

**Your guide to Pearson Edexcel
International Advanced Level (IAL)
Mathematics**

First teaching
September 2018



Welcome

Our International Advanced Level (IAL) qualifications have been developed in consultation with the international school community, including a large number of teachers and university lecturers, to make them engaging for international learners and to give them the necessary skills to support progression to higher and further study.

Now available in 21 subjects, with the following subjects updated for first teaching in September 2018: Mathematics, Further Mathematics, Pure Mathematics, Biology, Chemistry, Physics, Business, Economics and **IT (NEW qualification from September 2018)**.

This guide provides an overview of our International Advanced Level (IAL) qualifications in Mathematics, Further Mathematics and Pure Mathematics.

For further information, updates and support, visit qualifications.pearson.com/ial

“
Pearson Edexcel IAL
prepared me so much
for university and I was
successful in getting
offers and a scholarship
to the Australian
university of my choice.”

Hayin Lin, now studying Mathematics at
the University of Tasmania



Illustration by Lauren Rolwing

Why choose Pearson Edexcel International Advanced Level (IAL)?

Pearson Edexcel International Advanced Level (IAL) qualifications are popular for many reasons including:



Flexible and modular structure

Pearson Edexcel IAL provides the flexibility to teach a modular A level qualification. This allows learners to take examinations at the right time for them. The modular structure includes a synoptic approach to assessment, which means learners are examined on their learning from each unit and are also able to demonstrate their knowledge and understanding across the whole subject.

The modular approach exam results provide formal feedback throughout the course. Learners are able to more quickly understand the standard required to reach the level of achievement they are aiming for. This understanding motivates them to improve, and builds a sense of ownership through bite-size, short-term goals.



Multiple examination opportunities

Examinations are available in January, June and October. As exams are spread throughout the course, revision is broken down into unit-sized chunks, and there are less 'all-or-nothing' exam periods, enabling learners to focus their revision appropriately.



Clear and straightforward question papers

Our question papers are clear and provide sufficient challenge and support for students of all ability ranges. Our mark schemes are straightforward so that the assessment requirements are clear.



AS results contribute to A level grade

International AS qualifications can be taken separately, as a stand alone qualification, or used as a stage on the way to completing an Advanced Level qualification. This provides international schools and learners with greater choice and flexibility to meet their needs and aspirations.



Recognised by universities worldwide

Our IALs are fully comparable to UK reformed GCE A levels and provide the same progression routes to university and employment. Crucially, Pearson Edexcel IALs are widely recognised by universities across the world for entry on to undergraduate degree level programmes. Global universities that recognise these qualifications include the UK Russell Group, the Australia Group of 8 (Go8) and top ranked universities in North America and Asia.



International focus

Pearson Edexcel IAL qualifications and accompanying published resources contain international content where possible, such as topic themes, examples, case studies, photos and currencies, making content more relevant and engaging for all learners. Language is also reviewed by a specialist to ensure materials are written with EAL learners in mind, in a clear and accessible style.



100% externally assessed

Learners can resit individual unit examinations.

Pearson Edexcel International Advanced Level (IAL) Mathematics from 2018

We have listened to feedback from all parts of the international school community, including a large number of teachers and universities, to ensure we develop our Mathematics qualifications to be engaging for international learners and to give them the necessary skills to support progression to higher education or further study in Mathematics.

With three different awards available, **Mathematics**, **Further Mathematics** and **Pure Mathematics**, the qualification is designed to be studied over two years, with the option of a one-year AS level course. Results of the IAS qualification can contribute to the overall IAL grade.

The IAL Mathematics qualification has several features which we know teachers and students love including:

- full modularity with 14 units
- flexibility to combine units across Pure Mathematics, Further Mathematics, Mechanics, Statistics and Decision Mathematics
- 5 routes to combine units to achieve a qualification
- all units equally weighted with each examination timed at 1h 30m and 75 marks available
- examinations are available 3 times a year in January, June and October to suit different delivery models
- students have the opportunity to re-sit individual units
- IAS results will continue to contribute to IAL
- curriculum-matched textbooks and teacher supports have been developed to support teaching and learning from September 2018.

Your guide to assessment changes and timelines

The Core Mathematics units have been renamed Pure Mathematics and split as follows:

- Core Maths 12 content has been restructured into 2 units: Pure Maths 1 and Pure Maths 2 (Calculator permitted)
- Core Maths 34 content has been restructured into 2 units: Pure Maths 3 and Pure Maths 4 (Calculator permitted)

Decision Mathematics has been updated.

These 5 units have new unit codes as detailed here.

Cash-in codes remain the same.

Specification	Level	Units	Jun 2018	Oct 2018	Jan 2019	Jun 2019	Oct 2019	Jan 2020	Jun 2020	Oct 2020	Jan 2021
MATHEMATICS 2013 SPECIFICATION											
Core Maths	AS	WMA01	✓	✓	✓	✓	✓	✓	✓	X	X
Core Maths	A2	WMA02	✓	✓	✓	✓	✓	✓	✓	X	X
Mechanics 1	AS	WME01	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mechanics 2	A2	WME02	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mechanics 3	A2	WME03	✓	X	✓	✓	X	✓	✓	X	✓
Statistics 1	AS	WST01	✓	✓	✓	✓	✓	✓	✓	✓	✓
Statistics 2	A2	WST02	✓	✓	✓	✓	✓	✓	✓	✓	✓
Statistics 3	A2	WST03	✓	X	X	✓	X	X	✓	X	✓
Further Pure Maths 1	AS	WFM01	✓	X	✓	✓	X	✓	✓	X	✓
Further Pure Maths 2	A2	WFM02	✓	X	X	✓	X	X	✓	X	✓
Further Pure Maths 3	A2	WFM03	✓	X	X	✓	X	X	✓	X	✓
Decision Maths 1	AS	WDM01	✓	X	✓	✓	X	✓	✓	X	X
NEW MATHEMATICS 2018 SPECIFICATION											
Pure Maths 1	AS	WMA11	X	X	✓	✓	✓	✓	✓	✓	✓
Pure Maths 2	AS	WMA12	X	X	X	✓	✓	✓	✓	✓	✓
Pure Maths 3	A2	WMA13	X	X	X	X	X	✓	✓	✓	✓
Pure Maths 4	A2	WMA14	X	X	X	X	X	X	✓	✓	✓
Decision Maths 1	AS	WDM11	X	X	X	✓	X	✓	✓	X	✓

Helping students make the best progress they can

Pearson Edexcel International Advanced Level (IAL) Mathematics provides a **broad and deep development of learners' mathematical skills.**

Students will develop:

- their understanding of mathematics and mathematical processes in a way that promotes confidence and fosters enjoyment
- the ability to reason logically and recognise incorrect reasoning, to generalise and to construct mathematical proofs
- their range of mathematical skills and techniques and use them in more difficult, unstructured problems
- an understanding of coherence and progression in mathematics and of how different areas of mathematics can be connected
- skills to recognise how a situation may be represented mathematically and understand the relationship between 'real-world' problems and standard and other mathematical models and how these can be refined and improved.

Students will also:

- use mathematics as an effective means of communication
- read and comprehend mathematical arguments and articles concerning applications of mathematics
- acquire the skills needed to use technology such as calculators and computers effectively, recognise when such use may be inappropriate and be aware of limitations
- develop an awareness of the relevance of mathematics to other fields of study, to the world of work and to society in general
- take increasing responsibility for their own learning and the evaluation of their own mathematical development.

Developing transferable skills valued by universities and employers

In recent years, universities and employers have highlighted the need for students and graduates to develop a range of transferable skills, often referred to as 'soft skills', to enable them to better meet the demands of undergraduate study and the world of work.

In fact, universities and employers consider transferable skills to be the largest skills gap overall.



1 in 6

employers have difficulty finding candidates with the skills they require¹



54%

of companies say that skills shortages impact their ability to serve their customers²



1 in 3

skills in a job posting is a "soft skill"¹



87%

of university professors do not think students have the research skills needed for degree-level study³

Pearson Edexcel International Advanced Levels (IALs) equip students with these embedded transferable skills sought after by universities and employers. They develop core competencies, such as problem-solving, critical thinking and verbal reasoning. Transferable skills are signposted in our IAL qualifications and learning materials to support student development of them.

¹ *Employability - Personal & Social Capability Framework report from Pearson, 2016.*

² *Employability report from PSB for Pearson, 2016.*

³ *Bridging the Gap: Understanding the Differing Research Expectations of First-Year Students and Professors, Meg Raven, Mount Saint Vincent University, 2016.*

Supporting you at every stage

We provide an unparalleled level of support services, tools, resources and training alongside our qualifications, making teachers and students lives easier at every stage.

FREE resources and support	Planning, teaching & learning	Exam preparation and assessment	Results support
Getting started guide	✓		
Training events (face-to-face and online)	✓		
Subject advisor support	✓	✓	✓
Community forums	✓	✓	✓
Schemes of work	✓		
Sample assessment materials	✓	✓	
Examiner reports		✓	✓
Exemplar marked responses		✓	
Past papers		✓	
examWizard		✓	
Mark schemes		✓	
ResultsPlus mock exam analysis		✓	
ResultsPlus		✓	✓
Access to Scripts service (ATS)			✓
Additional paid for resources			
Printed and digital courseware (such as textbooks)	✓	✓	

Your free subject support

- **Our subject advisors provide** fast, reliable, expert help and aim to answer all emailed questions within 48 hours and resolve 90% of issues phoned in on the first call. Email TeachingMaths@pearson.com or call + 44 (0)20 7010 2174
- **Connect with other educators** around the world, share ideas and resources and stay up to date with the latest subject developments by joining our international schools community at community.pearsoninternationalschools.com.

Offering more advanced support services and tools

Our technology capability also allows us to provide the following unique services and tools to teachers and students:



ResultsPlus provides detailed information on exam performance and a platform to view and compare student results – as individuals or as groups – across the world. It helps with planning improvements in teaching and learning. ResultsPlus Direct is a free online service that gives students a detailed breakdown and comparison of their performance in Pearson Edexcel exams, globally, to help them identify areas of improvement.



examWizard is our free exam preparation tool containing a bank of past Pearson Edexcel exam questions, mark schemes and examiners' reports for a range of subjects. It saves you time by enabling you to create your own mock exams, topic tests, homework or revision activities in minutes and links directly to associated examiner reports and mark schemes!



Access to Scripts Service (ATS) is an online service which allows access to view electronically marked exam papers, free of charge, providing enhanced transparency and support for teachers to evaluate a student's performance on particular questions in relation to what they have been taught.



Awarding reliability. We use ePEN, our unique, image-based marking system ensuring real time monitoring, quality control and reporting to ensure the highest quality marking and provision of data for tools such as ResultsPlus. Pearson Edexcel exam marking processes have been proven to produce the most reliable results. This demonstrates that our qualifications maintain the highest standards and can be relied upon to deliver to expectation.

“Because of ResultsPlus, students can learn about their mistakes and rectify.”

Kanagambigai, Chief Counsellor, Chemistry Lecturer, A levels Department, HELP Academy, Malaysia commenting on the ResultsPlus mocks service.

Published resources

Developed for the 2018 International Advanced Level (IAL) specification, these new resources are specifically designed for international students, with a strong focus on progression, recognition and transferable skills, allowing learning in a local context to a global standard.



Matched to the new 2018 specifications

These new resources are written specifically to offer a complete match to the content, structure and modular approach of the new 2018 specifications. Offering support to a qualification that is fully comparable to the reformed UK GCE A levels, and recognised as equal to the GCE by universities worldwide.

Internationally appropriate content

Appropriate international content puts learning in a real-world context and includes a range of different contexts, photos, examples and currencies – making it engaging and relevant for all learners. Language is reviewed by a specialist to ensure materials are written in a clear and accessible style.

Lots of exam practice

Exam practice provides opportunities to assess understanding at key points, so students can make the best progress they can.

Signposted transferable skills

Transferable skills, needed for progression into higher education and employment, are embedded throughout the Student Books. They are explicitly signposted so students understand what skills they are developing and therefore go on to use these skills more effectively in the future.

Supporting learning beyond the classroom

Each Student Book provides access to an ActiveBook, which is a digital version of the Student Book, and can be accessed online, anytime, anywhere.

Better support for you

The online teacher resources provide a range of planning, teaching and assessment resources, saving you valuable time.

**Pearson highly recommends, but does not mandate, the use of our resources for teaching and learning the International Advanced Level (IAL).*

1 ALGEBRAIC EXPRESSIONS

1.1
1.2
1.10

Prior knowledge checks ensure students have the foundations to learn. Learning Objectives at the beginning of each chapter highlight what students need to know and understand.

Learning objectives

After completing this chapter you should be able to:

- Multiply and divide integer powers → pages 2–4
- Expand a single term over brackets and collect like terms → pages 2–4
- Expand the product of two or three expressions → pages 4–6
- Factorise linear, quadratic and simple cubic expressions → pages 6–9
- Know and use the laws of indices → pages 9–11
- Simplify and use the rules of surds → pages 12–13
- Rationalise denominators → pages 13–15

Prior knowledge check

- Simplify:
 - $4m^2n + 5mn^2 - 2m^2n + mn^2 - 3mn^2$
 - $3x^2 - 5x + 2 + 3x^2 - 7x - 12$
← International GCSE Mathematics
- Write as a single power of 2:
 - $2^5 \times 2^3$
 - $2^6 \div 2^2$
 - $(2^3)^2$
← International GCSE Mathematics
- Expand:
 - $3(x + 4)$
 - $5(2 - 3x)$
 - $6(2x - 5y)$
← International GCSE Mathematics
- Write down the highest common factor of:
 - 24 and 16
 - $6x$ and $8x^2$
 - $4xy^2$ and $3xy$
← International GCSE Mathematics

Computer scientists use indices to describe very large numbers. A quantum computer with 1000 qubits (quantum bits) can consider 2^{1000} values simultaneously. This is greater than the number of particles in the observable universe.

4.6 Pulleys

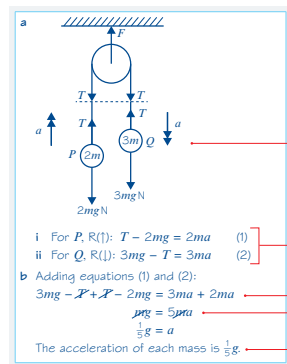
In this section you will see how to model systems of connected particles involving pulleys. The problems you answer will assume that particles are connected by a light, inextensible string, which passes over a **smooth pulley**. This means that the tension in the string will be the same **on both sides** of the pulley. The parts of the string each side of the pulley will be either horizontal or vertical.

Watch out You cannot treat a system involving a pulley as a single particle. This is because the particles are moving in different directions.

Example 13

Particles P and Q , of masses $2m$ and $3m$, are attached to the ends of a light inextensible string. The string passes over a small smooth fixed pulley and the masses hang with the string taut. The system is released from rest.

- Write down an equation of motion for P .
- Write down an equation of motion for Q .
- Find the acceleration of each mass.
- Find the tension in the string.
- Find the force exerted on the pulley by the string.
- Find the distance moved by Q in the first 4 s, assuming that P does not reach the pulley.
- State how you have used the fact that the pulley is smooth in your calculations.



Problem-solving

Resolve vertically for both P and Q . This will give you simultaneous equations involving the tension T and the acceleration a which can then be solved.

Draw a diagram showing all the forces acting on each mass and the pulley, and the acceleration.

Now resolve for each mass separately, in the direction of its acceleration.

Add the equations to eliminate T .

Simplifying.

You could also give your final answer as 2.0 m s^{-2} (2 s.f.).

Sample page from Edexcel International AS/A Level Pure Mathematics 1 Student Book

'Watch out' boxes draw learners' attention to common pitfalls in answering questions, giving practical hints when checking work and preparing for the exams.

Examples show how to work through questions, and how to lay out calculations.

“I like the modular nature of it, the fact that I can choose whichever core units I want to do, whichever applied units I want to do. It’s very comprehensive. It opens up many doors to many universities, international.”

Wang, Pearson Edexcel International Advanced Level student from Sri Lanka, studying Chemistry, Biology, Physics, and Mathematics.

About Pearson Edexcel

At the core of everything we do at Pearson is the desire to make a measurable impact on improving people’s lives through learning. From primary school to secondary school, through to professional certification; our qualifications help educate millions of people worldwide.

Foundations for success

Pearson Edexcel International Advanced Level (IAL) is part of the iProgress family for ages 5 to 19, which also includes iPrimary, iLowerSecondary and International GCSE (IG). We offer more than just a qualification, with professional development training that keeps teachers up-to-date with the latest educational practices, supporting materials that make planning and teaching lessons easier, and student textbooks and online resources, you’ll have more time to focus on the individual development of your students’ progress.

Progress to University

Developed by education specialists specifically for international learners, Pearson Edexcel IAL qualifications are recognised by leading universities across the world - including Oxford, Cambridge, Columbia University and Yale University. IAL qualifications provide learners with access to the world’s top universities and prestigious employment opportunities.



Find out more

To find out more about our Pearson Edexcel International Advanced Level (IAL) Mathematics qualifications, visit our website qualifications.pearson.com/ial