Delegate Booklet
Course Title: Welcome to Pearson International A Level Mathematics
YMA01
YMA01-23IF1

Name..
Date..

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About this event

Course Title: Welcome to Pearson International A Level Mathematics YMA01
Course Code: YMA01-23IF1

Aims and Objectives of the event

Course description:
This face-to-face event is designed for teachers who are new to delivering the International A Level Mathematics specification. This event will give you an understanding of the content of the qualification and how to cover it, an understanding of the mark schemes and practise applying them using exemplar student work, as well as access to the range of Pearson support available to teachers.

In this training, delegates will: -

- identify how the qualifications are devised
- review the content of the qualification
- explore how to plan the course and/or lessons
- understand the assessment of the qualification and how to prepare students
- identify the support available from Pearson
- network and share ideas with other teachers.

Agenda

Time	Item
10:00	Introductions
10:10	Welcome to Pearson – getting a good start
10:25	Session 1 The content of the course
11:10	Session 2 How is the contented assessed?
11:30	BREAK
11:45	Session 2 continued
12:45	Lunch
13:45	Session 3 Marking and mark schemes
14:45	Session 4 – Support from Pearson
16:00	End of training

Activity 1 – What are the details of the Specification?

- Use the extract from the Edexcel International GCSE specification and the specification for Pure 1
- Complete the table to summarise your findings on how much common material there is between the two.
- Put an x in the column you think is most appropriate

Spec reference	Fully in IGCSE	Partly in IGCSE	New
1.1			
1.2			
1.3			
1.4			
1.5			
1.6			
1.7			
1.8			
1.9			
1.10			
1.11			
1.12			
2.1			
2.2			
3.1			
3.2			
3.3			
4.1			
4.2			
4.3			
5			x

Extract

1.1 Laws of indices for all rational exponents.

1.2 Use and manipulation of surds. Students should be able to rationalise denominators.

1.3 Quadratic functions and their graphs.

1.4 The discriminant of a quadratic function.

1.5 Completing the square. Solution of quadratic equations. Solution of quadratic equations by factorisation, use of the formula, use of a calculator and completing the square.

1.6 Solve simultaneous equations; analytical solution by substitution.

1.7 Interpret linear and quadratic inequalities graphically.

1.8 Represent linear and quadratic inequalities graphically. Represent linear and quadratic inequalities graphically. Shading and use of dotted and solid line convention is required.

1.9 Solutions of linear and quadratic inequalities.

1.10 Algebraic manipulation of polynomials, including expanding brackets and collecting like terms, factorisation. Factorisation of polynomials of degree n, $n \leq 3$. The notation f(x) may be used.

1.11 Graphs of functions; sketching curves defined by simple equations. Geometrical interpretation of algebraic solution of equations. Use of intersection points of graphs of functions to solve equations. Functions to include simple cubic functions and the reciprocal functions
Knowledge of the term asymptote is expected.

Also, trigonometric graphs.

1.12 Knowledge of the effect of simple transformations on the graph of y = f(x) as represented by
y = af(x), y = f(x) + a, y = f(x + a), y = f(ax).

Students should be able to apply one of these transformations to any of the above functions (quadratics, cubics, reciprocals, sine, cosine, and tangent) and sketch the resulting graphs. Given the graph of any function y = f(x), students should be able to sketch the graph resulting from one of these transformations.

2.1 Equation of a straight line, including the forms $y - y_1 = m(x - x_1)$ and ax + by + c = 0

2.2 Conditions for two straight lines to be parallel or perpendicular to each other

3.1 The sine and cosine rules, and the area of a triangle in the form 1/2 ab sin C.

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

3.3 Sine, cosine and tangent functions. Their graphs, symmetries and periodicity.

4.1 The derivative of f(x) as the gradient of the tangent to the graph of y = f(x) at a point; the gradient of the tangent as a limit; interpretation as a rate of change; second order derivatives

4.2 Differentiation of x^n, and related sums, differences and constant multiples.

4.3 Applications of differentiation to gradients, tangents and normals.

5. Integration

Notes

Activity 2 – How is all the content assessed?

- Use the content of Pure 1, sections 1.1 to 1.5 to write a question which would assess student's ability.
- Write an answer to go with the question.
- Is there more than one method?
- How many marks would you give to the question and why? You do not need to write a mark scheme, but do think about how many marks to give it.

What students need to learn:		**Guidance**
1.	**Algebra and functions**	
1.1	Laws of indices for all rational exponents.	$a^m \times a^n = a^{m+n}$, $a^m \div a^n = a^{m-n}$, $(a^m)^n = a^{mn}$ The equivalence of $a^{\frac{m}{n}}$ and $\sqrt[n]{a^m}$ should be known.
1.2	Use and manipulation of surds.	Students should be able to rationalise denominators.
1.3	Quadratic functions and their graphs.	
1.4	The discriminant of a quadratic function.	Need to know and to use $b^2 - 4ac > 0$, $b^2 - 4ac = 0$ and $b^2 - 4ac < 0$
1.5	Completing the square. Solution of quadratic equations.	Solution of quadratic equations by factorisation, use of the formula, use of a calculator and completing the square. $ax^2 + bx + c = a\left(x + \frac{b}{2a}\right)^2 + \left(c - \frac{b^2}{4a}\right)$

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Activity 3 – General Mathematical Abilities

- What general mathematical abilities would you require from Students following an A level course in mathematics?
- Write down at least three below

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Activity 4 – Using a mark scheme

- Use the copy of the Pure 2 specification and the practice paper Pure 2 to find the coverage of the paper. This is also provided separately.
- Record your findings in the table below.

What students need to learn:		Guidance
1. Proof		
1.1	Understand and use the structure of mathematical proof, proceeding from given assumptions through a series of logical steps to a conclusion; use methods of proof stated below:	
1.2	Proof by exhaustion	Proof by exhaustion. This involves trying all the options. Suppose x and y are odd integers less than 7. Prove that their sum is divisible by 2.
1.3	Disproof by counter example.	Disproof by counter example – show that the statement "$n^2 - n + 1$ is a prime number for all values of n" is untrue.
2. Algebra and functions		
2.1	Simple algebraic division; use of the Factor Theorem and the Remainder Theorem.	Only division by $(ax + b)$ or $(ax - b)$ will be required. E.g. Students should know that if $\mathrm{f}(x) = 0$ when $x = \frac{b}{a}$, then $(ax - b)$ is a factor of $\mathrm{f}(x)$. Students may be required to factorise cubic expressions such as $x^3 + 3x^2 - 4$ and $6x^3 + 11x^2 - x - 6$. Students should be familiar with the terms 'quotient' and 'remainder' and be able to determine the remainder when the polynomial $\mathrm{f}(x)$ is divided by $(ax + b)$.
3. Coordinate geometry in the (x, y) plane		
3.1	Coordinate geometry of the circle using the equation of a circle in the form $(x - a)^2 + (y - b)^2 = r^2$ and including use of the following circle properties: (i) the angle in a semicircle is a right angle; (ii) the perpendicular from the centre to a chord bisects the chord; (iii) the perpendicularity of radius and tangent.	Students should be able to find the radius and the coordinates of the centre of the circle, given the equation of the circle and vice versa.

What students need to learn:		Guidance
4.	**Sequences and series**	
4.1	Sequences, including those given by a formula for the nth term and those generated by a simple relation of the $x_{n+1} = \mathrm{f}(x_n)$.	
4.2	Understand and work with arithmetic sequences and series, including the formula for the nth term and the sum of a finite arithmetic series; the sum of the first n natural numbers.	The proof of the sum formula should be known. Understanding of $\sum$ notation will expected.
4.3	Increasing sequences, decreasing sequences and periodic sequences.	
4.4	Understand and work with geometric sequences and series, including the formulae for the nth term and the sum of a finite geometric series; the sum to infinity of a convergent geometric series, including the use of $\lvert r \rvert < 1$.	For example, given the sum of a series students should be able to use logs to find the value of n. The proof of the sum formula for a finite series should be known. The sum to infinity may be expressed as S_∞.
4.5	Binomial expansion of $(a + bx)^n$ for positive integer n.	The notations $n!$, $\binom{n}{r}$ and ${}^nC_r$ may be used.
5.	**Exponentials and logarithms**	
5.1	$y = a^x$ and its graph.	$a > 0$, $a \neq 1$
5.2	Laws of logarithms.	To include $\log_a(xy) \equiv \log_a x + \log_a y$, $\log_a\left(\frac{x}{y}\right) \equiv \log_a x - \log_a y$ $\log_a x^k \equiv k \log_a x$, $\log_a\left(\frac{1}{x}\right) \equiv -\log_a x$, $\log_a a = 1$ where $a, x, y > 0$, $a \neq 1$.
5.3	The solution of equations of the form $a^x = b$.	Students may use the change of base formula.

What students need to learn:		Guidance
6. Trigonometry		
6.1	Knowledge and use of $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$, and $\sin^2\theta + \cos^2\theta = 1$.	
6.2	Solution of simple trigonometric equations in a given interval.	Students should be able to solve equations such as $\sin\left(x+\frac{\pi}{2}\right) = \frac{3}{4}$ for $0 < x < 2\pi$, $\cos(x + 30°) = \frac{1}{2}$ for $-180° < x < 180°$, $\tan 2x = 1$ for $90° < x < 270°$, $6\cos^2 x + \sin x - 5 = 0$ for $0 \leqslant x < 360°$, $\sin^2\left(x+\frac{\pi}{6}\right) = \frac{1}{2}$ for $-\pi \leqslant x < \pi$.
7. Differentiation		
7.1	Applications of differentiation to maxima and minima and stationary points, increasing and decreasing functions.	To include applications to curve sketching. Maxima and minima problems may be set in the context of a practical problem.
8. Integration		
8.1	Evaluation of definite integrals.	
8.2	Interpretation of the definite integral as the area under a curve.	Students will be expected to be able to evaluate the area of a region bounded by a curve and given straight lines. For example, find the finite area bounded by the curve $y = 6x - x^2$ and the line $y = 2x$. $\int x\,dy$ will not be required. Students will be expected to be able to evaluate the area of a region bounded by two curves.
8.3	Approximation of area under a curve using the trapezium rule.	For example, use the trapezium rule to approximate $\int_0^1 \sqrt{(2x+1)}\,dx$ using four strips. Use of increasing number of trapezia to improve accuracy and an estimate of the error may be required.

Pearson

Question number	Specification Content Reference / Topic Area / Sub-Topic
1	e.g. 4.5 Binomial expansion
2	
3	
4	
5	
6	
7	
8	
9	
10	

Notes...

Activity 5 – Assessment Objectives on a paper

- Look at the two questions together with the mark schemes for them.
- Assign AO marks to each of the questions.
- Q6 and Q7 from June 19 paper 1

6 The line with equation $y = 4x + c$, where c is a constant, meets the curve with equation $y = x(x - 3)$ at only one point.

(*a*) Find the value of c.

(4)

(*b*) Hence find the coordinates of the point of intersection.

(3)

(Total for Question 6 is 7 marks)

7

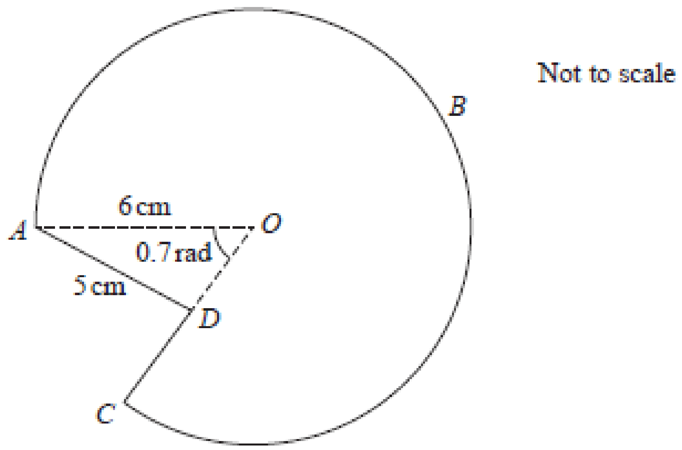

Figure 2

The shape $ABCDA$ consists of a sector $ABCOA$ of a circle, centre O, joined to a triangle AOD, as shown in Figure 2.

The point D lies on OC.
The radius of the circle is 6 cm, length AD is 5 cm and angle AOD is 0.7 radians.

(*a*) Find the area of the sector $ABCOA$, giving your answer to one decimal place.

(3)

Given angle ADO is obtuse,

(*b*) find the size of angle ADO, giving your answer to 3 decimal places.

(3)

(*c*) Hence find the perimeter of shape $ABCDA$, giving your answer to one decimal place.

(4)

(Total for Question 7 is 10 marks)

Mark scheme

Question Number	Scheme
6.(a)	Sets $4x+c=x(x-3)$ and attempts to write as a 3TQ Uses $b^2=4ac$ for their $x^2-7x-c=0$ Correct equation $49=-4c$ or $49+4c=0$ $c=-12.25$ oe
(b)	Attempt to solve $x^2-7x-c=0$ with their c Attempt to find the y coordinate for their x coordinate $\left(\frac{7}{2},\frac{7}{4}\right)$ oe

a)

Question Number	Scheme	
7.(a)	Attempts to use $\frac{1}{2}r^2\theta$ with $r=6$ and any allowable angle θ Full method to find area $\frac{1}{2}\times6^2\times(2\pi-0.7)$ or $\pi\times6^2-\frac{1}{2}\times6^2\times0.7$ $=100.5\text{ cm}^2$ (awrt)	
(b)	Attempts $\frac{\sin\angle ADO}{6}=\frac{\sin0.7}{5}\Rightarrow\sin\angle ADO=0.77...$ $\angle ADO=2.258$ (awrt)	
(c)	Attempts arc length $ABC=6\times(2\pi-0.7)$ Attempts length OD $\frac{\sin(\pi-0.7-"2.258")}{OD}=\frac{\sin0.7}{5}\Rightarrow OD=...$ Full method to find perimeter = "33.50"+5+ 6–"1.42" = 43.1 cm	33.50 1.42
Alt (c)	Alternative for arc length $ABC=12\pi-6\times0.7$ Alternative for finding OD using the cosine rule $OD^2=6^2+5^2-2\times6\times5\cos(\pi-0.7-"2.258")\Rightarrow OD$	

AO1	Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of contexts.
AO2	Recall, select and use their Construct rigorous mathematical arguments and proofs through use of precise statements, logical deduction and inference and by manipulation of mathematical expressions, including the construction of extended arguments for handling substantial problems presented in unstructured form.
AO3	Recall, select and use their knowledge of standard mathematical models to represent situations in the real world; recognise and understand given representations involving standard models; present and interpret results from such models in terms of the original situation, including discussion of the assumptions made and refinement of such models.
AO4	Comprehend translations of common realistic contexts into mathematics; use the results of calculations to make predictions, or comment on the context; and where appropriate, read critically and comprehend longer mathematical arguments or examples of applications.
AO5	Use contemporary calculator technology and other (such as formulae booklets or statistical tables) accurately and efficiently; understand when not to use such technology, and its limitations. Give answers to appropriate accuracy.

1. Which AOs do you think are to be found in Q6? How many marks would you give to each AO?	1. AO1 2. AO2 3. AO3 4. AO4 5. AO5
2. Which AOs do you think are to be found in Q7? How many marks would you give to each AO?	1. AO1 2. AO2 3. AO3 4. AO4 5. AO5

Notes

Activity 6 – Continuity from International GCSE to A level

- Suggest some other types of questions where working MUST be shown because of issues over use of a calculator.
- Write these in the space below.

Activity 7 - Assigning marks to a question

- Decide which processes should be paired to get a mark.
- Record your decision below.

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:

A Expand the brackets
B Differentiate the expanded form
C Set the derivative = 0 to get an algebraic equation
D Solve the algebraic equation.

There are 4 processes for 3 marks.
Which two processes should be combined to get a single mark?

1. A & B	1. Yes 2. No
2. B & C	1. Yes 2. No
3. C & D	1. Yes 2. No
4. Some other combination	

Notes..

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Activity 8 – Marking exercise

- Use the accompanying mark scheme to mark these questions from January 2019 paper 1.

1. Find

$$\int\left(\frac{2}{3}x^3 - \frac{1}{2x^3} + 5\right)\mathrm{d}x$$

simplifying your answer.

(4)

Question Number	Scheme	Marks
1.	$\int \frac{2}{3}x^3 - \frac{1}{2x^3} + 5\,\mathrm{d}x = \frac{2}{3}\times\frac{x^4}{4} - \frac{1}{2}\times\frac{x^{-2}}{-2} + 5x + c$	M1 A1
	$= \frac{1}{6}x^4 + \frac{1}{4}x^{-2} + 5x + c$	A1 A1 **(4 marks)**

M1 For raising any power by 1 eg. $x^3 \to x^4$, $x^{-3} \to x^{-2}$, $5 \to 5x$ or eg. $x^3 \to x^{3+1}$

A1 For two of $\frac{2}{3}\times\frac{x^4}{4}$, $-\frac{1}{2}\times\frac{x^{-2}}{-2}$, $+5x$ correct (un-simplified) . Accept $5x^1$
This may be implied by a correct simplified answer

A1 For two of $\frac{1}{6}x^4$, $+\frac{1}{4}x^{-2}$, $+5x$ correct and in simplest form. Accept forms such as $\frac{x^4}{6}$, $\frac{1}{4x^2}$,
CONDONE $+\frac{0.25}{x^2}$ but NOT $\frac{1/4}{x^2}$, $\frac{5x}{1}$, $-\left(-\frac{1}{4}x^{-2}\right)$

A1 Fully correct and simplified with $+c$ all on one line. Accept simplified equivalents (see above) and ignore any spurious notation. ISW after a correct simplified answer is achieved.

Candidate A

$$\frac{dy}{dx} = \frac{2}{3}x^3 - \frac{1}{2x^3} + 5$$

$$\cancel{= \frac{2x^4}{3 \cdot 4} + \frac{2x^4}{4} + \frac{5x^1}{1}}$$

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

$$y = \frac{\frac{2}{3}x^4}{4} - \frac{2x^{-2}}{-2} + \frac{5x^1}{1}$$

$$y = \frac{1}{6}x^4 - 1x^{-2} + 5x$$

Candidate B

$$f(x) = \frac{\frac{2}{3}}{4}x^4 - \left(\frac{\frac{1}{2}}{-2}x^{-2}\right) + 5x + c$$

$$= \frac{8}{3}x^4 + x^{-2} + 5x + c.$$

Candidate C

$$\frac{2}{3}x^3 - \frac{1}{2x^3} + 5$$

$$= \frac{1}{6}x^4 - \frac{1}{8}x^4 + 5x + c.$$

$$= \cancel{\frac{2}{24}x} \; \frac{1}{24}x^4 + 5x + c.$$

4.

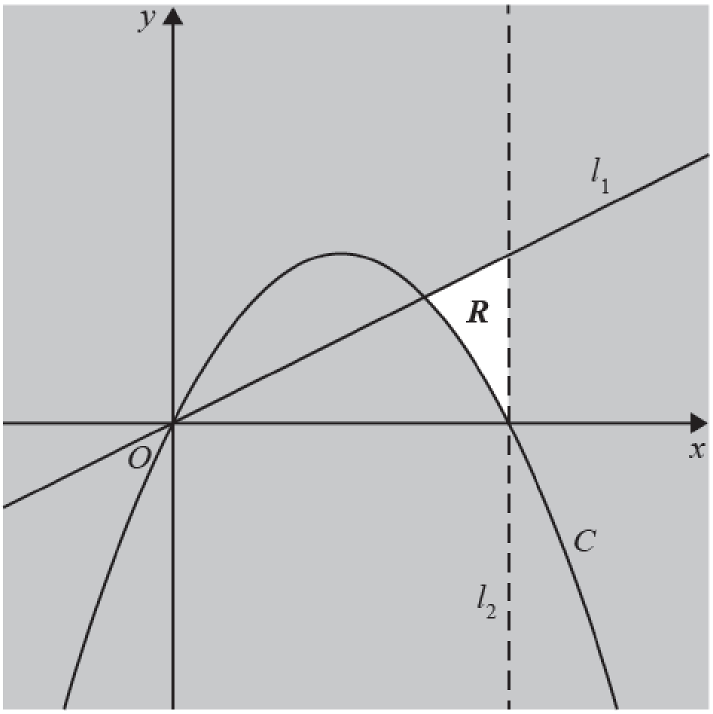

Figure 1

Figure 1 shows a line l_1 with equation $2y = x$ and a curve C with equation $y = 2x - \frac{1}{8}x^2$

The region R, shown unshaded in Figure 1, is bounded by the line l_1, the curve C and a line l_2

Given that l_2 is parallel to the y-axis and passes through the intercept of C with the positive x-axis, identify the inequalities that define R.

(3)

Question Number	Scheme	Marks
4.	When ---- represents < or > and —— represents $\le$ or $\ge$	
	Either $2y \le x$ or $y \ge 2x - \frac{1}{8}x^2$	B1
	$2x - \frac{1}{8}x^2 = 0 \Rightarrow x = 16 \Rightarrow x < ...$ or $x \le ...$	M1
	$x < 16$, $2y \le x$ and $y \ge 2x - \frac{1}{8}x^2$	A1
		(3) **(3 marks)**
Alt1	When ---- represents $\le$ or $\ge$ and —— represents < or >	
	Either $2y < x$ or $y > 2x - \frac{1}{8}x^2$	B1
	$2x - \frac{1}{8}x^2 = 0 \Rightarrow x = 16 \Rightarrow x < ...$ or $x \le ...$	M1
	$x \le 16$, $2y < x$ and $y > 2x - \frac{1}{8}x^2$	A1
		(3)

B1 Sight of $2y \le x$ or $y \ge 2x - \frac{1}{8}x^2$. Either inequality is sufficient for B1 and they may be written in an equivalent correct form (see NB below)

NB Inequalities cannot be in terms of R

M1 Attempts to find the upper bound for x to define R. Solves to find where the quadratic intersects the x-axis and then uses their value to write $x <$… or $x \le$ …. Use general principles for solving a quadratic equation (page 5). They do not need to find or state $x = 0$ and ignore any lower bound eg $0 < x < ...$

A1 $2y \le x$, $y \ge 2x - \frac{1}{8}x^2$ and $x < 16$ (Allow $A \le x < 16$ where $A \le 12$).

Candidates may write more than one inequality for a particular boundary. In these cases mark the last one. Correct inequalities labelled on the graph are also acceptable, however, an inequality written below takes precedence.

NB You may see $y \leqslant \frac{x}{2}$ for $2y \leqslant x$ or even $2x - \frac{1}{8}x^2 \le y \le \frac{x}{2}$ oe

Alternatively, some candidates may express their inequalities involving a boundary for a dashed line using $\le$ or $\ge$ and a boundary for a solid line using < or >. It may not always be clear so mark positively. See Alt1

Candidate D

ans : $R < \frac{x}{2}$

$R < x + c$

$R > 2x - \frac{1}{8}x^2$

Candidate E

l_2 when $y=0$ $x=$

$2x - \frac{1}{8}x^2 = 0.$

$x(2 - \frac{1}{8}x) = 0.$

$\cancel{x}$ $\frac{1}{8}x = 2$

$x = 16$

$x < 16$

$R =$ $2y \leq x$

$y \leq 2x - \frac{1}{8}x^2.$

$x < 16$

Candidate F

$0 = 2x - \frac{1}{8}x^2$

$x(2 - \frac{1}{8}x)$ $\quad 2 - \frac{1}{8}x = 0$

$\cancel{-\frac{1}{8}}\cancel{-1}\cancel{-\frac{1}{8}}x = -2 \div \frac{1}{8}$

$x = 0,$ $\quad x = \frac{1}{4}$

$\cancel{(\frac{1}{4}, 0)}$ $\quad L_1 = \frac{2y}{2} = \frac{x}{2}$

$y = \frac{1}{2}x$

$y \geq 2x - \frac{1}{8}x^2$

$y \leq \frac{1}{2}x$

$y < \frac{1}{4}$

Question	Marks	Comment
A		
B		
C		
D		
E		
F		

Notes...

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Activity 9 – Access to Scripts and ResultsPlus

- How could you see Access To Scripts (ATS) and ResultsPlus being used on a unitised (modular) course?
- Write down 3 suggestions in the space below.

Notes..

PERSONAL LEARNING

Things to do:

Things to avoid:

Your ideas: