REVISE
.wales

2.07 — Algebraic vocab, substitution & simplifying

Mark schemes for the 2.07 question pack

Spec 2.1.1, 2.1.2, 2.1.3, 2.1.7 — Unit 2

SOLUTIONS · 2025 SPECIFICATION

Mark schemes for the 14 questions in the corresponding revise.wales question pack (44 marks total). Sources: legacy WJEC GCSE papers, WJEC SAM, and custom-authored mark schemes. Pack layout © revise.wales.

16. (Numerator) $(4x + 1)(x - 2)$	B2	B1 for $(4x \ldots 1)(x \ldots 2)$ Allow equivalent e.g. $(x \ldots 0{\cdot}25)(4x \ldots 8)$
(Denominator) $4(x - 2)$	B1	
$\frac{4x + 1}{4}$ or $x + \frac{1}{4}$ $(x \neq 2)$	B1	Mark final answer. FT provided no more than 1 previous error and provided simplification required.

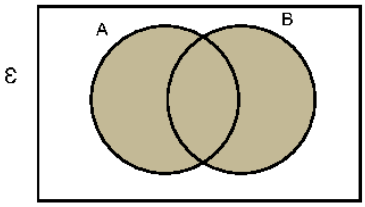
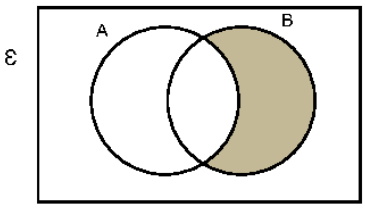
15. *(a)* $3\sqrt{5}$	B1	
15. *(b)* $4 \times \sqrt{49} - 2\sqrt{7 \times 3} - 2\sqrt{7 \times 3} + \sqrt{9}$ or $4 \times 7 - 2\sqrt{21} - 2\sqrt{21} + 3$ or equivalent	M1	Allow one incorrect term. $\sqrt{7}\sqrt{7}$ is insufficient for $\sqrt{49}$. $\sqrt{3}\sqrt{3}$ is insufficient for $\sqrt{9}$. Allow $\sqrt{7}\sqrt{3}$ or $\sqrt{3}\sqrt{7}$ for $\sqrt{21}$.
$31 - 4\sqrt{21}$	A1	$\sqrt{7}\sqrt{3}$ or $\sqrt{3}\sqrt{7}$ is insufficient for $\sqrt{21}$

11. $I \propto 1/d^2$ OR $I = k/d^2$ or equivalent $5 = k/2^2$ OR $k = 20$ $I = 20/d^2$ OR $I = 20/0{\cdot}5^2$ or equivalent $I = 80$ (lux)	B1 M1 M1 A1	Allow $I \propto k/d^2$ M1 implies B1. F.T. (for possible B0 M2 A0) for use of $I \propto d^2$ or $I \propto 1/d^n$ with $n > 0$ and $n \neq 2$. CAO. Use of $I \propto 1/d$, leading to $I = 10/d$ (or an answer of $I = 20$ (lux)) is awarded B0 FT M2 A0. Use of $I \propto d^2$, leading to $I = 1{\cdot}25\,d^2$ (or an answer of $I = 0{\cdot}3125$ (lux)) is awarded B0 FT M2 A0. Use of $I \propto 1/\sqrt{d}$, leading to $I = 5\sqrt{2}/\sqrt{d}$, (or an answer of $I = 10$ (lux)) is awarded B0 FT M2 A0.
12. $CAD = 2x$ (Reason =) Alternate segment (theorem) $BCD = 180 - 3x$ OR $BCD = 3(60 - x)$ (Reason =) Opposite angles in a cyclic quadrilateral (add up to 180°)	B1 E1 B1 E1	Check diagram. (If this is the only B mark awarded, then $2x$ marked on diagram must be unambiguous. Otherwise, ignore spurious angles on diagram.) Dependent on B1. Allow 'opposite segments'. Do not accept 'alternate angles' or 'opposite angles'. F.T. $180 - (x$ + 'their CAD'). Must be in simplest form. Mark final answer e.g. do not accept $60 - x$ or $x = 60$ If B0, E mark may be awarded provided there is a clear attempt to apply the circle theorem.
13.(a) $48x^2 + 6x - 48x^2 + 12x - 12x + 3$ OR $48x^2 + 6x - 48x^2 + 3$. $6x + 3$	B2 B1	Accept $48x^2 + 6x - (48x^2 - 12x + 12x - 3)$ or $48x^2 + 6x - (48x^2 - 3)$ B1 for $16x^2$ [$- 4x + 4x$] $- 1$ or $48x^2$ [$- 12x + 12x$] $- 3$ or $- 48x^2$ [$+ 12x - 12x$] $+ 3$. OR B1 if one error or incorrect (or extra or missing) term within entire expression. (An incorrect term may be implied e.g. $- 24x$ implies $- 12x - 12x$). Must be convincing. For last B1, do not accept $48x^2 + 6x - (48x^2 - 12x + 12x - 3)$ or $48x^2 + 6x - (48x^2 - 3)$ without further correct work seen before final $6x + 3$. If no work seen in (a), allow marks in (a) for work shown in (b)
13.(b) $-\frac{1}{2}$ or $-\frac{3}{6}$ or -0.5 or equivalent	B1	Mark final answer.

17. (Numerator) $(2x - 5)(x - 4)$ (Denominator) $2(x - 4)$ $\frac{2x-5}{2}$ or $x - \frac{5}{2}$ or equivalent.	B2 B1 B1	B1 for $(2x \ldots\ldots 5)(x \ldots\ldots 4)$ Mark final answer. F.T. provided no more than 1 previous error and provided simplification required.
Alternative method: *(Numerator)* $(x - 5/2)(2x - 8)$ $\frac{2x-5}{2}$ *or* $x - \frac{5}{2}$ *or equivalent.*	*B2* *B2*	*B1 for* $(x \ldots\ldots 5/2)(2x \ldots\ldots 8)$ *Mark final answer.* *F.T. provided at least B1 awarded, no more than 1 previous error and provided simplification required.*
18. (P[same colour] =) 10/16 × 9/15 + 6/16 × 5/15 or equivalent OR (P[different colours] =) 10/16 × 6/15 + 6/16 × 10/15 or equivalent. = 120/240 or equivalent 'Yes' with explanation (must refer to the 'other' probability)	M2 A1 E1	M1 for sight of any correct product. Award for the answer to either probability (total). Mark final answer. Do not ignore incorrect cancelling. If both probabilities are evaluated, accept 240 written as 16 × 15. If M0A0, award SC1 for an answer of 136/256 or 120/256 (method 'without replacement'). If M2A0 or SC1 awarded, then award E1 for 'No', provided only one answer evaluated (from calculating products), and a valid explanation given based on P[same colour] + P[different colours] = 1 or E1 for 'Yes' if both probabilities (incorrectly) evaluated and 'their P[same colour]' = 'their P[different colours]' E0 if both probabilities evaluated and 'their P[same colour]' + 'their P[different colours]' ≠ 1 with 'their P[same colour]' ≠ 'their P[different colours]'.

WJEC GCSE MATHEMATICS

AUTUMN 2020 MARK SCHEME

GCSE *Mathematics* Unit *1*: *Higher* Tier	Mark	Comments
1.(a) 5n − 3	B2	B1 for sight of 5n. Mark final answer.
1.(b) 17	B1	
1.(c) 2n + 2 OR 2(n + 1)	B2	If 2n + 2 is not their final answer allow B1 for sight of 2n + 2 in earlier work. B1 for a correct answer not simplified or incorrectly simplified e.g. n + n + 2.
2.(a)(i) 	B1	
2.(a)(ii) 	B1	
2.(b) A valid statement. e.g. 'all multiples of 6 are also multiples of 3' 'because 3 goes into 6', '6 is a multiple of 3'. '3 is a factor of 6'.	E1	Allow e.g. '(set) C is a subset of (set) A'. 'it is a multiple of 3' ' 6, 12, ... are also multiples of 3'.
3.(a) 9 −7	B2	B1 for each.
3.(b) At least 6 correct plots and no incorrect plot. A smooth curve drawn through their plots.	P1 C1	FT 'their (−2,9)' and 'their (2,−7)' Allow ± '½ a small square'. FT 'their 8 plots'. OR a curve through the 6 given points and (−2,9) and (2,−7). Allow intention to pass through their plots. (± 1 small square horizontal or vertical.)
3.(c) Line y = 1 drawn −0·8 AND 4·8	B1 B1	Must be at least 2cm long. FT intersection of 'their curve' with 'their y = 1' only if exactly two points of intersection and $y \neq 0$. If curve drawn, but no line drawn, allow a FT from intersection of 'their curve' with the line y = 1 only if exactly two points of intersection for B0 B1. Allow ± '1 small square'.

12. $6(2x+1)-4(3x-5)$ as a <u>numerator</u> within a single fraction $(3x-5)(2x+1)$ as a <u>denominator</u> h26 / $(3x-5)(2x+1)$	M1 M1 A1	Allow intention of brackets, e.g. $6\times 2x+1-4\times 3x-5$ CAO. Allow $26/(6x^2-7x-5)$ (If expanded, the denominator must be correct.) If M1 M1 A1, penalise further incorrect work –1. If no marks awarded, then SC1 for sight of 26.
13. (Linear scale factor =) $\sqrt[3]{}$ (1280 / 20) (= 4) $\sqrt[3]{}$ (1280 / 20) × 2·3 = 9·2 (cm)	B1 M1 A1	Or equivalent. Accept a method based on ratios e.g. 1 : 4 (from 20 : 1280 = 1 : 64 = 1 : 4^3) FT their derived scale factor (from $\sqrt[3]{}$). SC1 for an answer of 18.4 (using s.f. of 8, from $\sqrt{64}$).
<u>Alternative method</u> (using reciprocal scale factor) *(Linear scale factor =) $\sqrt[3]{}$(20 / 1280) (= 1 / 4)* 2·3 ÷$\sqrt[3]{}$(20 / 1280) OR 1 / $\sqrt[3]{}$(20 / 1280) × 2·3 *= 9·2 (cm)*	*B1* *M1* *A1*	*Or equivalent.* *Accept a method based on ratios.* *FT their derived scale factor (from $\sqrt[3]{}$).*
14. (a) 10x = 8·121212..... and 1000x = 812·1212.... <u>with</u> an attempt to subtract on both sides 804/990 (= 402/495 = 134/165)	M1 A1	Or x and 100x, or equivalent. Or a <u>complete</u> alternative method. An answer of 80·4/99 gains M1 only. ISW
<u>Alternative method</u> *0·8 + 0·0121212..... = 8/10 + 12/990 or equivalent* *804/990 (= 402/495 = 134/165)*	*M1* *A1*	*ISW*
14. (b) $6\sqrt{2}$	B1	
14. (c) $7\times 3+7\sqrt{5}-3\times 2\sqrt{5}-2(\sqrt{5})^2$ or equivalent $= 11+\sqrt{5}$	M1 A1	 Mark final answer. Accept $11+1\sqrt{5}$. If no marks awarded, SC1 for 3 correctly simplified terms i.e. 21, $7\sqrt{5}$, $-6\sqrt{5}$, -10.
15. • *FG* = *HG* (since *G* is the midpoint of *FH*) • *EG* is a common side • Angle *EGF* = Angle *EGH* (since *EG* and *FH* are perpendicular) SAS (or two sides and the <u>included</u> angle) so that EFG and EHG are congruent triangles.	B1 B1 B1 B1	Do not accept indications on the diagram. FT from B2 previously awarded. Must be convincing. Do not allow 'two sides and an angle'.
<u>Allow alternative method</u> • *FG = HG (since G is the midpoint of FH)* • *EG is a common side* • *EF = EH using Pythagoras* *SSS (or all corresponding sides equal) so that EFG and EHG are congruent triangles.*	*B1* *B1* *B1* *B1*	*Do not accept indications on the diagram.* *Must be convincing. An unsupported statement that EF = EH, or that triangle is 'isosceles', is insufficient.* *FT from B2 previously awarded. Allow RHS.* *Must be convincing.*

16. Sight of $4y^2 = 3 + my^2$ $(4-m)\,y^2 = 3$ OR $4y^2 - m\,y^2 = 3$ or equivalent $y^2 = 3/(4-m)$ OR $y^2 = -3/(m-4)$ $y = \pm\sqrt{[3/(4-m)]}$ OR $y = \pm\sqrt{[-3/(m-4)]}$	 B1 B1 B1 B1	FT until 2nd error for equivalent level of difficulty. Squaring. Allow $2^2\,y^2$ or $(2y)^2$ for $4y^2$. Isolating terms in y^2. FT a formula with three or more terms AND with at least two terms in y^2. Isolating y^2. Taking square root. Allow omission of $\pm$.
17. (a) $y = f(x) + 5$	B1	Correct notation required.
17. (b) $y = -f(x)$	B1	Correct notation required.
18. Sight of $x = (\sqrt{\pi}) \times r$ OR $x = \sqrt{(\pi r^2)}$ or equivalent Convincing concluding argument e.g. x is irrational since π (and therefore $\sqrt{\pi}$) is irrational.	B1 E1	Allow an equivalent expression, e.g. $r = x / (\sqrt{\pi})$ *or* $r = \sqrt{(x^2 / \pi)}$. Allow use of 3.14 for π. E1 depends on B1. Accept e.g. multiplying an integer by $\sqrt{\pi}$ will not produce another integer; multiplying an integer by $\sqrt{\pi}$ will produce an infinite decimal. Do not accept a reason based on $\sqrt{\pi}$ not being a whole number. Consideration of a specific numerical case gains no credit.
Allow an alternative method *x^2 and πr^2 both seen WITH a related statement about* • *squares of integers, or* • *rational / irrational numbers, or* • *(infinite) decimal numbers.* *e.g.* *πr^2 (or 3.14 r^2) cannot be a square number;* *multiplying an integer by π (or 3.14) cannot produce a square number;* *πr^2 is irrational;* *π times an integer (squared) is a decimal (or cannot be an integer).* *Convincing concluding argument leading to x (not x^2) being a non-integer* *e.g. x is irrational since x^2 is irrational;* *x is not an integer since x^2 is a decimal.*	*E1* *E1*	*For $x^2 = \pi r^2$, allow an equivalent equation,* *e.g. $r^2 = x^2 / \pi$.* *Allow use of 3.14 for π.* *Do not accept a statement that 3.14 r^2 is not an integer or that 3.14 r^2 is irrational.* *Depends on previous E1* *Consideration of a specific numerical case gains no credit.*

11. $\frac{63 \cdot 5^2}{8.65}$ = 466(·156…) or 466·16 or 466·2	 M2 A1	If many attempts are offered without a method/answer being identified, then mark the final attempt. If M2 not gained, award M1 for correct use of values $63 \leq d < 64$ AND $8{\cdot}6 < e \leq 8{\cdot}7$ Mark final answer. M2 required for A1. Fractional equivalent 466(·156…) = 80645/173 Allow this A1 for an answer of 470 only from correct unambiguous working seen. If no marks gained, award SC1 for sight of 63·5 and 8·65 used within the same calculation.
12. Use of cosine rule followed by sine rule (EG =) $\sqrt{(2{\cdot}7^2 + 3{\cdot}2^2 - 2 \times 2{\cdot}7 \times 3{\cdot}2 \times \cos 79(°))}$ (EG =) 3·77…. (cm) sin EFG = EG × sin 65(°) / 6·4 OR $EFG = \sin^{-1}(EG \times \sin 65(°) / 6{\cdot}4)$ F = 32(·29…..°)	S1 M2 A1 M2 A1	 M1 for (EG^2 =) $2{\cdot}7^2 + 3{\cdot}2^2 - 2 \times 2{\cdot}7 \times 3{\cdot}2 \times \cos 79(°)$ or for (EG^2 =) 14·2(3…..) Accept 3·8 cm Allow $\sqrt{14.2(3...)}$ if used in this form in subsequent work, provided not evaluated as a decimal (at any stage) F.T. 'their derived EG' (not 2·7, 3·2, 6·4 or spurious EG). Award M1 for sin EFG / EG = sin 65(°) / 6·4 OR EG / sin EFG = 6·4 / sin 65(°) Dependent on previous M2.
13. (Numerator) Sight of $3x(2x - 3)$ (Denominator) Sight of $(2x - 3)(2x + 3)$ $\frac{3x}{2x + 3}$	B1 B2 B1	 B1 for (2x ….. 3) (2x ….. 3) Mark final answer. F.T. provided at least one previous B1 awarded AND provided simplification required.
14. *(a)* ½ × (x – 1) × (2x + 3) × sin 30° [= 6] OR ½ × ($2x^2 + 3x - 2x - 3$) × sin 30° [= 6] $2x^2 + x - 3$ (= 6 × 2 × 2) $2x^2 + x - 27 = 0$	B1 B1 B1	Use of 'Area = ½ ab sinC'. Correct expansion of brackets and correct collection of x terms. May be implied within equation. Must be convincing.
14. *(b)* (x =) $\frac{-1 \pm \sqrt{[(1)^2 - 4(2)(-27)]}}{2(2)}$ (x =) $\frac{-1 \pm \sqrt{217}}{4}$ (x =) –3·93 AND 3·43	M1 A1 A1	**This substitution into the formula must be seen for M1, otherwise award M0A0A0.** Allow one slip in substitution **for M1 only**, but must be correct formula. Can be implied from at least one correct value of x evaluated, provided M1 awarded. Both solutions required. *Using trial and improvement* *Award B3 for a method leading to both solutions, namely x = –3·93 AND x = 3·43, otherwise B0.* An unsupported answer gains zero marks.
14. *(c)* (AC =) 2·43 (cm) Length cannot be negative / must be positive.	B1 E1	F.T. 'their derived x' provided one positive and one negative solution. Accept any valid explanation, e.g. x–1>0, so x>1, x cannot be negative (as x - 1 must be > 0)
15. *(a)* $y = f(x) - 3$	B1	
15. *(b)* $y = -f(x)$	B1	
15. *(c)* $y = f(x - 10)$	B1	

14.	$\frac{1}{5}$ or 0·2	B2	B1 for 5^{-1} or $\frac{1}{125^{1/3}}$ or $\frac{1}{\sqrt[3]{125}}$ or $\left(\frac{1}{125}\right)^{\frac{1}{3}}$ or $\sqrt[3]{\frac{1}{125}}$. Mark final answer

4.*(a)* $6p^7q^8$	B2	Mark final answer Award B1 for one of the following: • $6\times p^7\times q^8$ • $6p^7\times q^8$ • $6\times p^7q^8$ • $6p^7q^{\cdots}$ • $6p^{\cdots}q^8$ • kp^7q^8 $(k\neq 0 \text{ or } 6)$ • Sight of $6p^7$ **AND** q^8 in an expression (e.g. $6p^7 + q^8$).

4.*(b)*	$7a^2 + 35a - 6a^2 - 12a + 14$	B2	Award B1 for one of the following: • sight of $7a^2 + 35a$. • sight of $-6a^2 - 12a + 14$ (brackets must be removed) Note: If $7a^2 + 35a - 6a^2 + 12a - 14 = a^2 + 23a + 14$ is seen, then award B2 B2 (brackets implied).
	$= a^2 + 23a + 14$	B2	*FT for B2 if at least two a^2 terms AND at least two a terms to be simplified.* *FT for B1 if at least two a^2 terms OR at least two a terms to be simplified.* Award B2 for $1a^2 + 23a + 14$ If B2 not awarded, award B1 for one of the following: • correct collection of 'a^2 terms' $(1)a^2$ • correct collection of 'a terms' $(+23a)$. This 2nd B2 (or B1) is for their **final** answer. A correct answer must come from correct workings seen, however $7a^2 + 35a - 6a^2 + 12a - 14 = a^2 + 23a + 14$ is awarded B2 B2 (brackets implied). Mark final answer Penalise −1 from the final B1 or B2 mark for any one of the following: • incorrect subsequent working • any attempt to equate their expression to zero (and attempting to solve) • incorrectly factorising Note (sign error): Award B1B2 for $7a^2 + 35a - 6a^2 + 12a + 14 = a^2 + 47a + 14$ $7a^2 + 35a - 6a^2 + 12a - 14 = a^2 + 47a - 14$ $7a^2 + 35a - 6a^2 - 12a - 14 = a^2 + 23a - 14$

16. (a)(i) 16	B1	
16. (a)(ii) $\frac{1}{100}$	B1	
16. (b) $100x = 7{\cdot}141414.....$ and $10000x = 714{\cdot}1414....$ with an attempt to subtract on both sides $\frac{707}{9900}$	M1 A1	Or x and $100x$, or equivalent. Or a complete alternative method. The multiplied decimals must be correct. An answer of $\frac{7{\cdot}07}{99}$ gains M1 only. ISW
16. (b) *Alternative method* $0{\cdot}07 + 0{\cdot}00141414..... = \frac{7}{100} + \frac{14}{9900}$ *or equivalent* $\frac{707}{9900}$	*M1* *A1*	*ISW*
16. (c) $\frac{3\sqrt{5}}{2}$	B2	B1 for one of the following: • a numerator of $3\sqrt{5}$ • $\frac{\sqrt{45}}{\sqrt{4}}$ or $\frac{\sqrt{9}\times\sqrt{5}}{\sqrt{4}}$ i.e. for one step of simplification of surds (but not for $\sqrt{\frac{45}{4}}$) • sight of $1\cdot 5\sqrt{5}$ (from $\sqrt{2\cdot 25}\sqrt{5}$).
16. (d) An appropriate irrational number within the required range	B1	e.g. 2π, $\pi+3$, $\sqrt{40}$, $3\sqrt{5}$, $8-\sqrt{2}$. Ignore additional irrational numbers within range. B0 for multiple answers, unless all are irrational numbers within the required range.

17. $4n^2-2n-2n+1\ [+7]$ or equivalent	B2	Correct expansion of brackets and intention to add. B1 for one of the following: • 3 correct terms (and 1 incorrect or missing term) • 4 correct terms, but no intention to add • $4n^2+kn+1\ [+7],\ k\neq 0,\ -4$
$4n^2-4n+8$ or $4(n^2-n+2)$ AND concluding statement, e.g. "4 is a common factor" "The expression is a multiple of 4"	E1	Factorisation is not explicitly required for this mark, provided statement is convincing. If B0, award SC1 for a concluding statement resulting from an expansion of $4n^2+1+7$. Award no marks for trialling numbers.

13. $64n^2 + 8n + 8n + 1$ [– 3] or equivalent	B2	No marks for only trialling numbers. Correct expansion of brackets. B1 for 3 correct terms in an expression (and 1 incorrect or missing term).
$64n^2 + 16n - 2$ AND concluding statement OR $2(32n^2 + 8n - 1)$	E1	Factorisation is not explicitly required for this mark, provided statement is convincing e.g. all terms are even If no other marks, award SC1 for a concluding statement (or factorisation) resulting from an (incorrect) expansion e.g. $64n^2 - 2$, $16n^2 + 32n - 2$ If no marks awarded, SC2 for a complete non-algebraic proof *$8n + 1$ is odd* *odd^2 = odd* *odd – odd = even (and concluding statement)*

15. $5-5\sqrt{3}+\sqrt{3}-3$ $(=2-4\sqrt{3})$	B2	Correct expansion of brackets. B1 for 3 correct terms in an expression (and 1 incorrect or missing term) but not if there is subsequent incorrect evaluation of a term e.g. if $5\sqrt{3}$ is given as $\sqrt{15}$. $\sqrt{9}$ is insufficient for 3 (unless 3 implied by further working).
$(-)\ 9\sqrt{3}$	B1	
$2-13\sqrt{3}$	B1	Mark final answer. FT for equivalent difficulty (requiring collection of constants and terms in $\sqrt{3}$).

End of solutions