JustMaths

Countdown to your final Maths exam … part 2 (2019)

"Working Above" Markscheme & Examiners Report

Q1. Most students showed they were able to expand the brackets correctly. Many also demonstrated that they could rearrange terms, either by rearranging a t term, or by dividing through by a numerical value. Some struggled with sign changes. The final mark was frequently lost when the candidate could not resolve all terms correctly. The final expression did not have to be fully simplified, but candidates did have to write an expression that was algebraically equivalent with the correct answer.
In part (b) clear working out was essential. It was encouraging to see many detailed attempts. Trial and improvement approaches rarely resulted in correct solutions. Substitution methods were equally unsuccessful. Most errors were due to arithmetic mistakes or error in handling negative signs. Most candidates were able to manipulate the equations but processing them was much harder.

Q2. Only a very small minority of students was able to substitute the given expressions into the formula for the area of a trapezium, despite that also being on the formula sheet.
When they did, about half then went on to gain full marks.

Q3. Only the most able candidates scored more than two of the four marks here. Many correctly made the first step of multiplying both sides by $x^2 - 7$ but could go no further. Note here, it was not sufficient to simply say $y \times x^2 - 7$, correct manipulation was required. Having established $yx^2 - x^2$, many were unable to factorise this expression fully.

Q4. Approximately two thirds of candidates gave the correct answer to part (a) of this question. Where a candidate's response was not correct, this was usually due to the presence of "-3" or "$-3x$". In part (b) almost 70% of candidates were able to identify at least one factor of $2x^2 - 4x$. However many attempts showed only partial factorisation or a lack of care and less than a half of candidates scored full marks.

Candidates are reminded that their answers may be checked by multiplying out the brackets. Fully correct answers to part (c) of this question were quite rare. 14% of candidates scored 2 marks here with a further 4% of candidates scoring 1 mark for a correct expansion of $-3(x + 2)$ followed by an incorrect final answer. It is disappointing to report that many candidates did not appreciate the need to expand the brackets first. Many answers of "$8x + 16$" were seen.

Many candidates expanded the expression in the same way as they would for a quadratic expression, writing down 4 terms from an expansion of $(11 - 3)(x + 2)$ before collecting like terms. Those who did attempt to expand $-3(x + 2)$ first, often gave "$-3x + 6$" as their expansion. Expansion of the quadratic expression in part (d) was done more successfully, though there were many errors in signs and in evaluating 6 multiplied by 7. Some candidates tried to combine terms in "x" with terms in "x^2". About two fifths of candidates scored 2 marks for this part of the question and a further one quarter of candidates scored 1 mark for a partially correct expansion.

Q5. No Examiner's Report available for this question

Q6. No Examiner's Report available for this question

Q7. This question was well attempted but only the most able students were gaining full marks. Most gained one mark for indicating $y \times (x + 5)$ but then either did not expand the bracket or were able to isolate x correctly after expanding the bracket. Lots of poor and incorrect algebraic manipulation was seen in student's responses.

Q8. This question tested the more able students. Many of these students attempted to expand the numerator but had no idea what 'rationalise the denominator' meant.

Q9. No Examiner's Report available for this question

Q10. As this question only involved positive terms most candidates were able to successfully expand a pair of brackets usually the first two brackets $(x + 1)(x + 2)$ although a few still made arithmetical errors with multiplying simple values like 1×2 and writing 3 as their answer. Once one set of brackets had been expanded candidates generally seemed to be able to then expand this over a third bracket and were more successful when systematically multiplying each term across the bracket. They usually also then went onto get the second method mark for at least half the terms written correctly. There were some candidates who tried to do all three brackets in one step, usually leading to few marks being awarded.

+Candidates needed to be careful in copying their own work, often losing a mark when re-writing their answer out incorrectly in the next stage of their working. For example, having given x^3 in their second stage of working, ending up writing $x^2 + 6x^2 + 11x + 6$ as their final answer.

Q11. No Examiner's Report available for this question

Q12. This question was not done well. Few candidates could correctly write down the length of one side of the square, and many of those that could were unable to deal correctly with the subsequent calculations, often simplifying $\sqrt{120} \div 4$ to $\sqrt{30}$.

Q13. Most students were able to make a start with the factorization in part (a) of this question and so they scored at least 1 mark. Progress as far as $x(2a + b) - y(2a + b)$ or $2a(x - y) + b(x - y)$ was quite common. Only a small proportion of students could carry on to factorize the expression.

The expansion of $(n + 2)^2$ in part (b) of this question was usually correct and it was encouraging to see only a small number of expansions resulting in $n^2 + 4$.

There were more errors in the expansion of $(n - 3)^2$ with students making mistakes with signs or giving 6 as the constant term in the expansion. Success in adding the two expressions was varied and $n^2 + n^2 = n^4$ was seen far too often. However, a good proportion of attempts at this part of the question ended successfully.

Q14. It was disappointing to see that less than a quarter of candidates could factorise a three-term quadratic expression correctly and then solve the associated quadratic equation. However, some managed to factorise correctly and about the same number were able to give a solution where the 3 and 9 in the factors had the incorrect signs.

A surprising number of candidates did not realise that part (ii) followed on from part (i) and gave a solution involving the quadratic formula. In part (b) only a quarter of candidates were able to correctly factorise a quadratic expression where the terms were the difference of two squares (a popular question to include on a Higher Tier paper).

Q15. Factorisation of a quadratic function with non-unitary coefficient of x^2 was poor. Many chose to employ the formula to solve the given equation. Any mistake in the use of the formula, which was more often than not, resulted in no marks. A fully correct solution by this method gained just one of the three available marks. Many did make good attempts at factorising but then failed to complete the solution. A common incorrect attempt at factorisation was $(4x-9)(2x+3)$.

MARKSCHEME

Q1.

Question		Working	Answer	Mark	Notes
	(a)	$2a + 2t = 5t + 7$ $2a = 3t + 7$ $2a - 7 = 3t$	$\dfrac{2a-7}{3}$	3	M1 for expansion of bracket eg $2\times a+2\times t$ or divide all terms by 2 M1 for attempt at rearrangement of t term eg $-2t$ each side; $2a = 3t+?$ but with separate terms. A1 $\dfrac{2a-7}{3}$ oe but must have one term in t. NB: for ⅔ accept working to 2 dp: 0.67, 0.66, 2.33 or better
	(b)		$x = ⅔$ $y = -1\frac{1}{2}$	3	M1 for correct process to eliminate either x or y (condone one arithmetic error) M1 (dep on 1st M1) for correct substitution of their found variable or other acceptable method A1 cao for both $x = ⅔$ and $y = -1\frac{1}{2}$ oe SC: B1 for $x = ⅔$ or $y = -1\frac{1}{2}$ oe NB: for ⅔ accept working to 2 dp: 0.67 or 0.66 or better

Q2.

5MB2H November 2016					
Question	Working	Answer	Mark	Notes	Type
	$\frac{(\sqrt{5}+\sqrt{5}+6)}{2} \times (\sqrt{5}-2)$ $(\sqrt{5}+3)(\sqrt{5}-2)$ $5 + 3\sqrt{5} - 2\sqrt{5} - 6$ $\sqrt{5}(\sqrt{5}-2) + \frac{6(\sqrt{5}-2)}{2}$ $5 - 2\sqrt{5} + 3\sqrt{5} - 6$	$\sqrt{5} - 1$	3	M1 for $\frac{(\sqrt{5}+\sqrt{5}+6)}{2} \times (\sqrt{5}-2)$ M1 for expansion $5 + 3\sqrt{5} - 2\sqrt{5} - 6$ with 3 terms out of 4 correct including signs or all 4 terms correct ignoring signs A1 cao OR M1 for $\sqrt{5}(\sqrt{5}-2) + \frac{6(\sqrt{5}-2)}{2}$ M1 for expansion $5 - 2\sqrt{5} + 3\sqrt{5} - 6$ with 3 terms out of 4 correct including signs or all 4 terms correct ignoring signs A1 cao	E

Q3.

PAPER: 5MB3H_01				
Question	Working	Answer	Mark	Notes
	$(x^2 - 7)y = (x^2 + 9)$ $x^2y - 7y = x^2 + 9$ $x^2y - x^2 = 9 + 7y$ $x^2(y - 1) = 9 + 7y$	$x = (\pm)\sqrt{\frac{7y+9}{y-1}}$ oe	4	M1 for correctly removing the fraction or $(x^2 - 7)y$ oe seen M1 for a correct rearrangement, isolating terms in x^2 on one side of an equation M1 for the fully correct factorisation of their $x^2y - x^2$ oe A1 for $x = (\pm)\sqrt{\frac{7y+9}{y-1}}$ or $x = (\pm)\sqrt{\frac{-7y-9}{1-y}}$ oe

Q4.

Question	Working	Answer	Mark	Notes
(a)		$3y + 7x + 3$	1	B1 cao
(b)		$2x(x - 2)$	2	B2 for $2x(x - 2)$. Accept $2x(x + -2)$. (B1 for $x(2x - 4)$ or $2(x^2 - 2x)$ or $2x$(linear expression in x) or $(x - 2)$(linear expression in x))
(c)	$11 - 3x - 6$	$5 - 3x$	2	M1 for expansion of $-3(x + 2)$ A1 cao
(d)	$3x^2 + 7x - 18x - 42$	$3x^2 - 11x - 42$	2	M1 for 4 terms correct with or without signs or 3 out of exactly 4 terms correct (the terms may be in an expression or table) **OR** $x(3x+7) - 6(3x+7)$ or $3x(x - 6) + 7(x - 6)$ A1 cao

Q5.

Question	Working	Answer	Mark	Notes
		$a = \frac{23}{49}$ $b = \frac{17}{49}$	M1	for method to expand $(3 - \sqrt{2})^2$ $(= 11 - 6\sqrt{2})$
			M1	for method to rationalise the denominator, e.g. multiplying by $\frac{11+6\sqrt{2}}{11+6\sqrt{2}}$
			M1	(dep M1) for method to expand correctly either the numerator or the denominator, e.g. $23 + 17\sqrt{2}$ or $121 - 72$ $(= 49)$
			A1	for $a = \frac{23}{49}$
			A1	for $b = \frac{17}{49}$

Q6.

Question	Working	Answer	Mark	Notes
		1:3	M1	for a valid first step, e.g. $\sqrt{9 \times 7} + \sqrt{9c}$
			M1	for a complete method to show a multiplicative relationship, e.g. $3(\sqrt{7} + \sqrt{c})$
			A1	cao

Q7.

5MB3H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
	$y(x+5) = 3x$ $yx+5y = 3x$ $5y = 3x - yx$ $5y = x(3 - y)$	$x = \frac{5y}{3-y}$	3	M1 for intention to multiply by $x + 5$ M1 for intention to isolate yx and $3x$ on one side to get $3x - xy$ oe A1 for $x = \frac{5y}{3-y}$ or $\frac{-5y}{y-3}$

Q8.

5MB2H_01 November 2015					
Question		Working	Answer	Mark	Notes
			$2\sqrt{7}$	3	M1 for multiplying numerator and denominator by $\sqrt{7}$ M1 for correct method to expand $(4+\sqrt{2})(4-\sqrt{2})$ with 3 out of no more than 4 terms correct with correct signs or the 4 terms seen, ignoring signs A1 for $2\sqrt{7}$ (accept $\sqrt{28}$)

Q9.

Question		Working	Answer	Mark	Notes
			$\frac{11-\sqrt{2}}{17}$	3	M1 for intention to multiply numerator and denominator by $(5-\sqrt{8})$ M1 for correct expansion of either $(3+\sqrt{2})(5-\sqrt{8})$ or $(5+\sqrt{8})(5-\sqrt{8})$, at least 3 terms correct or 4 correct terms ignoring signs. A1 for fully correct working leading to $\frac{11-\sqrt{2}}{17}$

Q10.

Question	Working	Answer	Mark	Notes
		$x^3+6x^2+11x+6$	M1	for method to find the product of any two linear expressions (3 correct terms) e.g. $x^2+x+2x+2$ or $x^2+2x+3x+6$ or $x^2+x+3x+3$
			M1	for method of multiplying out remaining products, half of which are correct (ft their first product) e.g. $x^3+x^2+2x^2+3x^2+2x+3x+6x+6$
			A1	cao

Q11.

Question	Working	Answer	Mark	Notes
(a)		n^2+2	M1	begins to work with 2nd differences (e.g. shown as 2) or n^2+k $(k \neq 2)$
			A1	cao
(b)		2502	B1	ft a quadratic expression

Q12.

PAPER: 5MB2H_01					
Question		Working	Answer	Mark	Notes
			7.5	3	B1 for length given as $\frac{\sqrt{120}}{4}$ oe M1 for squaring $\frac{\sqrt{120}}{4}$ or $\frac{120}{4\times4}$ oe A1 for $\frac{120}{16}$ oe or $7\frac{1}{2}$ or 7.5 oe SC B1 for $\sqrt{30}\times\sqrt{30}$

Q13.

Question		Working	Answer	Mark	
	(a)	$(2a + b)(x - y)$		2	M1 for $2a(x - y)$ or $b(x - y)$ or $x(2a + b)$ or $y(2a + b)$ A1 for $(2a + b)(x - y)$ oe
	(b)		$2n^2 - 2n + 13$	3	B1 for $n^2 + 4n + 4$ or $n^2 - 6n + 9$ (need not be simplified) M1 (dep on B1) for '$n^2 + 4n + 4$' + '$n^2 - 6n + 9$' A1 cao

Q14.

		Working	Answer	Mark	Notes
	(a)(i)		$(x - 9)(x - 3)$	3	M1 for $(x \pm 9)(x \pm 3)$ A1 for $(x - 9)(x - 3)$
	(ii)		$x = 9$, $x = 3$		B1 cao
	(b)		$(y + 10)(y - 10)$	1	B1 for $(y + 10)(y - 10)$

Q15.

PAPER: 5MB3H_01				
Question	Working	Answer	Mark	Notes
		4.5, –0.75 oe	3	M2 for $(2x - 9)(4x + 3)$ oe (M1 for $(2x \pm 9)(4x \pm 3)$) oe A1 for 4.5, –0.75 oe [SC: B1 for 4.5 and –0.75 oe, found by any other method]