LEVEL 2

WJEC Level 2 Additional Mathematics

Approved by Qualifications Wales

Sample Assessment Materials

Unit 1: Algebra

Teaching from 2026
For award from 2027

This Qualifications Wales regulated qualification is not available to centres in England.

Made for Wales.
Ready for the world.

WJEC would like to thank the students and teachers of Fitzalan High School, Cardiff and Llanwern High School, Newport for their participation in the creation of these covers.

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Surname	Centre number	Candidate number
First name(s)		0

Level 2

5322U1

Additional Mathematics – Unit 1 Algebra

50 minutes

SAMPLE ASSESSMENT MATERIALS

Additional materials

The use of a calculator is **not** permitted in this examination.

Instructions to candidates

Use black ink or black ball-point pen. Do **not** use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces provided at the top of this page.

Answer **all** the questions in the spaces provided.

Write your answers in the spaces provided in this booklet. If you need more space, use the additional page(s) at the back of this booklet, taking care to number the question(s) correctly.

For examiner's use only		
Question	**Maximum mark**	**Mark awarded**
1.	**2**	
2.	**6**	
3.	**4**	
4.	**3**	
5.	**4**	
6.	**8**	
7.	**2**	
8.	**4**	
9.	**3**	
10.	**4**	
Total	**40**	

Take π as 3·14.

Information for candidates

The number of marks is given in brackets at the end of each question or part-question.

Formula List – Unit 1 Algebra

Arithmetic Series

$$S_n = \frac{1}{2}n[a + l] = \frac{1}{2}n[2a + (n-1)d]$$

Geometric Series

$$S_n = \frac{a(1 - r^n)}{1 - r}$$

Answer **all** questions.

1. Find the sum of the first 50 terms of the following arithmetic sequence. [2]

Examiner only

5, 9, 13, 17, ……..

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2. Use an algebraic method to solve the simultaneous equations [6]

$x^2 + y^2 = 40 - 17x$ and $x + y = 5$.

Examiner only

3. Fully factorise $x^4 - 17x^2 + 16$, and hence solve $x^4 - 17x^2 + 16 = 0$. [4]

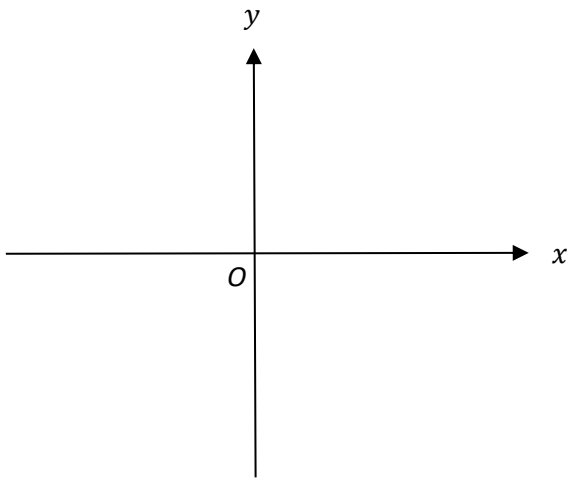
Examiner only

4. The fifth and sixth terms of a geometric series are 162 and 486 respectively.
Find the common ratio of this geometric series. [3]

Examiner only

5. In parts (a) and (b), a, b and c are all non-zero integers.

(a) On the axes below, sketch a graph to represent the equation $y = ax^2 + bx + c$ when it has no real roots. [1]



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(b) Write down values for a, b and c such that the equation $ax^2 + bx + c = 0$ has no real roots.
You must show your working to justify your conclusion. [3]

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$a =$ ……, $b =$ ……, $c =$ ……

6. (a) Rationalise the denominator in the following expression. [3]

Examiner only

$$\frac{1}{5-\sqrt{3}}$$

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(b) Simplify $\left(\sqrt{6}+5\sqrt{8}\right)\left(2\sqrt{6}+\sqrt{8}\right)-\left(2\sqrt{13}\right)^2$.
Give your answer in the form $a\sqrt{b}$, where b is a prime number. [5]

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7. Write $\sqrt[3]{\left(\frac{d^{\frac{5}{4}}}{d}\right)}$ as a single power of d. [2]

Examiner only

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8. Prove that $\frac{a+b}{a-b} - \frac{a-b}{a+b} \equiv \frac{4ab}{(a-b)(a+b)}$. [4]

Examiner only

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9. Solve the equation $16^x = 4^{37} \times 8^{-10}$. [3]

Examiner only

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10. Find the minimum value of the expression $(3x + 1)(x + 2) + (5 - 2x)(x + 4)$. [4]

Examiner only

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Minimum value is …….

END OF QUESTIONS

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.
	…… ……

MARK SCHEME

Level 2 Additional Mathematics Unit 1: Algebra SAMs		Mark	Comments
1.	$(S_{50} =) \frac{50}{2}[2(5) + (50-1) \times 4]$ = 5150	M1 A1	FT 'their stated or derived values for a and d'. CAO
1.	Alternative method 50th term = ([5 + (50 − 1) × 4] =) 201 $(S_{50} =) \frac{50}{2}[5 + 201]$ = 5150	M1 A1	FT 'their stated values for a' and 'their 50th term (stated or derived)'. CAO
2.	$y = 5 - x$ $x^2 + (5-x)^2 = 40 - 17x$ $2x^2 + 7x - 15 = 0$ $(2x-3)(x+5) = 0$ $x = 1.5$ AND $x = -5$ $y = 3.5$ and $y = 10$	B1 M1 A1 M1 A1 A1	Or $x = 5 - y$ FT 'their y' attempt to substitute. Must equate to zero (may be implied by answer). FT equivalent level of difficulty. Or a correct (x, y) pair. Or a correct 2nd (x, y) pair. FT x values from M1A0.
3.	Recognising that the expression is an underlying quadratic in structure. $(x+1)(x-1)(x+4)(x-4)$ (=0) $(x =) \pm 1$ AND $(x =) \pm 4$	S1 B2 B1	For example: • Attempt at factorising into two quadratic factors • Sight of x^2 being assigned to a linear variable, e.g. $y = x^2$ • Sight of $(x^2 =)\ 1$ AND $(x^2 =)\ 16$. The awarding of any subsequent B marks implies S1. Award B1 for any two or three brackets which multiply to give $x^4 - 17x^2 + 16$.
4.	$ar^4 = 162$ AND $ar^5 = 486$ $\frac{ar^5}{ar^4} = \frac{486}{162}$ $(r =)\ 3$	B1 M1 A1	
5.(a)	A positive quadratic graph above the x-axis OR a negative quadratic graph below the x-axis.	C1	

5.(b)	Using $\boldsymbol{b^2 - 4ac}$ $\boldsymbol{b^2 - 4ac < 0}$ for no real roots. Values for $\boldsymbol{a}$, $\boldsymbol{b}$ and $\boldsymbol{c}$ which give a negative discriminant.	M1 B1 A1	Substitution into the discriminant with 'their $\boldsymbol{a}$, $\boldsymbol{b}$ & $\boldsymbol{c}$' must be seen for M1. Accept any statement that says 'their value for the discriminant' is negative implies there are no real roots OR no real roots implies the discriminant is negative. Answer line takes precedence. If no workings shown, award SC1 for 'their $\boldsymbol{a}$, $\boldsymbol{b}$ & $\boldsymbol{c}$' giving a negative discriminant.
6.(a)	$\frac{1}{5-\sqrt{3}} \times \frac{5+\sqrt{3}}{5+\sqrt{3}}$ o.e. $\frac{5+\sqrt{3}}{25+5\sqrt{3}-5\sqrt{3}-\sqrt{3}\sqrt{3}}$ o.e. $= \frac{5+\sqrt{3}}{22}$	M1 M1 A1	Multiplying by $\frac{-5-\sqrt{3}}{-5-\sqrt{3}}$
6.(b)	$12 + \sqrt{48} + 10\sqrt{48} + 40$ $\left(-\left(2\sqrt{13}\right)^2\right)$ Sight of (−)52 $= 44\sqrt{3}$	M2 B1 A2	M1 for 2 or 3 terms correct. From $\left(2\sqrt{13}\right)^2$ CAO. A1 for $11\sqrt{48}$ or $22\sqrt{12}$. FT for A1 only for a correct simplification of 'their expression' provided M1B1 or M2B0 previously awarded.
7.	$d^{\frac{1}{12}}$	B2	B1 for any one of the following: • $(d^{\frac{1}{4}})^{\frac{1}{3}}$ • $d^{\frac{1}{4}}$ • $\frac{d^{\frac{5}{12}}}{d^{\frac{1}{3}}}$ • Numerator of $d^{\frac{5}{4}\times\frac{1}{3}}$ • Denominator of $d^{(1\times)\frac{1}{3}}$
8.	(LHS ≡) $\frac{(a+b)(a+b)-(a-b)(a-b)}{(a-b)(a+b)}$ o.e. $\frac{(a^2+2ab+b^2)-(a^2-2ab+b^2)}{(a-b)(a+b)}$ $\frac{a^2+2ab+b^2-a^2+2ab-b^2}{(a-b)(a+b)}$ $\frac{4ab}{(a-b)(a+b)}$ or showing LHS ≡ RHS	M1 A1 A1 A1	Brackets must be shown. Must be seen or implied as a quotient. Multiplication of second bracket by −1. CSO

9.	$\boldsymbol{4x = 74 - 30}$ $\boldsymbol{x = 11}$	B2 B1	B1 for one of the following (does not have to be written as a power): • $4x$ • 74 • −30
9.	<u>Alternative method (deriving an equation from powers of 4)</u> $2x = 37 - 15$ $\boldsymbol{x = 11}$	B2 B1	B1 for one of the following (does not have to be written as a power): • $2x$ • −15
10.	$x^2 + 4x + 22$ $(x + 2)^2 \quad (\pm\ldots)$ (Minimum value =) 18	B2 M1 A1	B1 for: • $3x^2 + 6x + (1)x + 2$ o.e. • $5x + 20 - 2x^2 - 8x$ o.e. FT 'their $ax^2 + bx + c$' provided $a, b, c \neq 0$ CAO

How to read the mark scheme

- ‘M' marks are awarded for any correct method applied to appropriate working, even though a numerical error may be involved. Once earned they cannot be lost.
- ‘m’ marks are dependent method marks. They are only given if the relevant previous ‘M’ mark has been earned.
- ‘A' marks are given for a numerically correct stage, for a correct result or for an answer lying within a specified range. They are only given if the relevant M/m mark has been earned either explicitly or by inference from the correct answer.
- 'B' marks are independent of method and are usually awarded for an accurate result or statement.
- ‘S’ marks are awarded for strategy
- ‘E’ marks are awarded for explanation
- ‘U’ marks are awarded for units
- ‘P’ marks are awarded for plotting points
- ‘C’ marks are awarded for drawing curves
- ‘SC’ marks are awards for special cases
- CAO: correct answer only
- ISW: ignore subsequent working
- FT: follow through
- CSO: correct solution only

Mapping grid

Question	Marks	Assessment objective		
		AO1	AO2	AO3
1	2	2		
2	6	6		
3	4	4		
4	3		3	
5(a)	1	1		
5(b)	3		3	
6(a)	3	3		
6(b)	5	5		
7	2	2		
8	4			4
9	3	3		
10	4		4	
Total	**40**	**26**	**10**	**4**