REVISE
.wales

Indices & powers (non-calculator)

Mark schemes for the Indices & powers (non-calculator) question pack

WJEC Level 2 Additional Mathematics (9550) · Algebra

Official WJEC mark schemes for the 10 questions in the matching revise.wales question pack (48 marks total), from the 2011–2024 papers.

2		Indices must be simplified throughout

3			Indices must be simplified throughout
	(a) $12x^{7/10}$	B1	
	(b) x^5	B1	Must be simplified
	(c) $2 + 5x^{½}$ or $2 + 5\sqrt{x}$	B2	Allow $1(2 + 5x^{½})$ For award of B2 mark final answer B1 for any of the following: • …. $+ 5x^{½}$ • …. $+5\sqrt{x}$ • $2 +$ …. • $2(x^0) + 5x^{2/4}$
		4	

4	(a) $6x^{5/8}$	B1	Mark final answer
	(b) x^3	B1	Allow $x^{3/1}$. Mark final answer
	(c) $5+7x^{½}$ or $5+7\sqrt{x}$	B2	Mark final answer. Allow $1(5+7x^{½})$ B1 for sight of $5(x^0)$ or $5x^0$ **and** $7x^{4/8}$ or $7x^{1/2}$
		4	

5	Overall strategy that could lead to finding $E\hat{C}B$, e.g. length of 3 sides and then cosine rule	S1	Or full alternative strategy
	$EC^2 = 6.2^2 + 3.7^2$	M1	($EC^2 = 52.13$, EC =7.22....cm)
	$BC^2 = 2.5^2 + (8.4 - 6.2)^2$	M1	($BC^2 = 11.09$, BC = 3.33....cm)
	$EB^2 = 8.4^2 + 3.7^2 + 2.5^2$	M1	May be shown in stages (e.g. $BF^2 = 8.4^2 + 3.7^2$ then $EB^2 = 2.5^2 + BF^2$) ($EB^2 = 90.5$, EB = 9.513...cm)
	With substituted values: $\cos E\hat{C}B = \frac{EC^2 + BC^2 - EB^2}{2 \times EC \times BC}$ i.e. $\cos E\hat{C}B = \frac{52.13 + 11.09 - 90.5}{2 \times 7.22... \times 3.33...}$ (= -0.567...)	M2	OR alternative full method, e.g. finding angles BEC or EBC using cosine rule followed by use of sine rule with sin $E\hat{C}B$ isolated FT 'their derived lengths' provided at least 2 M marks previously awarded M1 for substituted values: $EB^2 = EC^2 + BC^2 - 2 \times EC \times BC \times \cos E\hat{C}B$ OR for alternative full method without sin $E\hat{C}B$ isolated
	$E\hat{C}B = 124.56(....°)$ or 124.6° or 125(°)	A1	CAO, must be from correct working Allow 124.4(... °), 124.48(°), 124.5(°) or 125.39(... °) or 125.4(°) from premature approximation
	QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer	QWC 2 9	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
6	(a) Multiplier $(6-\sqrt{3}) / (6-\sqrt{3})$	M1	Allow if the multiplier is stated as $(6-\sqrt{3})$ provided it is used as $(6-\sqrt{3})/(6-\sqrt{3})$
	Denominator $36 + 6\sqrt{3} - 6\sqrt{3} - 3$ OR $36 - 3$ OR 33	A1	
	$\frac{12 - 2\sqrt{3}}{33}$	A1	CAO. Mark final answer *Unsupported answer is awarded no marks.*
	(b)(i) $y^{1/5}/y^{3/4}$ or alternative correct 1st step	B1	Or equivalent first stage of working with indices
	$y^{-11/20}$ or $1/y^{11/20}$	B1	CAO. Mark final answer
	(ii) Correctly extracting $x^{2/7}$ as a factor, or $\frac{x^{2/7}}{2x^{2/7}} + \frac{6x^{3/7}}{2x^{2/7}}$	M1	
	$\frac{1}{2} + 3x^{1/7}$ or $\frac{1 + 6x^{1/7}}{2}$	A1 7	CAO. Mark final answer

7	(a) $(3)^3 + 8(3)^2 - 2(3) + 6$ (= 27 + 72 - 6 + 6) = 99	M1 A1	Or division method giving $x^2 + 11x$ …
	(b)(i) Substitute x = -3 Showing f(-3) = 0	M1 A1	Or division method giving $x^2 - 2x$ … Convincing from working shown (not if incorrect working seen), allow $(-3)^3 + (-3)^2 - 41(-3) - 105 = 0$, also allow for sight of $-3^3 + -3^2 - 41\times-3 - 105 = 0$ provided no incorrect calculation is given such as -3^2 as -9
	(ii) $(x + 3)(x^2 + bx + c)$ or intention to divide by $(x+3)$ with x^2 shown ((x + 3)) (x^2 - 2x - 35) ((x + 3))(x + 5)(x - 7)	M1 A2 A1 A1 8	A1 for -2x or -35. Or use of factor theorem A1 (x+5), A1 (x- 7) CAO. Mark final answer, *but ignore attempts to 'solve'*
8	(dy/dx=) $12x^2 - 6x$ dy/dx = 0 or $12x^2 - 6x = 0$ or $12x^2 = 6x$ x = 0 and y = 20 x = ½ and y = 19¾ $d^2y/dx^2 = 24x - 6$ (0, (20)): $d^2y/dx^2 < 0$, point is a maximum (½, (19¾)): $d^2y/dx^2 > 0$, point is a minimum	B1 M1 A1 A1 M1 A1 A1 7	FT their dy/dx form $ax^2 \pm bx$ If A0, A0 here, award A1 for x = 0 with x = ½ *Answer only, no working shown M0 A0 A0* Or first derivative test, interpretation of first derivative test. Or alternative (e.g. full graphical method with explanation) FT for their x value FT for their other x value provided this does not have the same interpretation as the first x value *Answer only, no working shown M0 A0 A0* *If $d^2y/dx^2 = cx + d$ where $c \neq 0$ and test applied correctly then SC2 instead of final A1, A1 (as M1 has not been awarded))provided one minimum and one maximum*
9	$\frac{\sqrt{3}}{2} \times \frac{1}{2} = \frac{\sqrt{3}}{4}$	B1 1	**Working must be shown**
10	(a) $FG^2 = (-4 - 8)^2 + (10 - 28)^2$ ($= 12^2 + 18^2 = 468$) FG = $6\sqrt{13}$	M1 A1	Or equivalent. Allow 1 slip or error M1, A0 for answers $\sqrt{468}$ or 21.6(3...) CAO
	(b) Gradient FG (28-10)/(8 - -4) = 18/12 (= 9/6 = 3/2)	M1 A1	Do not ignore incorrect cancelling, mark final answer
	(c) (-4 + 8)/2 or (10 + 28)/2 Mid point (2, 19)	M1 A1	Sight of (2, …) or (… , 19) implies M1 provided no incorrect working is seen
	Perpendicular gradient -2/3 (or -6/9 or -12/18)	B1	FT -1/ 'their answer in (b)'
	$\frac{y - 19}{x - 2} = \frac{-2}{3}$ or 19 = -2/3 × 2 + c	M1	OR for an alternative correct method of finding the equation of a straight line, for the idea of how an equation of a straight line can be found. FT 'their perpendicular gradient' or 'their answer in (b)' AND 'their mid point' or for 'points F or G' used
	y – 19 = -2/3(x - 2) or 3(y – 19) = -2(x – 2) or 3y = -2x + 61 or c = 20⅓ or c = 61/3	m1	**Do not allow** use gradient from their answer in (b), and/or points F or G as the mid-point of FG. Only FT for 'their perpendicular gradient' (not 'their answer' from (b)) AND 'their mid point'
	2x + 3y – 61 = 0 or -2x – 3y + 61 = 0	A1 10	CAO. Must be in this form with '=0' with terms in any order

3	(a) 1/64	B2	*No marks if no working.* B1 for sight of 4^{-3} or 2^{-6} or $\frac{1}{4^3}$ or $1/2^6$. Mark final answer
	(b) $\frac{1}{12-\sqrt{11}} \times \frac{12+\sqrt{11}}{12+\sqrt{11}}$	M1	*No marks if no working.*
	$= \frac{12+\sqrt{11}}{133}$	A1	Mark final answer
		4	

16	144	B1 1	*No marks if no working.* **Must** see 12^2 or '$(2\sqrt{3})^4$ = 16×9'

			Use of a/a/x throughout max 4 marks only, final A0
6	(a) Multiplier $(3-\sqrt{2})$ / $(3-\sqrt{2})$ Denominator	M1	
	$9 + 3\sqrt{2} - 3\sqrt{2} - 2$ OR $9 - 2$ OR 7 $5(3-\sqrt{2})/7$ or $(15-5\sqrt{2})/7$	A1 A1	CAO. Mark final answer *Unsupported answer is awarded no marks.*
	(b)(i) $6x^{10/4}/x^{3/2}$ or $6x^{5/2}/x^{3/2}$	B1	Or equivalent first stage of working with indices *Allow incorrect evaluation of 2×3*
	$= 6x$	B1	CAO. Accept $6x^1$
	(ii) Correctly extracting a factor of $(7)x^{1/7}$ (numerator), or $\frac{28(x^{1/7})}{7(x^{1/7})} + \frac{x^{2/7}}{x^{1/7}}$ or $\frac{28 + 7x^{1/7}}{7}$ $4 + x^{1/7}$	M1 A1 7	CAO. Mark final answer

		0	3 terms not with whole number coefficients
14	(a) 2500	B1	*e.g.* $(\sqrt{50})^4 = 50^2 = 2500$, *or* $50^2 = 2500$ *Answer only, no working shown, B0*
	(b)(i) $(12)x^{2/4}/x^{3/2}$ or equivalent first stage of work evaluated correctly with simplification of indices	B1	
	$12x^{-1}$ or $12/x$	B1	CAO. Mark final answer
	(ii) **Correctly** extracting a factor of $x^{1/6}$ (numerator), OR correct alternative method with one **correct** step towards simplification	M1	Must be correct, but could be $4x^{1/6}$, $2x^{1/6}$ or $x^{1/6}$. For an alternative method, need sight of the two terms and $3 + \ldots$ or $\ldots + x^{1/6}$ for M1
	$3 + x^{1/6}$	A1	CAO. Mark final answer
		5	

	Additional Mathematics Summer 2012		Final Mark Scheme
1	(a)(i) 27	B2	B1 for either 1/8 or 216 *Answer only, no working shown, B0*
	(ii) 10 000	B1	*e.g.* $(\sqrt{100})^4 = 10^4 = 10\,000$, *or* $10^4 = 10\,000$, *or* $100^2 = 10\,000$. *Do not accept* $\sqrt{100^4} = 10\,000$ *Answer only, no working shown, B0*
	(b)(i) $(20)x^{8/4}/x^{3/2}$ or equivalent first stage of work evaluated correctly with simplification of indices	B1	
	$20x^{1/2}$ or $20\sqrt{x}$	B1	CAO. Mark final answer
	(ii) **Correctly** extracting a factor of $x^{1/5}$ (numerator), OR correct alternate method with one **correct** step towards simplification	M1	Must be correct, but could be $6x^{1/5}$, $3x^{1/5}$ or $x^{1/5}$. For an alternative method, need sight of $3 + x^{2/5}/x^{1/5}$ for M1
	$3 + x^{1/5}$	A1	CAO. Mark final answer
		7	

	Summer 2011		
11	(a)(i) 5/6	B2	*Working needs to be shown otherwise B0* B1 for either 1/6 or 5.
	(ii) Sight of 7^{-2} or 49^{-1} AND 1/49	B1	CAO. *Answer only, no working shown B0.*
	(b) (i) $\frac{30x^{7/4}}{x^{5/4}}$	B1	Or for an intermediate stage working with indices, maybe implied by a correct answer
	$= 30x^{1/2}$	B1	CAO. An answer of $30x^{2/4}$ implies first B1 only
	(ii) $\frac{y^{1/5}(3+2y)}{5y^{1/5}}$	B1	Maybe implied by sight of the correct answer
	$= \frac{3+2y}{5}$ or 3/5 +2y/5	B1	CAO. Mark final answer
		7	*When splitting into 2 fractions, SC1 for 3/5 +2y$^{6/5}$/5y$^{1/5}$ or*

End of solutions