S4	Construct cumulative frequency tables	Y9 Unit 13
S4	Construct cumulative frequency graphs	Y9 Unit 13

Level	Curriculum learning objectives	Curriculum reference
	Using statistics	
P3/S1	Find the mean from an ungrouped frequency table	
P3/S1	Calculate the mean and median for small sets of discrete data	
S2	Know when to use the mean, median, mode and range for discrete data	Y9 Unit 5
S2	Compare two sets of data using an average and the range	Y9 Units 5, 13
S3	Find the modal class of a large set of data	Y9 Unit 5
S3	Estimate the mean from grouped data	Y9 Unit 13
S4	Estimate the median from grouped data	Y9 Unit 13
S4	Estimate the median, upper and lower quartiles and interquartile range of a set of grouped data using a cumulative frequency graph	Y9 Unit 13

Level	Curriculum learning objectives	Curriculum reference
	Probability	
P3/S1	Find the probabilities of equally likely outcomes	
P3/S1	Know that if the probability of an event happening is p then the probability that it will not happen is $1-p$	
P3/S1	List the outcomes when one or two events happen	
S2	Compare probabilities using fractions	Y9 Unit 9
S2	Use the language of probability when interpreting results	Y9 Unit 15
S2	Work out if a game is fair	Y9 Units 9, 15
S2	Write the probability of an experiment as $\mathrm{P}(n)$	Y9 Unit 9
S2	Identify mutually exclusive outcomes of an experiment	Y9 Unit 9
S2	Use probabilities from experimental data to predict outcomes	Y9 Units 9, 15
S2	Understand relative frequency and use relative frequency to compare experiments	Y9 Units 9, 15
S2	Find and record all the possible mutually exclusive outcomes for single and two successive events in a systematic way using tables and diagrams	Y9 Unit 15
S3	Know that the sum of the probabilities of all mutually exclusive outcomes is 1 and use this to calculate probabilities	Y9 Units 9, 15
S4	Plot and use relative frequency diagrams	Y9 Units 9, 15

Level	Curriculum learning objectives	Curriculum reference
S4	Draw and use tree diagrams	Y9 Unit 9
S4	Draw and use tree diagrams for complex independent events	Y9 Unit 15
S4	Solve problems involving probability	Y9 Unit 15
S4	Draw and use tree diagrams for events where the probability of a second event depends on the outcome of the first event	Y9 Unit 15

Assessment summary

The test is externally assessed through an examination paper lasting 1 hour and 20 minutes.

Summary of table of assessment

Test	Paper code: LMA01/01
Overview of assessment • Section A consists of 30 multiple-choice questions. • Section B consists of 50 marks of short-answer questions. • The test duration is 1 hour 20 minutes. • Questions target levels P3/S1, S2, S3 and S4.	

Levels of attainment and weightings

	% in test
P3/S1	15
S2	35
S3	35
S4	15
TOTAL	**100%**

Entering your pupils for assessment

Pupil entry

Details of how to enter pupils for this award can be found in Edexcel's *Information Manual*, copies of which are sent to all active Edexcel centres. The information can also be found on the Edexcel website: www.edexcel.com

Access arrangements and special requirements

Edexcel's policy on access arrangements and special considerations for GCE, GCSE, International GCSE, and Entry Level qualifications aims to enhance access to the qualifications for pupils with disabilities and other difficulties without compromising the assessment of skills, knowledge, understanding or competence.

Please see the Edexcel website (www.edexcel.com/sfc) for:

- the Joint Council for Qualifications policy *Access Arrangements and Special Considerations, Regulations and Guidance Relating to Students who are Eligible for Adjustments in Examinations*
- the forms to submit for requests for access arrangements and special considerations
- dates for submission of the forms.

Requests for access arrangements and special considerations must be addressed to:

Special Requirements
Edexcel
One90 High Holborn
London, UK
WC1V 7BH

Assessing your pupils

The first assessment opportunity for this test will take place in the June 2012 series and in each following June series for the lifetime of the test.

Awarding and reporting

The awarding and certification of this test will comply with the requirements of the current GCSE/GCE Code of Practice, which is published by the Office of Qualifications and Examinations Regulation (Ofqual).

The Edexcel International Award in Lower Secondary Mathematics will be graded as pass or fail and is awarded at four levels:

- P3/S1
- S2
- S3
- S4.

The first certification opportunity for the Edexcel International Award in Lower Secondary Mathematics is 2012.

Pass description

Please see *Appendix A: Levels of attainment*. To achieve an award, a pupil must demonstrate the characteristics for the level across the four attainment levels for mathematics.

Language of assessment

Assessment of this test will be available in English only. Assessment materials will be published in English only and all work must be produced in English.

Malpractice and plagiarism

For up-to-date advice on malpractice and plagiarism, please refer to the Joint Council for Qualifications *Suspected Malpractice in Examinations: Policies and Procedures* document on the JCQ website www.jcq.org.uk/

Pupil recruitment

Edexcel's access policy concerning recruitment to our qualifications and awards is that:

- they must be available to anyone who is capable of reaching the required standard
- they must be free from barriers that restrict access and progression
- equal opportunities exist for all pupils.

Prior learning

This award tests the content, knowledge and skills developed in the Edexcel International Lower Secondary Curriculum for Mathematics.

Progression

This award supports progression to the Edexcel GCSE/International GCSE in Mathematics.

Support and training

Edexcel support services

Edexcel has a wide range of support services to help you implement this test successfully.

Ask the Expert – To make it easier for you to raise a query with us online, we have merged our **Ask Edexcel** and **Ask the Expert** services.

There is now one easy-to-use web query form that will allow you to ask any question about the delivery or teaching of Edexcel qualifications. You'll get a personal response, from one of our administrative or teaching experts, sent to the email address you provide.

We'll also be doing lots of work to improve the quantity and quality of information in our FAQ database, so you'll be able find answers to many questions you might have by searching before you submit the question to us.

Examzone – The Examzone site is aimed at pupils sitting external examinations and gives information on revision, advice from examiners and guidance on results, including re-marking, resitting and progression opportunities. Further services for pupils – many of which will also be of interest to parents – will be available in the near future. Links to this site can be found on the main homepage at www.examzone.co.uk.

Training

A programme of professional development and training courses, covering various aspects of the specification and test, can be arranged by Edexcel. Full details can be obtained from our website: www.edexcel.com

Appendices

Appendix A: Levels of attainment

Attainment targets set out the knowledge, skills and understanding that pupils of different abilities and maturities are expected to have by the end of each level. The targets consist of six levels of increasing difficulty. Each level description describes the type and range of performance that pupils working at that level should characteristically demonstrate.

Level	Attainment Target 1: Using and applying mathematics
P3/S1	In order to carry through tasks and solve mathematical problems, pupils identify and obtain necessary information. They check their results, considering whether these are sensible. Pupils show understanding of situations by describing them mathematically using symbols, words and diagrams. They draw simple conclusions of their own and explain their reasoning.
S2	Pupils carry through substantial tasks and solve quite complex problems by independently breaking them down into smaller, more manageable tasks. They interpret, discuss and synthesise information presented in a variety of mathematical forms. Their writing explains and informs their use of diagrams. Pupils are beginning to give mathematical justifications.
S3	Starting from problems or contexts that have been presented to them, pupils progressively refine or extend the mathematics used to generate fuller solutions. They give a reason for their choice of mathematical presentation, explaining the features they have selected. Pupils justify their generalisations, arguments or solutions, showing some insight into the mathematical structure of the problem. They appreciate the difference between mathematical explanation and experimental evidence.
S4	Pupils develop and follow alternative approaches. They reflect on their own lines of enquiry when exploring mathematical tasks; in doing so they introduce and use a range of mathematical techniques. Pupils convey mathematical or statistical meaning through precise and consistent use of symbols that is sustained throughout the work. They examine generalisations or solutions reached in an activity, commenting constructively on the reasoning and logic or the process employed, or the results obtained, and make further progress in the activity as a result.

Level	Attainment Target 2: Number and algebra
P3/S1	Pupils use their understanding of place value to multiply and divide whole numbers and decimals by 10, 100 and 1000. They order, add and subtract negative numbers in context. They use all four operations with decimals to two places, they reduce a fraction to its simplest form by cancelling common factors and solve simple problems involving ratios and direct proportion. They calculate fractional or percentage parts of quantities and measurements using a calculator where appropriate. Pupils understand and use an appropriate non-calculator method for solving problems that involve multiplying and dividing any three digit number by any two digit number. They check their solutions by applying inverse operations or estimating using approximations. They construct, express in symbolic form and use simple formulae involving one or two operations. They use brackets appropriately. Pupils use and interpret coordinates in all four quadrants. They find the LCM and HCF of two numbers. Learners generate coordinate pairs and plot the graph of a linear function.
S2	Pupils order and approximate decimals when solving numerical problems and equations (for example, $x^3 + x = 20$), using trial and improvement methods. Pupils are aware of which number to consider as 100 per cent, or a whole, in problems involving comparisons, and use this to evaluate one number as a fraction or percentage of another. They understand and use the equivalences between fractions, decimals and percentages, and calculate using ratio in appropriate situations. They add and subtract fractions by writing them with a common denominator. When exploring number sequences, pupils find and describe in words the rule for the next term or nth term of a sequence where the rule is linear. They formulate and solve linear equations with whole number coefficients. They represent mappings expressed algebraically, and use Cartesian coordinates for graphical representation interpreting general features. Learners factorise and expand using a simple bracket.
S3	In making estimates, pupils round to one significant figure and multiply and divide mentally. They understand the effects of multiplying and dividing by numbers between 0 and 1. Pupils solve numerical problems involving multiplication and division with numbers of any size, including fractions, using a calculator efficiently and appropriately. They understand and use proportional changes, calculating the result of any proportional change using only multiplicative methods. Pupils find and describe in symbols the next term or nth term of a sequence where the rule is quadratic; they multiply two expression of the form $(x + n)$; they simplify the corresponding quadratic expressions. Pupils use algebraic and graphical methods to solve simultaneous linear equations in two variables. They solve simple inequalities. Learners use and understand standard form.

Level	Attainment Target 2: Number and algebra
S4	Pupils solve problems involving calculating with powers, roots and numbers expressed in standard form, checking for correct order of magnitude. They choose to use fractions or percentages to solve problems involving repeated proportional changes or the calculation of the original quantity given the result of a proportional change. They evaluate algebraic formulae, substituting fractions, decimals and negative number. They calculate one variable, given the other, in formulae such as $V = \pi r^2 h$. Pupils manipulate algebraic formulae, equations and expressions, finding common factors and multiplying two linear expressions. They know that $a^2 - b^2 = (a + b)(a - b)$. They solve inequalities in two variables. Pupils sketch and interpret graphs of linear, quadratic, cubic and reciprocal functions, and graphs that model real situations.

Level	Attainment Target 3: Shape, space and measures
P3/S1	When constructing models and when drawing or using shapes, pupils measure and draw angles of the nearest degree, and use language associated with angles. Pupils know the angle sum of a triangle and that of the angles at a point. They identify all the symmetries of 2-D shapes. They know the rough metric equivalents of imperial units still in daily use and use and convert one metric unit to another. They make sensible estimates of a range of measures in relation to everyday situations. Pupils understand and use the formula for the area of a rectangle. Learners begin to use simple transformations.
S2	Pupils recognise and use common 2-D representations of 3-D objects. They know and use properties of quadrilaterals in classifying different types of quadrilateral. They solve problems using angle and symmetry properties of polygons and the angular properties of intersecting and parallel lines, and explain these properties. They devise instructions for a computer to generate and transform shapes and paths. They understand and use appropriate formulae for finding circumferences and areas of circles, areas of plane rectilinear figures and volumes of cuboids when solving problems. They enlarge shapes by a positive whole number scale factor.
S3	Pupils understand and apply Pythagoras' theorem when solving problems in two dimensions. They calculate lengths, areas and volumes in plane shapes and right prisms. Pupils enlarge shapes by a fractional scale factor, and appreciate the similarity of the resulting shapes. They determine the locus of an object moving according to a rule. Pupils appreciate the imprecision of measurement and recognise that a measurement given to the nearest whole number may be inaccurate by up to one half in either direction. They understand and use compound measures, such as speed.
S4	Pupils understand and use congruence and mathematical similarity. They use sine, cosine and tangent in right-angled triangles when solving problems in two dimensions. They distinguish between formulae for perimeter, area and volume, by considering dimensions. Learners find the length of an arc and the area of a sector.

Level	Attainment Target 4: Handling data
P3/S1	Pupils understand and use the mean of discrete data. They compare two simple distributions, using the range and one of the mode, media or mean. They interpret graphs and diagrams, including pie charts, and draw conclusions. They understand and use the probability scale from 0 to 1. Pupils find and justify probabilities, and approximations to these, by selecting and using methods based on equally likely outcomes and experimental evidence, as appropriate. They understand that different outcomes may result from repeating an experiment.
S2	Pupils collect and record continuous data, choosing appropriate equal class intervals over a sensible range to create frequency tables. They construct and interpret frequency diagrams. They construct pie charts. Pupils draw conclusions from scatter diagrams, and have a basic understanding of correlation. When dealing with a combination of two experiments, pupils identify all the outcomes, using diagrammatic, tabular or other forms of communication. In solving problems, they use their knowledge that the total probability of all the mutually exclusive outcomes of an experiment is 1.
S3	Pupils specify hypotheses and test them by designing and using appropriate methods that take account of variability or bias. They determine the modal class and estimate the mean, median and range of sets of grouped data, selecting the statistic most appropriate to their line of enquiry. They use measures of average and range, with associated frequency polygons, as appropriate, to compare distributions and make inferences. They draw a line of best fit on a scatter diagram, by inspection. Pupils understand relative frequency as an estimate of probability and use this to compare outcomes of experiments.
S4	Pupils interpret and construct cumulative frequency tables and diagrams, using the upper boundary of the class interval. They estimate the median and interquartile range and use these to compare distributions and make inferences. They understand how to calculate the probability of a compound event and use this in solving problems. Learners construct and use tree diagrams.

Appendix B: Codes

Type of code	Use of code	Code number
Cash-in codes	The cash-in code is used as an entry code to aggregate the pupil's scores to obtain the overall grade for the test. Centres will need to use the entry codes only when entering pupils for their test.	LMA01
Entry codes	The entry codes are used to: • enter a pupil for assessment • aggregate the pupil's paper scores to obtain the overall grade for the test.	Please refer to the Edexcel *Information Manual*, available on the Edexcel website.

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