Pearson Edexcel

International A Level Mathematics

Welcome to Pearson

YMA01-23IF01

First teaching in 2018, first assessment 2019

Pearson Edexcel

Session Agenda

- Introduction to the new Edexcel International AS/A level in mathematics
- How the mathematics units are combined to make the A levels
- Teaching issues and Activity 1
- Introduction to Assessment Objectives (AOs)
- AOs – the details
- AOs and mark schemes
- Linking marks with progress through a question
- Support for exam preparation
- Further support
- Time for questions

Aims and objectives

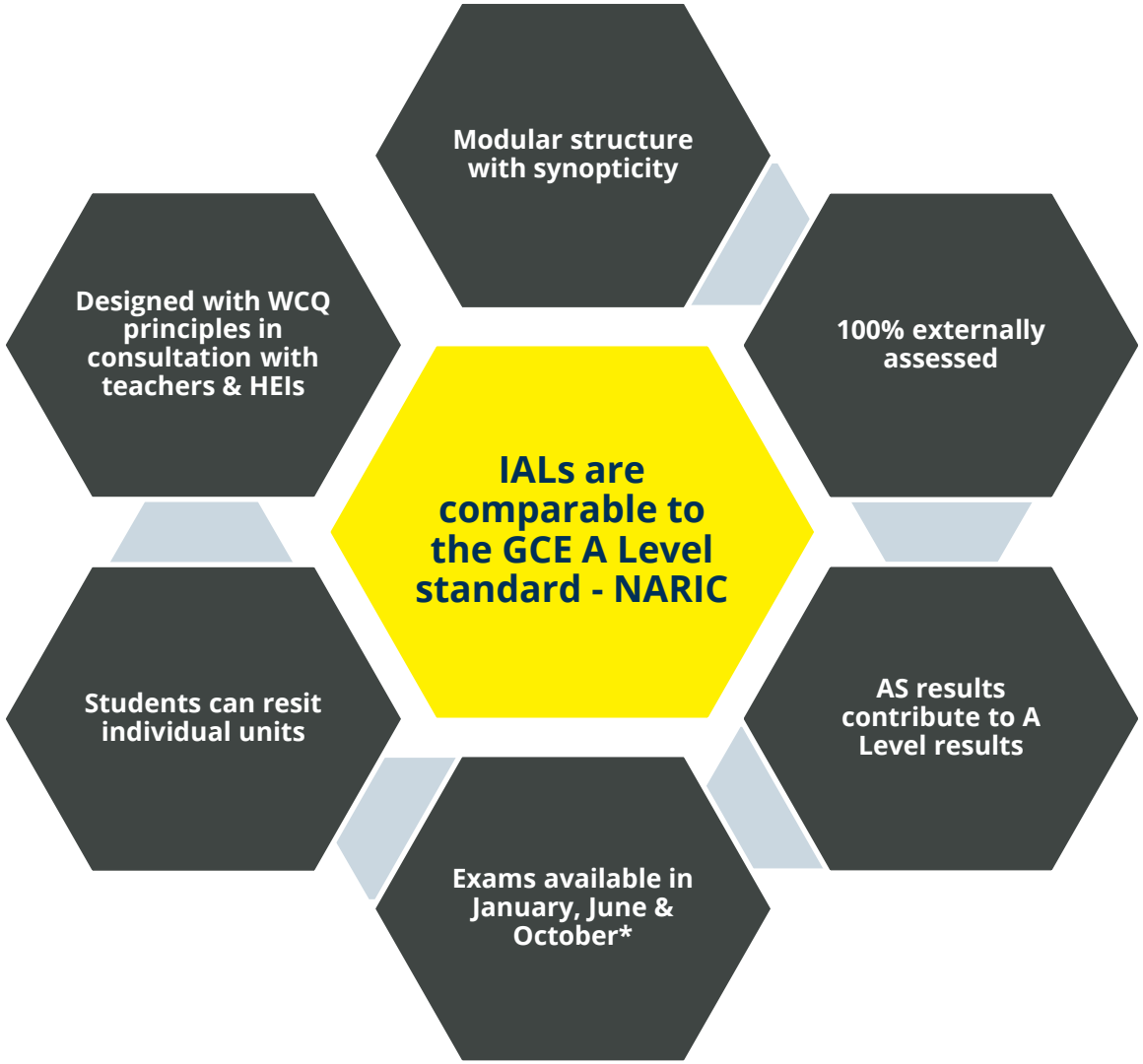
- gain understanding about how the qualifications are devised
- understand the content of the qualification
- understand how to plan the course and/or lessons
- understand the assessment of the qualification and how to prepare students
- understand the Assessment Objectives for the qualification.
- understand the question types for the qualification
- understand the mark schemes for the qualification
- practise using the mark schemes on exemplar student work
- learn about the support provided by Pearson around assessment and exemplars
- To network and share ideas with other teachers.

Pearson Edexcel International A Level

IAL Features

- International A Levels and AS Levels are created for International Students

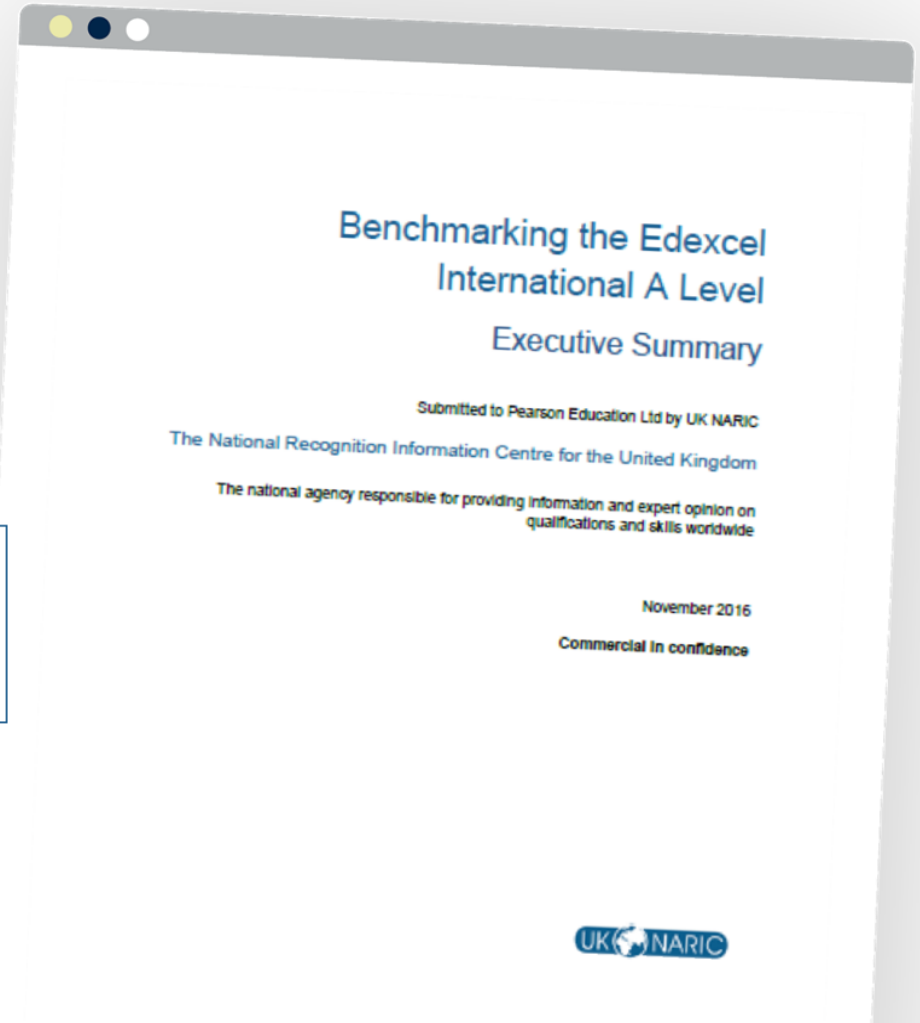
- Globally recognised.



Updated NARIC report for Edexcel IAL

The executive summary confirms that Edexcel IALs are considered comparable to the GCE A Level standard following reforms to the UK regulated qualifications.

Qualification:	Edexcel International Advanced Level
Awarding Institution:	Pearson Education Ltd
Comparability:	Is considered comparable to GCE A Level standard

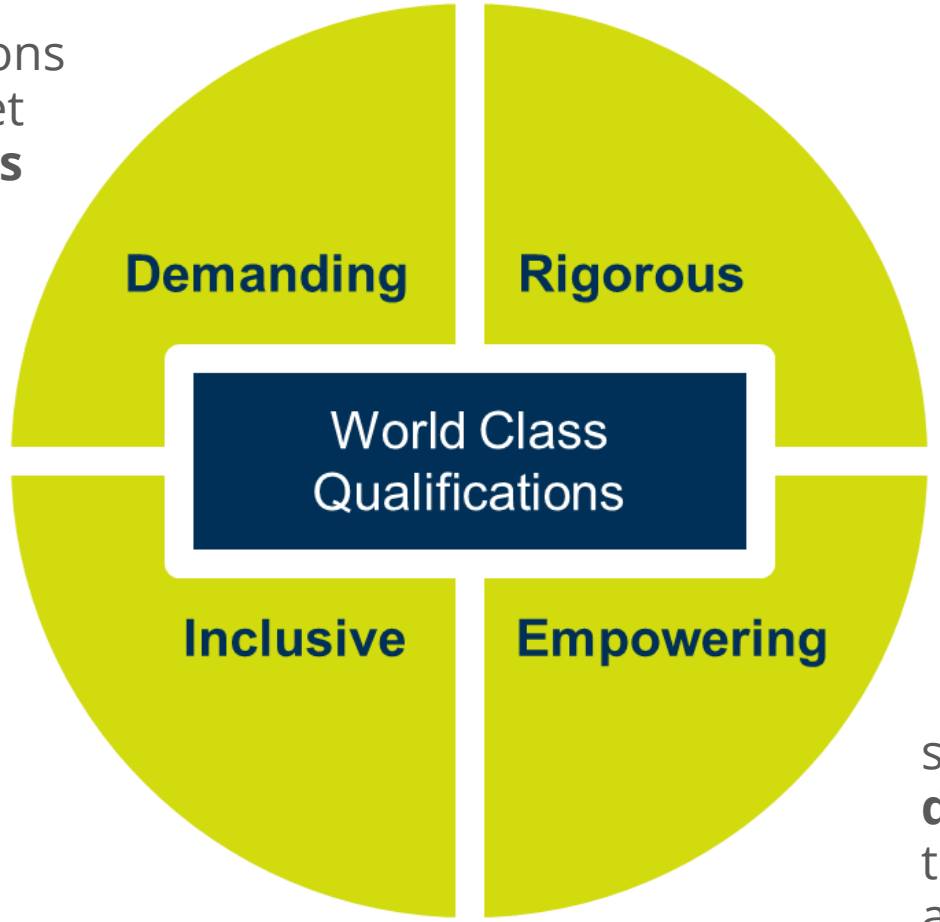


IAS & IAL subjects

Biology	Chemistry	Physics	Mathematics	Further Mathematics
Pure Mathematics	Information Technology	Business	Economics	Accounting
English Language	English Literature	History	Geography	Psychology
Arabic	French	German	Greek	Spanish
		Law (IAL only)		

World-class qualifications

All Edexcel qualifications are developed to meet Pearson's **World Class Qualification design principles**



Endorsement of educational **thought-leaders and assessment experts** from across the globe

Developed using an understanding and benchmarking of **all educational systems**

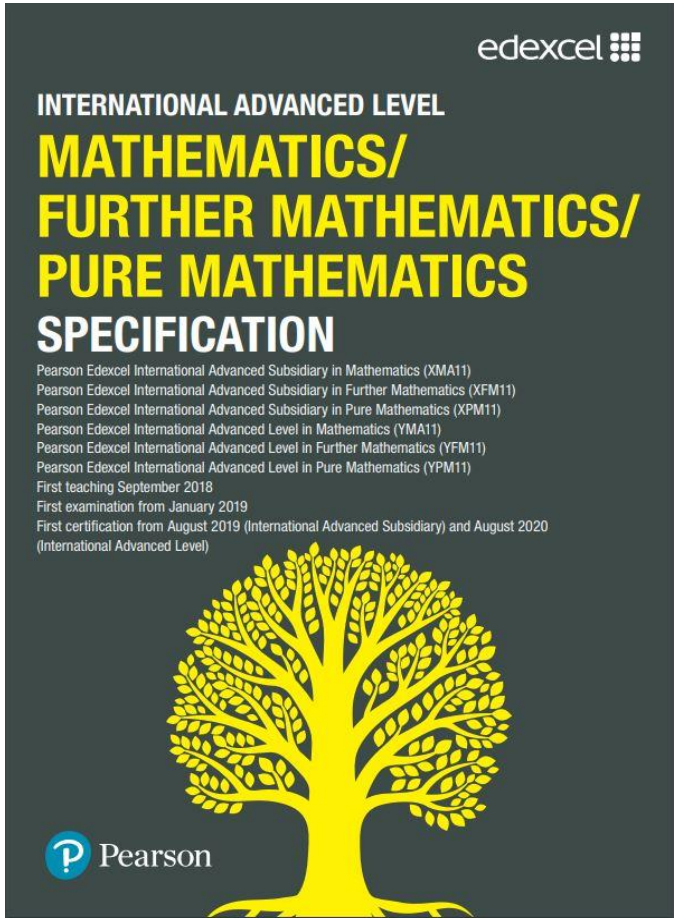
Qualifications that support young people to **develop the capabilities** they need to **progress** and prosper in their lives

Pearson Edexcel International A Level Mathematics

IAL 2018 Mathematics

Mathematics | Further Mathematics | Pure Mathematics

Reviewed and updated in light of GCE A level changes	**Pure Mathematics content in 4 units (Plus 3 units of Further Pure Mathematics)**	**5 optional routes to achieve qualification**
14 equally weighted units	**Transferable Skills embedded**	**Fully modular examinations three times a year AS contributes to A level**
Dedicated textbooks are available	**Suitable preparation for AEA Mathematics**	**TeachingMaths@pearson.com**



The Edexcel IAL mathematics units

Pure 1	Pure 2	Pure 3	Pure 4
Further Pure 1	Further Pure 2	Further Pure 3	
Mechanics 1	Mechanics 2	Mechanics 3	
Statistics 1	Statistics 2	Statistics 3	
Decision Mathematics1			

What is International AL Mathematics?

Pure 1	Pure 2	Pure 3	Pure 4

Algebra
Calculus
Trigonometry

and Mechanics 1 and Statistics 1 or Mechanics 1 and Decision Mathematics

or Statistics 1 and Decision Mathematics
Or
Mechanics I and II
Or
Statistics 1 and II

Each unit is assessed by a 90 minute 75 mark examination

Each unit accounts for one sixth of the final award

What is International AL Pure Mathematics?

Pure 1	Pure 2	Pure 3	Pure 4

Algebra
Calculus
Trigonometry

And

Further Pure 1

And either

Further Pure 2

or

Further Pure 3

What is International AL Further Mathematics?

Further Pure 1

And either Further Pure 2 or Further Pure 3

And a further 4 units from the applied units and the remaining FP unit

Each unit is assessed by a 90 minute
75 mark examination

What is International AS Mathematics?

This is a course which consists of Pure 1, Pure 2 and one of the applied courses.

There are similar arrangements for AS Pure mathematics and AS Further mathematics.

Full details are available on the Edexcel website and in the Specification document.

International AL Mathematics: the details

The details of the content can be found in the **specification**

The details of the assessment model can be found in the **specification**

Examples of examination papers and mark schemes can be found in the **sample assessment materials (SAMS)**

All available on the Pearson Eedexcel site

https://qualifications.pearson.com/en/qualifications/edexcel-international-advanced-levels/mathematics-2018.html

International AL Mathematics: the details

The Pure units: P1, P2, P3 and P4

P1 follows on naturally from Edexcel International GCSE
P2 assumes knowledge of P1
P3 assumes knowledge of P1 and P2
P4 assumes knowledge of P1 and P2 and P3

The Applied units: M1, M2, S1, S2, D1

M1 assumes knowledge of P1, P2 and 2 dimensional vectors
M2 assumes knowledge of P1, P2, P3, P4 and M1

S1 follows on naturally from Edexcel International GCSE
S2 assumes knowledge of S1, P1 and the definite integration found in P2

D1 follows on naturally from Edexcel International GCSE

International AL Mathematics: the details

The Pure units all have a similar structure.
For example:

Pure1
Algebra and functions
Co-ordinate geometry in the (*x*, *y*) plane
Trigonometry
Differentiation
Integration

These are the main headings

Algebra and functions has 12 sections

The assessment of Pure 1 is by an externally set and externally marked examination consisting of about 10 questions.

International AL Mathematics: the details

The examination of any unit consists of a combination of short and long questions.

Here is an example of a short question from a Pure 1 paper:

2. (a) Given that $3^{-1.5} = a\sqrt{3}$ find the exact value of a

(2)

(b) Simplify fully $\dfrac{(2x^{\frac{1}{2}})^3}{4x^2}$

(3)

International AL Mathematics: the details

The examination of any unit consists of a combination of short and long questions.

Here is an example from Mechanics 1:

3. A block A of mass 9 kg is released from rest from a point P which is a height h metres above horizontal soft ground. The block falls and strikes another block B of mass 1.5 kg which is on the ground vertically below P. The speed of A immediately before it strikes B is 7 m s^{-1}. The blocks are modelled as particles.

(a) Find the value of h.

(2)

Immediately after the impact the blocks move downwards together with the same speed and both come to rest after sinking a vertical distance of 12 cm into the ground. Assuming that the resistance offered by the ground has constant magnitude R newtons,

(b) find the value of R.

(8)

International AL Mathematics: the details

Activity 1

You need a copy of the Pure 1 Section from the International AL specification and a copy of the International GCSE specification.

Use both copies to write down any topics which you feel would be completely new to a student doing the P1 course if they had previously followed the International GCSE course.

Teaching IAL Mathematics

Teaching IAL Mathematics

Issues you have to consider when teaching (some of which are culture specific).

- Classroom layout – can you arrange the tables/desks to suit your style of teaching?
- Do you have a smart screen?
- Do you have access to the internet?
- What type of exercise books do you use – or do you want students to work on file paper?
- Assuming English is the language of instruction, how well do your students understand the spoken word and the written word?

Learning culture – competitive/cooperative

Using paper and files enables students to be more responsible for their own work in preparation for H.E.

Teaching IAL Mathematics

Issues on content coverage:

- how much prior learning can you assume?
- what textbook should you use?
- how often should you test learning?
- should you write your own tests ?

Some of these have resource implications and are covered later.

Teaching IAL Mathematics

Organisational issues:

- how often should you set homework and how much?
- does your school/college have an examination week?
- when sharing a course between two teachers, how do you split the content?

For example if P1 and M1 are being taught first, how is P2 going to be split?

Teaching IAL Mathematics

Organisational issues:

- Sharing the first year of the course between two teachers

One possible model:

- Term 1 Share P1: Teacher A does Algebra and Functions, Coordinate geometry
  Teacher B does Trigonometry, Differentiation and Integration

- Term 2 Teacher A does Mechanics 1
  Teacher B does Pure 2

- Term 3 Revision – Pure 1, 2 and Mechanics 1 past papers

Teaching IAL Mathematics

Organisational issues:

- We want you to let us know if you share the first year of the course between two teachers

Teaching IAL Mathematics

Activity 2

This asks you to consider the issues raised in three previous slides (they are repeated on the Activity 2 sheet).

Look at each of the slides in turn and consider what other points you would have to think about when teaching the course.

Use Chat to add anything you feel has been omitted from the slides.

Teaching IAL Mathematics

Schemes of Work (SOWs)

Whether a single teacher is taking all the lessons or whether the teaching is shared, an SOW is essential:

- it enables progression, so that ideas are presented in the correct order
- it enables the course to be taught in a timely manner, so that no topic is rushed
- it enables cooperation between teachers if the course is shared
- it enables testing to take place in a methodical way

Teaching IAL Mathematics

Some teachers prefer to design their own schemes of work or to use a maths department one to reflect local priorities.

Edexcel has produced an SOW as a guide for teachers:

General

- Teaching time for each topic - 4 hours for powers and surds
- Prior knowledge needed - collect like terms and factorise
- keywords - irrational

The examples relates to the Algebra and Functions section of Pure 1

Teaching IAL Mathematics

Some teachers prefer to produce their own schemes of work or to use a maths department one to reflect local priorities.

Edexcel has produced an SOW as a guide for teachers:

The examples relate to surds in the Algebra and Functions section of Pure 1

<u>Specific</u>

- Teaching objectives - use and manipulate surds; rationalise the denominator
- Teaching points - Make sure students can square $2\sqrt{3}$ correctly
- Opportunities for reasoning/problem solving - exact answers involving Pythagoras
- Common misconceptions - writing $\frac{1}{3x}$ as $3x^{-1}$

Assessing IAL Mathematics

Assessing IAL Mathematics

Each unit is assessed through a 90-minute examination paper.

The examination paper is constructed by the senior examining team – experienced examiners, most of whom are practising or retired teachers
or lecturers.

The rules for constructing examination papers are strict:

- Sufficient content must be present in each paper
- All content must be examined over a period of papers
- No content can be set which is NOT in the specification
- The five Assessment Objectives must all be tested
- The demand of successive papers should be roughly the same.

Assessing IAL Mathematics

Assessment Objectives

The marks assigned to each assessment objective are different in some units.

These describe how the content is to be examined.

In IAL Mathematics there are five assessment objectives:

AO1 Recall, select and use knowledge of facts, concepts and techniques

AO2 Construct rigorous arguments and proofs

AO3 Recall, select and use knowledge of mathematical models

AO4 Comprehend translations of realistic contexts into mathematics

AO5 Use calculator technology and other permitted resources accurately.

Assessing IAL Mathematics

Ensuring consistency

The examination paper marking team consists of experienced practising or retired teachers managed by team leaders who themselves are responsible to a senior examiner.

To ensure fairness of marking each examination script is scanned and electronically split so that each question is marked by different examiner.

Each examiner must adhere to a detailed mark scheme; their marking is monitored and corrected if necessary by a senior examiner.

Assessment Objectives

IAL Mathematics has five AOs – examples:

AO1 Given that $y = 4x^2 - \frac{3}{\sqrt{x}}$

find $\frac{dy}{dx}$

This question is fairly standard and is all AO1

AO2 The lengths, in cm, of the two shorter sides of a right -angled triangle are $2 + \sqrt{2}$ and $2 - \sqrt{2}$
Show that the length in cm of the longest side is $2\sqrt{3}$

‘Show’ and ‘prove’ are generally linked to AO2

Assessment Objectives

IAL Mathematics has five AOs – examples:

AO2 also refers to … and the construction of extended arguments for handling substantial problems in unstructured form

9. The equation

$$\frac{3}{x} + 5 = -2x + c$$

where c is a constant, has no real roots.

Find the range of possible values of c.

(7)

Take a few moments to think about the steps a student would have to carry out to complete the question.

Assessment Objectives

IAL Mathematics has five AOs – examples:

AO3 The population, P millions, of a country is given by

$$P = 5e^{0.4t} + 10e^{-0.8t}$$

where t is the time in years.

Write down the initial population.

Assessment Objectives

IAL Mathematics has five AOs – examples:

AO4 (a) Show that $\frac{\sin(2x+y)+\sin(2x-y)}{4\cos x\cos y} = \sin x$

where $\cos x\cos y \neq 0$

(b) Hence, solve the equation

$$\frac{\sin\left(2x+\frac{\pi}{3}\right)+\sin\left(2x-\frac{\pi}{3}\right)}{2\cos x} \equiv 1$$

for values of x between 0 and 2π

Assessment Objectives

IAL Mathematics has five AOs – examples:

AO5 $I = \int_0^1 \mathbf{f}(x)\mathbf{d}x$

where f(x) $= \sqrt{1 + 2x^2}$

Complete the column for x = 0.75 giving the value of f(x) correct to 3 decimal places.

Use the trapezium rule to calculate an estimate for I

x	0	0.25	0.5	0.75	1
f(x)	1	1.061	1.225		1.732

Assessment Objectives pure units

	AO1	AO2	AO3	AO4	AO5
P1	30–35	25–30	5–15	5–10	1–5
P2	25–30	25–30	5–10	5–10	5–10
P3	25–30	25–30	5–10	5–10	5–10
P4	25–30	25–30	5–10	5–10	5–10

All figures in the above table are expressed as marks out of 75

Assessment Objectives applied units

	AO1	AO2	AO3	AO4	AO5
M1	20 – 25	20 – 25	15 – 20	6 – 11	4 – 9
M2	20 – 25	20 – 25	10 – 15	7 – 12	5 –10
S1	20 – 25	20 – 25	15 – 20	5 – 10	5 –10
S2	25 – 30	20 – 25	10 – 15	5 – 10	5 –10
D1	20 – 25	20 – 25	15 – 20	5 – 10	5 –10

All figures in the above table are expressed as marks out of 75

Assessment Objectives

Activity 1

Study the two questions taken from Pure 1 June 2019.

Make a judgement about which AOs should be assigned to each question.

The mark schemes and a summary of the AOs are available to help you.

Complete the online mark sheet.

Marks will be shared anonymously with the meeting.

Assessment Objectives

Constructing a full paper requires that most of the content is covered and that the sum of the marks allocated to each AO on the paper lies within the allowed totals.

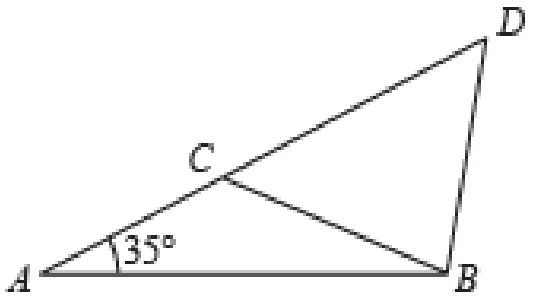
Q	Content	Marks	AO1	AO2	AO3	AO4	AO5
1	4.1, 4.3 Sequences	4					
2	3.1 Circles	7					
3	1.1, 1.3 Proof	4					
4	4.5 Binomial Expansion	7					
5	7.1 Differentiation problem in context	8					
6	2.1, 6.2 Factor Theorem and Trig equation	8					
7	4.2, 4.4 AP and GP problem in context	9					
8	5.2, 5.3 Laws of logarithms	9					
9	6.1, 6.2 Trig identity and equation	8					
10	7.1, 8.1, 8.2 Calculus	11					
		75					
			25-30	25-30	5-10	5-10	5-10

This is for a recent Pure 2 paper

Assessment Objectives

However it is possible to vary a question to alter the distribution of AO marks.

7.



Not to scale

Figure 3

Figure 3 shows the design for a structure used to support a roof.

The structure consists of four wooden beams, AB, BD, BC and AD.

Given $AB = 6.5\,\text{m}$, $BC = BD = 4.7\,\text{m}$ and angle $BAC = 35°$

(a) find, to one decimal place, the size of angle ACB,

(3)

(b) find, to the nearest metre, the total length of wood required to make this structure.

(3)

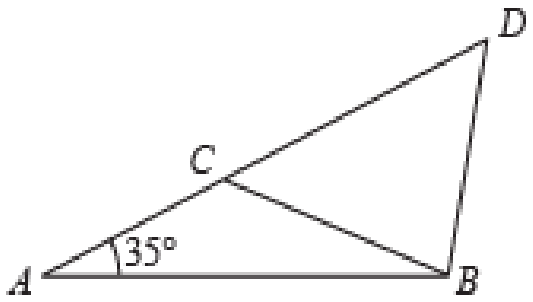
Originally all AO4

Take a few moments to think how this question could be altered from AO4

Assessment Objectives

Here is one possible attempt which does not change the underlying mathematical processes very much.

7.



Not to scale

Figure 3

(a) find, to one decimal place, the size of angle *ACB*.

(b) find, correct to the nearest metre, the perimeter of triangle *ABD*.

Now a combination of AO1 and AO2

Assessment Objectives

Producing the finished draft of a paper requires a lot of skill to set the questions so that the AO marks totals agree both across rows and down columns.

The other factor which has to be considered is that of DEMAND – what cognitive skills are required to do each question.

Roughly speaking, the less structure in a question (and the greater number of steps required to complete it) the more demanding it is.

Also important is how familiar the question is likely to be to the student.

Linked to both of the above is the fact the student may have to devise their own strategy – so which techniques to use may not be immediately apparent.

Assessment Objectives

Demand:

This question comes from Mechanics 1 Jan 2019

The same question could be set where only the last part is asked. This usually increases the demand

3.

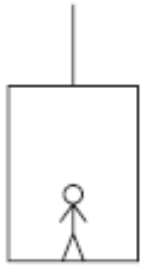


Figure 1

A lift of mass M kg is being raised by a vertical cable attached to the top of the lift. A person of mass m kg stands on the floor inside the lift, as shown in Figure 1. The lift ascends vertically with constant acceleration $1.4\,\text{m s}^{-2}$. The tension in the cable is 2800 N and the person experiences a constant normal reaction of magnitude 560 N from the floor of the lift. The cable is modelled as being light and inextensible, the person is modelled as a particle and air resistance is negligible.

(a) Write down an equation of motion for the person only.

(2)

(b) Write down an equation of motion for the lift only.

(2)

(c) Hence, or otherwise, find

(i) the value of m,

(ii) the value of M.

(3)

Grade boundaries

Also, for an examination with 5 grades per paper, the demand must be such that each paper is accessible at the low end and challenging enough at the upper end.
The table shows the marks needed in June 2019.
The UMS correspond to grades A to E (80 to 40).

Module	**80**	**70**	**60**	**50**	**40**
WMA11 Pure Mathematics 1	58	51	44	38	32
WMA12 Pure Mathematics 2	60	53	46	40	34
WDM11 Decision Mathematics 1	59	53	47	42	37

Total mark for any paper is 75, so a student who got 177 marks or better out of 225 would get a grade A (at AS)

Awarding marks

The purposes of a mark scheme are:

- to enable partial or full success to be rewarded
- to ensure consistency between markers
- to ensure consistency from one exam session to the next

Awarding marks

How partial or full success is rewarded.

Each question is given a number of marks according to the amount of work required to do it.

Marks are allocated according to which AOs the question is testing.

The mark scheme is then constructed so that as the student progresses through the solution of the question, marks are accumulated.

Awarding marks

How partial or full success is rewarded.

The marks awarded belong to three different types:

- M marks – marks for appropriate methods used in a correct way
- A marks – accurate answers which are conditional on correct method(s) being used
- B marks – unconditional accuracy marks

Awarding marks

How partial or full success is rewarded.

For M marks there is often guidance for how to reward a student who tries to use a method but not fully correctly.

For example, in integrating a polynomial, the M mark is usually awarded if the power of x is increased by 1.

For example, in solving a quadratic using the formula, sign errors are not penalised for the M mark.

Awarding marks

How partial or full success is rewarded.

In addition:

dM denotes a method mark which is dependent on a previous M mark

“ “ are used to denote where an incorrect answer can be used in a subsequent part and still be awarded marks (known as ‘follow though’). Usually there are conditions attached to following through.

Awarding marks

Students may have access to a sophisticated calculator. Using just this may mean they do not demonstrate ability in an assessment objective.

So Edexcel mathematics exams often have instructions to show full working.

2. Answer this question showing each stage of your working.

(a) Simplify $\dfrac{1}{4-2\sqrt{2}}$

giving your answer in the form $a + b\sqrt{2}$ where a and b are rational numbers.

(2)

2.(a)	$\dfrac{1}{4-2\sqrt{2}} = \dfrac{1}{4-2\sqrt{2}} \times \dfrac{4+2\sqrt{2}}{4+2\sqrt{2}}$	M1
	$= \dfrac{4+2\sqrt{2}}{16-8} = \dfrac{1}{2} + \dfrac{1}{4}\sqrt{2}$ oe	A1

This step, or equivalent MUST be shown

Awarding marks

Activity 2

Suggest some other types of questions where working MUST be shown because of issues over use of a calculator.

Use Chat to write down any types.

Awarding marks

Activity 2

Here is a short (possibly incomplete) list:

- Solution of simultaneous equations
- Solution of quadratic equations
- Solution of cubic equations
- Factorisation of cubic polynomials
- Definite integrals
- Solution of trig equations
- Location of turning points

Awarding marks

Here is question 1 from the November 2019 paper of Pure 2:

1. A curve C has equation $y = 2x^2(x - 5)$

(a) Find, using calculus, the x coordinates of the stationary points of C.

(4)

(b) Hence find the values of x for which y is increasing.

(2)

Just take a moment to think what is the sequence of mathematical processes that a student must use to do part (a).

Write down what the very first step should be.

Awarding marks

Here is question 1 from the November 2019 paper of Pure 2:

1. A curve C has equation $y = 2x^2(x - 5)$

(a) Find, using calculus, the x coordinates of the stationary points of C.

(4)

(b) Hence find the values of x for which y is increasing.

(2)

One way to do part (a) requires the following steps:

Expand the brackets

Differentiate the expanded form

Set the derivative = 0 to get an algebraic equation

Solve the algebraic equation.

The mark scheme must reflect this. There are 4 processes. There must be an accuracy mark for the final answer

Awarding marks

Here is question 1 from the November 2019 paper of Pure 2:

1. A curve C has equation $y = 2x^2(x - 5)$

(a) Find, using calculus, the x coordinates of the stationary points of C.

(4)

(b) Hence find the values of x for which y is increasing.

(2)

Activity 3

Decide which processes should be paired to get a mark.
Record your decision on the response sheet.

Decisions will be shared anonymously.

Awarding marks

Here is an excerpt from the mark scheme:

1 (a)	$y = 2x^2(x-5) = 2x^3 - 10x^2$	B1
	$\frac{dy}{dx} = 6x^2 - 20x$	M1
	Sets $\frac{dy}{dx} = 0 \Rightarrow 6x^2 - 20x = 0 \Rightarrow x = 0, \frac{10}{3}$ oe	dM1 A1
		(4)

The full mark scheme contains a lot more information.

This method mark can only be awarded if the earlier one has been awarded

Awarding marks

How does it relate to the sequence of processes shown earlier?

1 (a)	$y = 2x^2(x-5) = 2x^3 - 10x^2$ $\frac{dy}{dx} = 6x^2 - 20x$ Sets $\frac{dy}{dx} = 0 \Rightarrow 6x^2 - 20x = 0 \Rightarrow x = 0, \frac{10}{3}$ oe	B1 M1 dM1 A1 **(4)**

Expand the brackets — B1

Differentiate the expanded form — M1

Set the derivative = 0 to get an algebraic equation
Solve the algebraic equation. — dM1 (both lines needed)

Correct values of *x* — A1

Of course, further explanation is needed for the method marks

Awarding marks

Here is an excerpt from the mark scheme:

1 (a)	$y = 2x^2(x-5) = 2x^3 - 10x^2$	B1
	$\frac{dy}{dx} = 6x^2 - 20x$	M1
	Sets $\frac{dy}{dx} = 0 \Rightarrow 6x^2 - 20x = 0 \Rightarrow x = 0, \frac{10}{3}$ oe	dM1 A1
		(4)

Expand the brackets — B1

Must be correct

Differentiate the expanded form — M1

For reducing at least one power of x by 1

Set the derivative = 0 and solve an algebraic equation — dM1

$y' = 0$ and solves their quadratic to get at least one root

A1

Awarding marks

Part (b) obviously requires the use of the answers to part (a) and this is reflected in the mark scheme:

One of $x \leq$ "0" or $x \geq$ "$\frac{10}{3}$". Allow for $x <$ "0" or $x >$ "$\frac{10}{3}$".

They must have only achieved a maximum of two x coordinates in (a).

$x \leqslant 0, \quad x \geqslant \frac{10}{3}$

Denotes that the marker must follow through the student's response

Awarding marks

Activity 4: marking student responses

Please mark the two questions given in Activity 4.
Mark schemes are available on the sheets.

Record your marks on the response sheet which will be shared anonymously.
Any comments/questions put in Chat.

Awarding marks

Activity 4: marking student responses

I hope you found the activity interesting.

Mark schemes are designed to cover most of the likely responses to a question.

This explains why they are long and detailed.

Experienced markers will have seen many of the techniques required in previous exams so the task of marking a full paper is not as daunting as it first appears.

Awarding marks

Students lose marks for all sorts of reasons, but there are some common errors which experienced teachers generally know about and teach their classes accordingly.

In the previous activity there were two commonly occurring errors – one for each question.

Spend a moment thinking what they could be.

Awarding marks

Students lose marks for all sorts of reasons, but there are some common errors which experienced teachers generally know about and teach their classes accordingly.

Here is a question from June 2019 Pure 1 which illustrates some of them.

8. The curve C with equation $y = f(x)$, $x > 0$, passes through the point $P(4, 1)$.

Given that $f'(x) = 4\sqrt{x} - 2 - \frac{8}{3x^2}$

(a) find the equation of the normal to C at P. Write your answer in the form $ax + by + c = 0$, where a, b and c are integers to be found.

(4)

(b) Find $f(x)$.

(5)

Spend a moment thinking what errors students could make.
There are some in (a) and in (b).

Awarding marks

The principal examiner's report had these points to make for part (a):

8. The curve C with equation $y = f(x)$, $x > 0$, passes through the point $P(4, 1)$.

Given that $f'(x) = 4\sqrt{x} - 2 - \frac{8}{3x^2}$

(a) find the equation of the normal to C at P. Write your answer in the form $ax + by + c = 0$, where a, b and c are integers to be found.

(4)

Misunderstandings seen that caused a loss in marks were:

- Integrating in part (a)
- Differentiating again in part (a) and finding $f''(4)$ as opposed to $f'(4)$
- Finding the equation of the tangent rather than normal in part (a)

Awarding marks

The principal examiner's report had these points to make for part (b):

8. The curve C with equation $y = f(x)$, $x > 0$, passes through the point $P(4, 1)$.

Given that $f'(x) = 4\sqrt{x} - 2 - \frac{8}{3x^2}$

(b) Find $f(x)$.

(5)

- Failing to add a constant in part (b)
- Making a sign slip when integrating $-\frac{8}{3x^2}$

Assessing IAL Mathematics

Arriving at a final grade

The raw mark for each of the 6 units is converted to a mark on the Uniform Mark Scale (UMS).

The purpose of the UMS is to take into account the relative difficulty of each unit as evidenced by the distribution of raw marks on that unit.

So a difficult paper (say paper 1) may have a grade A boundary at 56 marks, whereas an easier one (say paper 3) may have the grade A boundary at 60 marks.

A student who got 56 on paper 1 and 60 on paper 3 would have the same UMS (80) on each paper.

The final grade is found by adding all six UMS (grade A is 480 out of a possible 600)

Supporting IAL Mathematics

Supporting IAL Mathematics

Edexcel provides a multitude of support features for centres to help prepare students for exams.

• Regional Pearson support staff – can advise especially on upcoming courses, and published material

• Online and face to face courses – enable teachers to get to know the qualification (and count towards teacher professional development)

• Pearson paid-for publications – student text books to cover each unit and teacher books to support classroom work

• Schemes of work for each unit

• and…….

Supporting IAL Mathematics teaching

Examination preparation

Edexcel provides a multitude of support features to help prepare students for exams. These include:

- past papers and mark schemes
- a results analysis service
- a dedicated site where centres can easily select their own questions on a particular topic (for example, geometric sequences)
- a dedicated member of Edexcel permanent staff
- detailed examiner reports.

There will be further information on these in later slides

Supporting IAL Mathematics

Specifically for examinations

- ResultsPlus - analysis of student performance for own centre

- examWizard – enables a teacher to produce own worksheets based on examination questions

- Maths Emporium - easy access to past papers, mark schemes, grade boundaries and examiner reports

- easy access to a student's exam papers

ResultsPlus

- Free online results analysis tool for teachers
- Provides a detailed breakdown of student performance in Edexcel exams.
- Identify topics and questions where the student could benefit from further learning
- Use this knowledge to inform teaching strategies and approaches
- Provides a comparison of student performance at regional level.
- Allows centres to view their country's results compared to the total Edexcel cohort.
- Mock exams results can also be fed into the system to produce an analysis
- Schools can sign up for free ResultsPlus account in just a few quick and easy steps:

https://qualifications.pearson.com/en/support/Services/ResultsPlus.html

ResultsPlus

1.
Student takes exam on paper

2.
Exam papers scanned

3.
Examiners mark papers online

4.
Performance reports shared

ResultsPlus

Grade Performance

- Whole centre
- Department
- Class
- Student

Detailed Analysis

- Performance on each question
- Comparison to Edexcel data

Skills Maps

- Curriculum mapped
- Contextualised performance

Comparison

- by subject
- by class
- by specification
- by centre
- by year

Mock Analysis

- Provides insight
- Develops student learning

Exam Documents

- Exam per
- Mark schemes
- Examiners reports

examWizard

- Free tool for teachers containing a bank of past paper questions to help create their own bespoke mock exams and tests to focus on particular topic areas as needed
- Use existing mark schemes for accurate marking
- Use existing examiner report for insight
- Use the results to understand where students need more support, informing teaching strategies.

https://qualifications.pearson.com/en/support/Services/examwizard.html?utm_source=guide&utm_medium=print&utm_campaign=GBSEMA0618GQA16&utm_content=makingastart

Access to Script (ATS) OnlinePortal

Access to Scripts (ATS) is a free online portal which allows teachers to immediately access electronically marked exam papers

Provides enhanced transparency and

- Offers transparent approach to marking process
- Provides better understanding of marking before requests for enquiries about results are made
- Provides excellent aid for teaching and preparing other cohorts for examinations by helping you to evaluate a student's performance on particular questions in relation to what they have been taught.

Available instantly from results day for all our examination series, for a defined window, you can view and download scripts which have been marked online free of charge from our Self-Service Portal.

For more information on ATS, and the post results windows, visit our post-results pages.

https://qualifications.pearson.com/en/support/Services/access-to-scripts.html

Mathematics Emporium

- Free resource for teachers containing all past papers
- See complete mark schemes for each paper
- See grade boundaries for each paper
- Specification and practice papers
- Examiner reports for each paper

https://www.mathsemporium.com/mathematics-emporium/?redirect_to=https%3A%2F%2Fwww.mathsemporium.com%2F

Contact your dedicated Subject Advisor

Subject Advisor details: Mark Heslop

Twitter: @EmporiumMaths
Email: TeachingMaths@pearson.com

Sign up for monthly newsletters to stay on top of qualification updates, training, course materials and industry news.

Support Overview

Free Support

- Getting Started Guide & Scheme of Work
- Welcome to Pearson Events
- Subject interpretation of transferable skills
- Subject Advisor
- Results Plus
- Regional Support Manager

Additional support for selected subjects

- Curriculum Matched Publishing
- Lesson plans
- Exemplar Marked Responses
- Topic booklets & Subject guides
- Additional SAMs
- Exam Wizard

Curriculum Matched Resources

Developed for the latest International A Level Mathematics specification, these Mathematics 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.

https://qualifications.pearson.com/en/qualifications/edexcel-international-advanced-levels/mathematics-2018.resources.html?filterQuery=category:Pearson-UK:Publisher%2FPearson

Other useful links

1. Grade Boundaries

This page shows the minimum marks needed to achieve a certain grade for all UK and international examinations. Also refer to the examiners report which is available for download with other documents.

2. Examination Results Statistics

Results statistics summarise the overall grade outcomes of candidates sitting Pearson Edexcel examinations.

3. Progress to University

Here you can find information and guidance about how to progress to universities worldwide with Pearson Edexcel qualifications.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