edexcel

INTERNATIONAL GCSE

Mathematics (Specification B) (9-1)

SPECIFICATION

Pearson Edexcel International GCSE in Mathematics (Specification B) (4MB1)

For first teaching September 2016
First examination June 2018

Pearson

edexcel

INTERNATIONAL GCSE

Mathematics (Specification B)

SPECIFICATION

Pearson Edexcel International GCSE in Mathematics (Specification B) (4MB1)

For first teaching in September 2016

First examination June 2018

Pearson

Edexcel, BTEC and LCCI qualifications

Edexcel, BTEC and LCCI qualifications are awarded by Pearson, the UK's largest awarding body offering academic and vocational qualifications that are globally recognised and benchmarked. For further information, please visit our qualification websites at qualifications.pearson.com. Alternatively, you can get in touch with us using the details on our contact us page at qualifications.pearson.com/contactus

About Pearson

Pearson is the world's leading learning company, with 40,000 employees in more than 70 countries working to help people of all ages to make measurable progress in their lives through learning. We put the learner at the centre of everything we do, because wherever learning flourishes, so do people. Find out more about how we can help you and your learners at qualifications.pearson.com

Acknowledgements

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

References to third party material made in this specification are made in good faith. Pearson does not endorse, approve or accept responsibility for the content of materials, which may be subject to change, or any opinions expressed therein. (Material may include textbooks, journals, magazines and other publications and websites.)

All information in this specification is correct at time of going to publication.

ISBN 978 1 446 93111 0

Contents

1 About this specification

The Pearson Edexcel International GCSE in **Mathematics (Specification B)** is part of a suite of International GCSE qualifications offered by Pearson.

This qualification is not accredited or regulated by any UK regulatory body.

This specification includes the following key features.

Structure: the Pearson Edexcel International GCSE in Mathematics (Specification B) is a linear qualification. It consists of two examinations available at Higher Tier only (targeted at grades 9–4, with 3 allowed). Both examinations must be taken in the same series at the end of the course of study.

Content: relevant, engaging and of equivalent standard to the Higher Tier content of Pearson's regulated GCSE in Mathematics.

Assessment: designed to be accessible to students from grades 9–4 using varying question-style approaches with short- and long-type questions.

Approach: a solid basis for students wishing to progress to Edexcel AS and Advanced GCE Level, or equivalent qualifications.

Specification updates

This specification is Issue 1 and is valid for the Pearson Edexcel International GCSE in Mathematics (Specification B) examination from 2018. If there are any significant changes to the specification Pearson will inform centres to let them know. Changes will also be posted on our website.

For more information please visit qualifications.pearson.com

Using this specification

This specification has been designed to give guidance to teachers and encourage effective delivery of the qualification. The following information will help you get the most out of the content and guidance.

Compulsory content: arranged according to topic headings, as summarised in *Section 2: Mathematics (Specification B) content*.

Examples: we have included examples to exemplify content statements to support teaching and learning. It is important to note that these examples are for illustrative purposes only and centres can use other examples. We have included examples that are easily understood and recognised by international centres.

Qualification aims and objectives

The Pearson Edexcel International GCSE in Mathematics (Specification B) qualification enables students to:

- develop their knowledge and understanding of mathematical concepts and techniques
- acquire a foundation of mathematical skills for further study in the subject or related areas
- enjoy using and applying mathematical techniques and concepts, and become confident in using mathematics to solve problems
- appreciate the importance of mathematics in society, employment and study.

Why choose Edexcel qualifications?

Pearson – the world's largest education company

Edexcel academic qualifications are from Pearson, the UK's largest awarding organisation. With over 3.4 million students studying our academic and vocational qualifications worldwide, we offer internationally recognised qualifications to schools, colleges and employers globally.

Pearson is recognised as the world's largest education company, allowing us to drive innovation and provide comprehensive support for Edexcel students to acquire the knowledge and skills they need for progression in study, work and life.

A heritage you can trust

The background to Pearson becoming the UK's largest awarding organisation began in 1836, when a royal charter gave the University of London its first powers to conduct exams and confer degrees on its students. With over 150 years of international education experience, Edexcel qualifications have firm academic foundations, built on the traditions and rigour associated with Britain's educational system.

Results you can trust

Pearson's leading online marking technology has been shown to produce exceptionally reliable results, demonstrating that at every stage, Edexcel qualifications maintain the highest standards.

Developed to Pearson's world-class qualifications standards

Pearson's world-class standards mean that all Edexcel qualifications are developed to be rigorous, demanding, inclusive and empowering. We work collaboratively with a panel of educational thought-leaders and assessment experts, to ensure that Edexcel qualifications are globally relevant, represent world-class best practice and maintain a consistent standard.

For more information on the World Class Qualifications process and principles please go to *Appendix 2* or visit our website: uk.pearson.com/world-class-qualifications

Why choose Pearson Edexcel International GCSE in Mathematics (Specification B)?

We've listened to feedback from all parts of the International school and UK Independent school subject community, including a large number of teachers. We've made changes that will engage students and develop their skills to progress to further study of Mathematics and a wide range of other subjects. Our content and assessment approach has been designed to meet students' needs and sits within our wider subject offer for Mathematics.

At Edexcel we offer both Specification A and Specification B International GCSE qualifications for Mathematics – these have been designed to meet different student needs. The content and assessment approach for this Specification B qualification has been designed to meet student needs in the following ways, and sits within our wider subject offer for Mathematics.

Clear and straightforward question papers – Our question papers are clear and designed specifically to target the higher tier (grades 9–4 with grade 3 allowed) making them accessible for students in this ability range. Our mark schemes are straightforward, so that the assessment requirements are clear.

Broaden and deepen students' skills – We have designed the International GCSE to extend students' knowledge by broadening and deepening skills, for example:

- students develop problem-solving skills by translating problems in mathematical or non-mathematical contexts
- students will develop reasoning skills through exercises such as presenting arguments and proofs, and making deductions and drawing conclusions from mathematical information.

Comparable to GCSE – We have designed our International GCSE qualification to be of equivalent standard to Pearson's regulated GCSE qualification. This ensures that International GCSEs are recognised globally and provide learners with the same progression routes.

Supports progression to A Level – Our qualifications enable successful progression to A Level and beyond. Through our world-class qualification development process, we have consulted with International A Level and GCE A Level teachers, as well as university professors to validate the appropriacy of this qualification including the content, skills and assessment structure.

Centres wishing to teach mathematics using a different approach to meet their students' needs can use our Pearson Edexcel International GCSE in Mathematics (Specification A) or extend students' study with Pearson Edexcel International GCSE in Further Pure Mathematics. More information about all of our qualifications can be found on our Edexcel International GCSE pages at: qualifications.pearson.com

Supporting you in planning and implementing this qualification

Planning

- Our *Getting Started Guide* gives you an overview of the Pearson Edexcel International GCSE in Mathematics (Specification B) to help you understand the changes to content and assessment, and to help you understand what these changes mean for you and your students.
- We will provide you with a course planner and editable schemes of work.
- Our mapping documents highlight key differences between the new and 2009 legacy qualification.

Teaching and learning

- Our skills maps will highlight skills areas that are naturally developed through the study of mathematics, showing connections between areas and opportunities for further development.
- Print and digital learning and teaching resources – promotes any time, any place learning to improve student motivation and encourage new ways of working.

Preparing for exams

We will also provide a range of resources to help you prepare your students for the assessments, including:

- specimen papers to support formative assessments and mock exams
- examiner commentaries following each examination series.

ResultsPlus

ResultsPlus provides the most detailed analysis available of you students' exam performance. It can help you identify the topics and skills where further learning would benefit your students.

examWizard

A free online resource designed to support students and teachers with exam preparation and assessment.

Training events

In addition to online training, we host a series of training events each year for teachers to deepen their understanding of our qualifications.

Get help and support

Our subject advisor service will ensure you receive help and guidance from us. You can sign up to receive the Edexcel newsletter to keep up to date with qualification updates and product and service news.

Qualification at a glance

The Pearson Edexcel International GCSE in Mathematics (Specification B) comprises of two externally assessed papers.

This specification is offered through a single tier.

Questions are targeted at grades in the range 9–4, with 3 allowed.

Students whose level of achievement is below the minimum judged by Pearson to be of sufficient standard will receive an unclassified U result.

Paper overview

Paper 1	*Component/paper code 4MB1/01
• Externally assessed • Availability: January and June • First assessment: June 2018	Paper is $33\frac{1}{3}$% of the total International GCSE
Content summary • Number and algebra • Geometry and trigonometry • Statistics and probability	
Assessment • Assessed through a 1 hour and 30 minute examination set and marked by Pearson. • The total number of marks is 100. • The paper will consist of around 26–30 questions with varying mark allocations per question, which will be stated on the paper. • The paper will contain questions from any part of the specification content, and the solution of any questions may require knowledge of more than one section of the specification content. • The paper will have approximately 40% of the marks distributed evenly over grades 4 and 5 and approximately 60% of the marks distributed evenly over grades 6, 7, 8 and 9. • A calculator may be used in the examination (please see *page 24* for further information).	

Paper 2	*Component/paper code 4MB1/02
• Externally assessed • Availability: January and June • First assessment: June 2018	Paper is $66\frac{2}{3}$ % of the total International GCSE
Content summary • Number and algebra • Geometry and trigonometry • Statistics and probability	
Assessment • Assessed through a 2 hour and 30 minute examination set and marked by Pearson. • The total number of marks is 100. • The paper will consist of around 11–12 questions with varying mark allocations per question, which will be stated on the paper. • The paper will contain questions from any part of the specification content, and the solution of any questions may require knowledge of more than one section of the specification content. • The paper will have approximately 40% of the marks distributed evenly over grades 4 and 5 and approximately 60% of the marks distributed evenly over grades 6, 7, 8 and 9. • Where a question on Paper 2 requires the use of a formula from the formulae sheet (*Appendix 4*), that formula will be given at the end of the question. • A calculator may be used in the examinations (please see *page 24* for further information).	

* See *Appendix 1* for a description of this code and all the other codes relevant to this qualification.

2 Mathematics (Specification B) content

Content

Externally assessed

Description

The Pearson Edexcel International GCSE in Mathematics (Specification B) requires students to demonstrate application and understanding of the following.

Number and algebra

- Use numerical skills in a purely mathematical way and in real-life situations.
- Set theory and notation.
- Use letters as equivalent to numbers and as variables.
- Understand the distinction between expressions, equations and formulae.
- Use algebra to set up and solve problems.
- Demonstrate techniques of algebraic manipulation.
- Use functions of one variable.
- Construct and interpret graphs.
- Use matrices.

Geometry and trigonometry

- Use properties of angles.
- Understand a range of transformations in a plane.
- Apply the metric system to real-life problems.
- Understand ideas of space and shape.
- Use rulers, compasses and protractors appropriately to construct shapes.
- Use vectors and vector notation.
- Use trigonometry in two– and three–dimensional problems.

Statistics and probability

- Understand the basic ideas of statistical techniques.
- Use basic ideas of probability.

Students should be able to demonstrate **problem-solving skills** by translating problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes.

Students should be able to demonstrate **mathematical reasoning skills** by:

- making deductions and drawing conclusions from mathematical information
- constructing chains of reasoning
- presenting arguments and proofs

interpreting and communicating information accurately.

Assessment information

Two written papers assessed through a 1 hour and 30 minute examination (Paper 1) and a 2 hour and 30 minute examination (Paper 2), set and marked by Pearson.

The total number of marks for each paper is 100.

Paper 1 will consist of around 26–30 questions and Paper 2 will consist of around 11–12 questions with varying mark allocations per question, which will be stated on each paper.

Both papers will contain questions from any part of the specification content, and the solution of any questions may require knowledge of more than one section of the specification content.

Each paper will have approximately 40% of the marks distributed evenly over grades 4 and 5 and approximately 60% of the marks distributed evenly over grades 6, 7, 8 and 9.

Diagrams will not necessarily be drawn to scale and measurements should not be taken from diagrams unless instructions to this effect are given.

Each student may be required to use mathematical instruments, e.g. pair of compasses, ruler, protractor.

Where a question on Paper 2 requires the use of a formula from the formulae sheet (*Appendix 4*), that formula will be given at the end of the question.

Tracing paper may be used in the examinations.

A calculator may be used in the examinations (please see *page 24* for further information).

Questions will be set in SI units (international system of units).

1 Number

What students need to learn	Notes
A The ordinary processes of number manipulation	The 'four operations' and combination of them by use of brackets
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	Students should understand what surds represent and their use for exact answers Manipulation will be simple For example: $5\sqrt{3}+2\sqrt{3}=7\sqrt{3}$ $\sqrt{48}=4\sqrt{3}$ $10\times\frac{1}{\sqrt{5}}=2\sqrt{5}$
E Rationalising the denominator	$\frac{15}{\sqrt{7}-2}$
F Natural numbers, integers and rational and irrational numbers	Recognitions of these sets Proofs of irrationality will not be required
G Weights, measures and money	Carry out calculations using standard units of mass, length, area, volume and capacity, time and average speed Metric and SI units only Carry out calculations using money, including converting between currencies (where conversion is required, the rate of conversion will always be given)

What students need to learn	Notes
H Fractions, decimals, ratio, proportion and percentage	Students will be expected to interchange any of these methods of fractional representation and to select the most appropriate to given situations Ratios and proportions are required in, at most, three proportions, i.e. $a:b$ or $a:b:c$ Students will be expected to use the four operations with fractions and decimals, and use percentages, ratio and/or proportion in problems
I Expressing numbers to a given degree of accuracy	Correction to a given number of decimal places or significant figures
J Solve problems using upper and lower bounds where values are given to a degree of accuracy	
K Numbers in standard form	$a \times 10^n$, where n is an integer and $1 \leqslant a < 10$ Solve problems involving standard form Questions may involve the application of any of the techniques listed in **1** to problems of everyday personal, domestic or community life

2 Sets

What students need to learn	Notes
A The idea of a set	
B Set language and notation	Questions may be set involving these ideas in the abstract or derived from practical situations
C Union and intersection of sets	Understand sets defined in algebraic terms
D Number of elements in a set	Use the notation $\mathrm{n}(A)$
E Complementary sets	Use the notation A'
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

What students need to learn	Notes
A The basic processes of algebra	Collecting like terms, using the four operations, the rules of indices, with integers and fractional powers
B The construction, interpretation and use of formulae and their manipulation	To include change of subject of a formula and substitution
C The factorisation of simple algebraic expressions	
D Use of the factor theorem	Including application to cubics and factors of the form $(ax+b)$ or $(ax-b)$
E Algebraic division of a cubic by a linear factor	
F The manipulation of simple algebraic fractions, the denominators being numerical, linear or quadratic	Simple cases involving sum, difference, product and quotient of algebraic fractions
G Solution of equations of 1st, 2nd and 3rd degree containing one unknown quantity	Solution of quadratics to include solution by factorisation, by graph, by completing the square or by formula Problems that result in the solution of such equations may also be set
H Solution of linear simultaneous equations in two unknowns	Simple questions may be set requiring the graphical solution of simultaneous linear equations
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	Simple questions may be set requiring the graphical solution of simultaneous linear inequalities No questions will be set on linear programming
K Solve quadratic inequalities in one unknown and represent the solution set on a number line	
L The idea of a sequence	Being able to recognise sequences with a common difference or common integer sequences, and to continue a given sequence

4 Functions

What students need to learn	Notes
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 $\mathrm{f}(x) = \ldots$ and $\mathrm{f}: x \mapsto \ldots$	
D Domain and range of a function	Questions will not be set on continuity, but students will be expected to recognise when parts of the domain need to be excluded (e.g. $x = 0$ must be excluded from the domain of the function f where $\mathrm{f}(x) = \frac{1}{x}$)
E Composite functions	'fg' will mean 'do g first then f'
F Inverse functions	Finding the inverse of a function
G Variation, direct and indirect proportion	To include only the following: $y \propto x,\ y \propto \frac{1}{x}$ $y \propto x^2,\ y \propto \frac{1}{x^2}$ $y \propto x^3,\ y \propto \frac{1}{x^3}$ $y \propto \sqrt{x},\ y \propto \frac{1}{\sqrt{x}}$
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: $y = Ax^3 + Bx^2 + Cx + D + \frac{E}{x} + \frac{F}{x^2}$ in which the constants are numerical and at least three of them are zero	Students will be expected to draw and interpret graphs from given equations Use of the intersection of two curves (graphs) to solve equations
K The gradients of graphs above by drawing	Students will be expected to draw a reasonable tangent to the graph at a named point and to construct an appropriate right-angled triangle from which to calculate the gradient

What students need to learn	Notes
L Differentiation of integer powers of x	Use of $\frac{\mathrm{d}y}{\mathrm{d}x}$ notation
M Determination of gradients, rates of change, maxima and minima, stationary points and turning points	Students will either be required to differentiate or use graphical methods to arrive at solutions and relate their calculations to their graphs and vice versa
N Applications to linear kinematics and to other simple practical problems	This includes the drawing and interpretation of distance/time and speed/time graphs, and other graphs of a similar nature Students need to be able to understand the relationship between displacement or distance, velocity and speed, and acceleration, for example: $\frac{\mathrm{d}s}{\mathrm{d}t} = v$ and $\frac{\mathrm{d}v}{\mathrm{d}t} = a$

5 Matrices

What students need to learn	Notes
A Representation of data by a matrix	
B Addition and multiplication of matrices	An understanding of ideas of how to perform row and column multiplication, of order not more than 3×3, for these operations will be expected
C Multiplication of a matrix by a scalar	
D Unit (identity) matrix and zero (null) matrix	Of order not more than 3×3
E Determinants and inverses of non-singular 2×2 matrices	Knowledge of singular matrices is not required
F Transformations of the plane associated with 2×2 matrices	Transformations include: Reflections in $x = 0, y = 0$ and $y = \pm x$ Rotations about the origin Enlargements with centre at the origin
G Combination of transformations	The matrix $\mathbf{AB}$ represents the transformation represented by $\mathbf{B}$ followed by the transformation represented by $\mathbf{A}$

6 Geometry

What students need to learn	Notes
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 ofsymmetry 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

What students need to learn	Notes
A Length, area, and volume	
B Mensuration of two-dimensional shapes, rectangle, parallelogram, trapezium, triangle, circle	Straightforward calculations, where appropriate, of areas of the shapes mentioned and also of two-dimensional shapes that can be divided into a collection of such shapes (e.g. trapezia, polygons)
C Mensuration of three-dimensional shapes, right circular cylinder, right circular cone and sphere, cuboid, pyramid, prism	Straightforward calculations, where appropriate, of volumes of the shapes mentioned and also of three-dimensional shapes which can be divided into a collection of such shapes (e.g. cone, hemisphere)
D Length of an arc, area of a sector of a circle	Radian measure is excluded

8 Vectors and transformation geometry

What students need to learn	Notes
A Scalar and vector quantities	Vectors will be in two dimensions only
B Understand and use vector notation	The notations $\overrightarrow{OA}$ and $\mathbf{a}$ will be used, as will column vectors
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	To include the finding of a matrix for a given transformation of the plane, using $\begin{pmatrix}1\\0\end{pmatrix}$ and $\begin{pmatrix}0\\1\end{pmatrix}$ These transformations will be those for which the origin is unchanged

9 Trigonometry

What students need to learn	Notes
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	Use of the sine and cosine rule Area of a triangle $=\frac{1}{2}ab\sin C$ Questions on latitude and longitude will not be set Calculations of the angle between two planes, or of the angle between a straight line and a plane will not be set
C Angles of elevation and depression	Angles will be given in degrees and decimals of a degree
D Bearings	The normal convention of bearings being measured clockwise will be adopted

10 Statistics and probability

What students need to learn	Notes
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	Questions involving weighted or moving means will not be set
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	Knowing that when A and B are mutually exclusive events, $\mathrm{P}(A \text{ or } B) = \mathrm{P}(A) + \mathrm{P}(B)$
G Use of product rule for two or more independent events	Knowing that when A and B are independent events, $\mathrm{P}(A \text{ and } B) = \mathrm{P}(A) \times \mathrm{P}(B)$
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 $\mathrm{P}(A\|B)$ will not be used
K Understand and use the term 'expected frequency'	

3 Assessment information

Assessment requirements

Paper number	Level	Assessment information	Number of marks allocated in the paper
Paper 1	Higher	Assessed through a 1 hour and 30 minute examination set and marked by Pearson. The paper is weighted at $33\frac{1}{3}$ % of the qualification, targeted at grades 9–4 with 3 allowed.	100
Paper 2	Higher	Assessed through a 2 hour and 30 minute examination set and marked by Pearson. The paper is weighted at $66\frac{2}{3}$ % of the qualification, targeted at grades 9–4 with 3 allowed.	100

Calculators

Students will be expected to have access to a suitable electronic calculator for all examination papers. The electronic calculator to be used should have these functions as a minimum:

- $+, -, \times, \div, x^2, \sqrt{x}$, memory, brackets, $x^y, x^{\frac{1}{y}}, \overline{x}, \sum x, \sum fx$, 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.

Assessment objectives and weightings

		% in International GCSE
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 • matrices.	57–63%
AO2	Demonstrate knowledge, understanding and skills in shape, space and measures: • geometry and trigonometry • vectors and transformation geometry.	27–33%
AO3	Demonstrate knowledge, understanding and skills in handling data: • statistics • probability.	7–13%
	TOTAL	**100%**

Relationship of assessment objectives to units

Unit number	Assessment objective		
	AO1	**AO2**	**AO3**
Papers 1	19–21%	9–11%	2.33–4.33%
Papers 2	38–42%	18–22%	4.67–8.67%
Total for International GCSE	57–63%	27–33%	7–13%

All components will be available for assessment from June 2018.

Relationship of problem-solving and mathematical reasoning skills to papers.

	Problem solving	Mathematical Reasoning
Paper 1	30%	20%
Paper 2	30%	20%

4 Administration and general information

Entries

Details of how to enter students for the examinations for this qualification can be found in our *International Information Manual*. A copy is made available to all examinations officers and is available on our website.

Students should be advised that, if they take two qualifications in the same subject, colleges, universities and employers are very likely to take the view that they have achieved only one of the two GCSEs/International GCSEs. Students or their advisers who have any doubts about subject combinations should check with the institution to which they wish to progress before embarking on their programmes.

Access arrangements, reasonable adjustments, special consideration and malpractice

Equality and fairness are central to our work. Our equality policy requires all students to have equal opportunity to access our qualifications and assessments, and our qualifications to be awarded in a way that is fair to every student.

We are committed to making sure that:

- students with a protected characteristic (as defined by the UK Equality Act 2010) are not, when they are undertaking one of our qualifications, disadvantaged in comparison to students who do not share that characteristic
- all students achieve the recognition they deserve for undertaking a qualification and that this achievement can be compared fairly to the achievement of their peers.

Language of assessment

Assessment of this qualification will only be available in English. All student work must be in English.

We recommend that students are able to read and write in English at level B2 of the Common European Framework of Reference for Languages.

Access arrangements

Access arrangements are agreed before an assessment. They allow students with special educational needs, disabilities or temporary injuries to:

- access the assessment
- show what they know and can do without changing the demands of the assessment.

The intention behind an access arrangement is to meet the particular needs of an individual student with a disability without affecting the integrity of the assessment. Access arrangements are the principal way in which awarding bodies comply with the duty under the UK Equality Act 2010 to make 'reasonable adjustments'.

Access arrangements should always be processed at the start of the course. Students will then know what is available and have the access arrangement(s) in place for assessment.

Reasonable adjustments

The UK Equality Act 2010 requires an awarding organisation to make reasonable adjustments where a student with a disability would be at a substantial disadvantage in undertaking an assessment. The awarding organisation is required to take reasonable steps to overcome that disadvantage.

A reasonable adjustment for a particular student may be unique to that individual and therefore might not be in the list of available access arrangements.

Whether an adjustment will be considered reasonable will depend on a number of factors, including:

- the needs of the student with the disability
- the effectiveness of the adjustment
- the cost of the adjustment; and
- the likely impact of the adjustment on the student with the disability and other students.

An adjustment will not be approved if it involves unreasonable costs to the awarding organisation, time frames or affects the security or integrity of the assessment. This is because the adjustment is not 'reasonable'.

Special consideration

Special consideration is a post-examination adjustment to a student's mark or grade to reflect temporary injury, illness or other indisposition at the time of the examination/ assessment, which has had, or is reasonably likely to have had, a material effect on a candidate's ability to take an assessment or demonstrate their level of attainment in an assessment.

Further information

Please see our website for further information about how to apply for access arrangements and special consideration.

For further information about access arrangements, reasonable adjustments and special consideration please refer to the JCQ website: www.jcq.org.uk

Malpractice

Candidate malpractice

Candidate malpractice refers to any act by a candidate that compromises or seeks to compromise the process of assessment or that undermines the integrity of the qualifications or the validity of results/certificates.

Candidate malpractice in examinations **must** be reported to Pearson using a *JCQ Form* M1 (available at www.jcq.org.uk/exams-office/malpractice). The form can be emailed to pqsmalpractice@pearson.com or posted to: Investigations Team, Pearson,

190 High Holborn, London, WC1V 7BH. Please provide as much information and supporting documentation as possible. Note that the final decision regarding appropriate sanctions lies with Pearson.

Failure to report malpractice constitutes staff or centre malpractice.

Staff/centre malpractice

Staff and centre malpractice includes both deliberate malpractice and maladministration of our qualifications. As with candidate malpractice, staff and centre malpractice is any act that compromises or seeks to compromise the process of assessment or that undermines the integrity of the qualifications or the validity of results/certificates.

All cases of suspected staff malpractice and maladministration **must** be reported immediately, before any investigation is undertaken by the centre, to Pearson on a *JCQ Form M2(a)* (available at www.jcq.org.uk/exams-office/malpractice).

The form, supporting documentation and as much information as possible can be emailed to pqsmalpractice@pearson.com or posted to: Investigations Team, Pearson, 190 High Holborn, London, WC1V 7BH. Note that the final decision regarding appropriate sanctions lies with Pearson.

Failure to report malpractice itself constitutes malpractice.

More-detailed guidance on malpractice can be found in the latest version of the document *JCQ General and vocational qualifications: Suspected Malpractice in Examinations and Assessments,* available at www.jcq.org.uk/exams-office/malpractice

Awarding and reporting

The International GCSE qualification will be graded and certificated on a six-grade scale from 9 to 4, with 3 allowed using the total subject mark where 9 is the highest grade. Individual components are not graded. The first certification opportunity for the Pearson Edexcel International GCSE in Mathematics (Specification B) will be in June 2018. Students whose level of achievement is below the minimum judged by Pearson to be of sufficient standard to be recorded on a certificate will receive an unclassified U result.

Student recruitment and progression

Pearson's policy concerning recruitment to our qualifications 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 students.

Prior learning and other requirements

The qualification builds on the content, knowledge and skills developed in the Key Stage 3 Programme of Study (ages 11–14) or international equivalences for Mathematics.

Progression

Students can progress from this qualification to:

- the Pearson Edexcel International GCSE in Further Pure Mathematics
- the GCE Advanced Subsidiary (AS) and Advanced Level in Mathematics, Further Mathematics and Pure Mathematics
- the International Advanced Subsidiary (AS) and Advanced Level in Mathematics, Further Mathematics and Pure Mathematics
- other equivalent, Level 3 Mathematics qualifications
- further study in other areas where mathematics is required
- other further training or employment where numerate skills and knowledge are required.

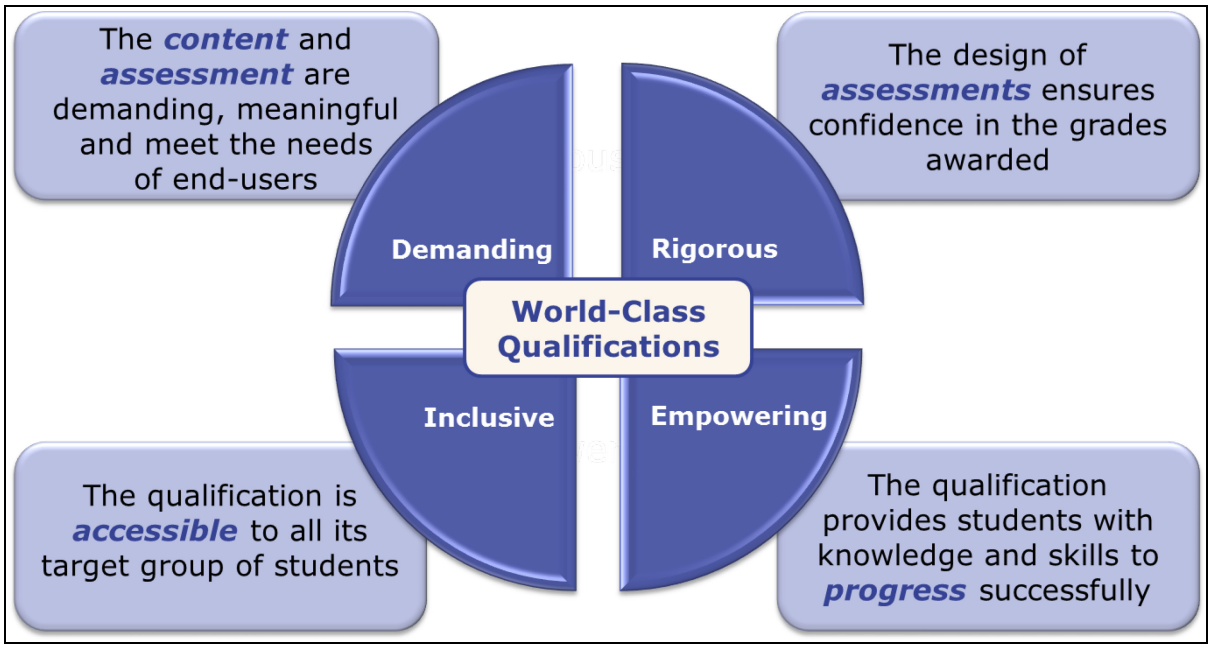
Appendices

Appendix 1: Codes

Type of code	Use of code	Code
Subject codes	The subject code is used by centres to enter students for a qualification.	Pearson Edexcel International GCSE Mathematics (Specification B): 4MB1
Paper codes	These codes are provided for information. Students need to be entered for individual papers.	Paper 1: 4MB1/01 Paper 2: 4MB1/02

Appendix 2: Pearson World Class Qualification Design Principles

Pearson's world-class qualification design principles mean that all Edexcel qualifications are developed to be **rigorous, demanding, inclusive and empowering**.



We work collaboratively to gain approval from an external panel of educational thought-leaders and assessment experts from across the globe. This is to ensure that Edexcel qualifications are globally relevant, represent world-class best practice in qualification and assessment design, maintain a consistent standard and support learner progression in today's fast changing world.

Pearson's Expert Panel for World-class Qualifications is chaired by Sir Michael Barber, a leading authority on education systems and reform. He is joined by a wide range of key influencers with expertise in education and employability.

"I'm excited to be in a position to work with the global leaders in curriculum and assessment to take a fresh look at what young people need to know and be able to do in the 21st century, and to consider how we can give them the opportunity to access that sort of education." Sir Michael Barber.

Endorsement from Pearson's Expert Panel for World-class Qualifications for International GCSE development processes

"We were chosen, either because of our expertise in the UK education system, or because of our experience in reforming qualifications in other systems around the world as diverse as Singapore, Hong Kong, Australia and a number of countries across Europe.

We have guided Pearson through what we judge to be a rigorous world-class qualification development process that has included:

- Extensive international comparability of subject content against the highest-performing jurisdictions in the world
- Benchmarking assessments against UK and overseas providers to ensure that they are at the right level of demand

- Establishing External Subject Advisory Groups, drawing on independent subject-specific expertise to challenge and validate our qualifications

Importantly, we have worked to ensure that the content and learning is future oriented, and that the design has been guided by Pearson's Efficacy Framework. This is a structured, evidence-based process which means that learner outcomes have been at the heart of this development throughout.

We understand that ultimately it is excellent teaching that is the key factor to a learner's success in education but as a result of our work as a panel we are confident that we have supported the development of Edexcel International GCSE qualifications that are outstanding for their coherence, thoroughness and attention to detail and can be regarded as representing world-class best practice."

Sir Michael Barber (Chair) Chief Education Advisor, Pearson plc	**Professor Sing Kong Lee** Professor, National Institute of Education in Singapore
Dr Peter Hill Former Chief Executive ACARA	**Bahram Bekhradnia** President, Higher Education Policy Institute
Professor Jonathan Osborne Stanford University	**Dame Sally Coates** Director of Academies (South), United Learning Trust
Professor Dr Ursula Renold Federal Institute of Technology, Switzerland	**Professor Bob Schwartz** Harvard Graduate School of Education
Professor Janice Kay Provost, University of Exeter	**Jane Beine** Head of Partner Development, John Lewis Partnership
Jason Holt CEO, Holts Group	

Appendix 3: Transferable skills

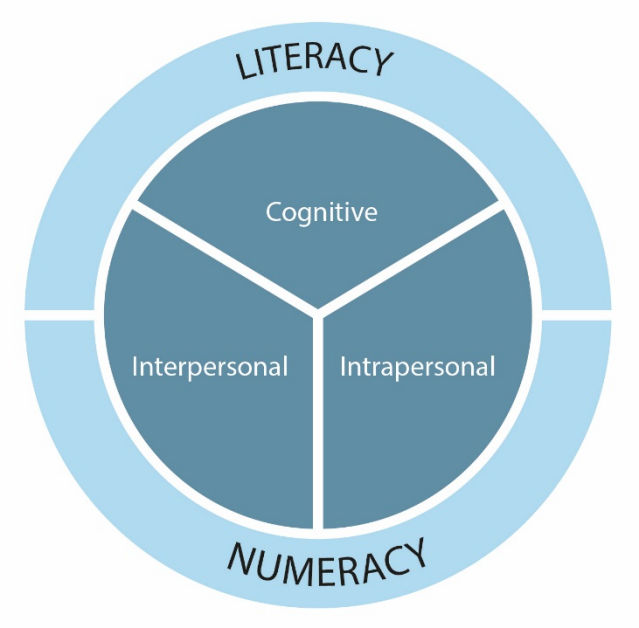
The need for transferable skills

In recent years, higher education institutions and employers have consistently flagged the need for students to develop a range of transferable skills to enable them to respond with confidence to the demands of undergraduate study and the world of work.

The Organisation for Economic Co-operation and Development (OECD) defines skills, or competencies, as 'the bundle of knowledge, attributes and capacities that can be learned and that enable individuals to successfully and consistently perform an activity or task and can be built upon and extended through learning.'[1]

To support the design of our qualifications, the Pearson Research Team selected and evaluated seven global 21st-century skills frameworks. Following on from this process, we identified the National Research Council's (NRC) framework [2] as the most evidence-based and robust skills framework, and have used this as a basis for our adapted skills framework.

The framework includes cognitive, intrapersonal skills and interpersonal skills.



The skills have been interpreted for this specification to ensure they are appropriate for the subject. All of the skills listed are evident or accessible in the teaching, learning and/or assessment of the qualification. Some skills are directly assessed. Pearson materials will support you in identifying these skills and developing these skills in students.

The table overleaf sets out the framework and gives an indication of the skills that can be found in the Pearson Edexcel International GCSE in Mathematics (Specification B) and indicates the interpretation of the skill in this area. A full subject interpretation of each skill, with mapping to show opportunities for students' development is provided on the subject pages of our website: qualifications.pearson.com

---

[1] OECD (2012), Better Skills, Better Jobs, Better Lives (2012): http://skills.oecd.org/documents/OECDSkillsStrategyFINALENG.pdf

[2] Koenig, J. A. (2011) Assessing 21st Century Skills: Summary of a Workshop, National Research Council

Cognitive skills	Cognitive processes and strategies:	• Critical thinking • Problem solving • Analysis • Reasoning • Interpretation • Decision making • Adaptive learning • Executive function
	Creativity:	• Creativity • Innovation
Intrapersonal skills	Intellectual openness:	• Adaptability • Personal and social responsibility • Continuous learning • Intellectual interest and curiosity
	Work ethic/ conscientiousness:	• Initiative • Self-direction • Responsibility • Perseverance • Productivity • Self-regulation (metacognition, forethought, reflection) • Ethics • Integrity
	Positive core self evaluation:	• Self-monitoring/self-evaluation/self-reinforcement
Interpersonal skills	Teamwork and collaboration:	• Communication • Collaboration • Teamwork • Co-operation • Interpersonal skills
	Leadership:	• Leadership • Responsibility • Assertive communication • Self-presentation

Appendix 4: Formulae sheet

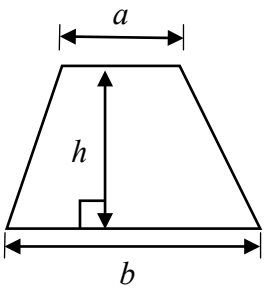
Sum of interior angles of polygon
$(2n-4)$ right angles

The quadratic equation

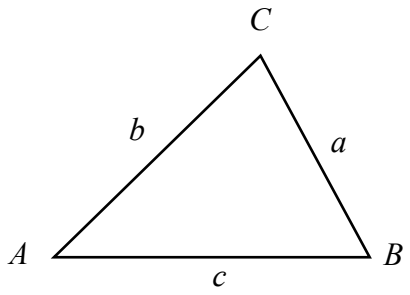
The solutions of $ax^2+bx+c=0$ where $a \neq 0$ are given by:

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

Area of trapezium $=\frac{1}{2}(a+b)h$



Trigonometry



In any triangle *ABC*

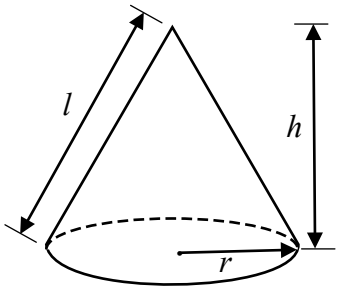
Sine Rule $\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$

Cosine Rule $a^2=b^2+c^2-2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$

Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



Volume of pyramid
$=\frac{1}{3}\times$ base area $\times$ height

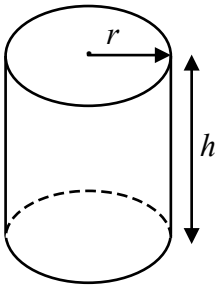
Determinant of matrix

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} = ad-bc$$

Inverse of matrix

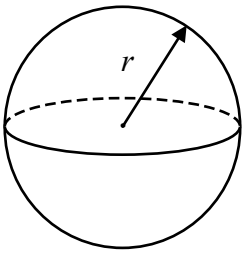
$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}^{-1} = \frac{1}{ad-bc}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$$

Volume of cylinder = $\pi r^2 h$
Curved surface area of cylinder = $2\pi rh$



Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Appendix 5: Notation

Notation used in the examination include the following:

$\{\quad\}$	the set of
$\mathrm{n}(A)$	the number of elements in the set A
$\{x:\ \}$	the set of all x such that
$\in$	is an element of
$\notin$	is not an element of
$\varnothing$	the empty (null) set
$\mathscr{E}$	the universal set
$\cup$	union
$\cap$	intersection
$\subset$	is a subset of
A'	the complement of the set A
PQ	operation Q followed by P
$\mathrm{f}: A \to B$	is a function under which each element of set A has an image in set B
$\mathrm{f}: x \mapsto y$	f is a function under which x is mapped to y
$\mathrm{f}(x)$	the image of x under the function f
f^{-1}	the inverse relation of the function f
fg	the function g followed by function f, i.e. $\mathrm{f}(\mathrm{g}(x))$
	open interval on the number line
	closed interval on the number line
$\mathbf{a}$	the vector $\mathbf{a}$
$\overrightarrow{AB}$	the vector represented in magnitude and direction by $\overrightarrow{AB}$ the vector from point A to point B
$\lvert\mathbf{a}\rvert$	the magnitude of vector $\mathbf{a}$

Appendix 6: Glossary

Term	Definition
Assessment objectives	The requirements that students need to meet to succeed in the qualification. Each assessment objective has a unique focus which is then targeted in examinations or coursework. Assessment objectives may be assessed individually or in combination.
External assessment	An examination that is held at the same time and place in a global region.
JCQ	Joint Council for Qualifications. This is a group of UK exam boards that develop policy related to the administration of examinations.
Linear	Qualifications that are linear have all assessments at the end of a course of study. It is not possible to take one assessment earlier in the course of study.
Unit	A modular qualification will be divided into a number of units. Each unit will have its own assessment.

For information about Edexcel, BTEC or LCCI qualifications
visit qualifications.pearson.com

Edexcel is a registered trademark of Pearson Education Limited

Pearson Education Limited. Registered in England and Wales No. 872828
Registered Office: 80 Strand, London WC2R 0RL
VAT Reg No GB 278 537121

Getty Images: Alex Belmonlinsky

ISBN 978-1-4469-3111-0