Countdown to your final Maths exam ... part 5 (2018)

Examiners Report & Markscheme

Mark Scheme

Q1.

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

Q2.

Question		Working	Answer	Mark	Notes
	(i)		25.1	4	M1 for any route starting and ending at C going through H, S and Y. Condone missing last section back to C M1 for a valid route for which their correct total is shown A1 for 25.1 B1 ft for communicating their shortest route (must start and end at C and pass through S, H and Y).
	(ii)		CSHSYC or CYSHSC		

Q3.

		Working	Answer	Mark	Notes
		$4x-3=2x+2y$ $2x-3=2y$ $2x=2y+3$ $x=y+1.5$	$x=y+1.5$	3	M1 for attempt to expand brackets eg $2\times x+2\times y$ or divide through by 2 (each term). M1 for attempt to get x on one side of equation. A1 for $(x=)\ y+1.5$, $^{2y+3}/_{2}$, oe

Q4.

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
	(a)		$e(3e+5)$	1	B1 for $e(3e+5)$
	(b)		4	3	M1 for intention to expand brackets, eg $7k-21$ or division of all terms on RHS by 7 as first step, eg $\frac{3}{7}k-\frac{5}{7}$ M1 for correct method to isolate terms in k in an equation A1 cao
	(c)		$2x^2-13x-24$	2	M1 for 4 terms correct ignoring signs or 3 out of no more than 4 terms correct A1 cao
	(d)		$-\frac{1}{3}$	3	M1 for clear intention to multiply both sides by 4 or split into individual fractions on LHS M1 for correct method to isolate term in f in an equation, ft from equations of form $a+bf=c$, where $a, b, c\neq 0$ A1 cao

Q5.

Question	Working	Answer	Mark	Notes
(a)		$4d$	1	B1 accept $4\times d$, $d\times 4$, $d4$
(b)		$f+10$	2	M1 for f or $1f$ or 10 or for $3f$ $2f$ and $4+6$ A1 for $f+10$ (accept $1f+10$)

Q6.

Question	Working	Answer	Mark	Notes
	$m^2 = k/6$	$m = \sqrt{\frac{k}{6}}$	2	M1 $m^2 = k/6$ or $6m^2/6 = k/6$ or $\sqrt{6m^2} = \sqrt{k}$ or $\sqrt{6}\,m = \sqrt{k}$ A1 $m = \sqrt{\frac{k}{6}}$ or $m = \pm\sqrt{\frac{k}{6}}$ or $m = -\sqrt{\frac{k}{6}}$

Q7.

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

Q8.

	Working	Answer	Mark	Notes
(a)		$5m + 10$	1	B1 cao
(b)		$y(y + 3)$	1	B1 cao
(c)		a^9	1	B1 cao

Q9.

PAPER: 5MB3F_01				
Question	Working	Answer	Mark	Notes
		22.5(0)	3	M1 for working out the change for one week eg 15+3.5−2 (=16.5) or 3.5−2 (=1.5) or 6−4 (=2) or 6.5−3.5 (=3) M1 for working out the change for all weeks or differences eg (15+)3.5−2+4−6+5+6.5−3.5 oe or "1.5" + "−2" + "5" + "3" (=7.5) A1 for 22.5(0) OR M1 for working out the totals in or out eg 3.5+4+5+6.5 (=19) or 2+6+3.5 (=11.5) M1 for finding the differences of totals eg "19" – "11.5" (=7.5) A1 for 22.5(0)

Q10.

Question	Working	Answer	Mark	Notes
(a)	$5x + 35 + 3x - 6$	$8x + 29$	2	M1 for $5x + 35$ OR $3x - 6$ or $8x$ or 29 A1 for $8x + 29$
(b)		$3ab(a + 2b)$	2	B2 for $3ab(a + 2b)$ (B1 for correct partial factorisation $a(3ab + 6b^2)$ or $b(3a^2 + 6ab)$ or $3a(ab + 2b^2)$ or $3b(a^2 + 2ab)$ or $ab(3a + 6b)$ OR $3ab(ma + 2b)$ or $3ab(a + nb)$ where $m \neq 1$, $n \neq 2$) [B0 for partial factorisation using only an integer e.g. $3(a^2b + 2ab^2)$]

Q11.

PAPER: 5MB2H_01					
Question		Working	Answer	Mark	Notes
	(a)		$2x^2 + 7x + 3$	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) A1 cao
	(b)		$4x(x + 2y)$	2	M1 for $4x(ax + by)$, a & b integers or $ax(x + 2y)$ or any expression with brackets which multiplies to give $4x^2 + 8xy$ A1 cao

Q12.

Question		Working	Answer	Mark	Notes
	(a)		$(x + 1)(x + 4)$	2	B2 for $(x + 1)(x + 4)$ (B1 for $(x + a)(x + b)$ with one factor correct or $(x - 1)(x - 4)$ or $x(x + 4)+1(x + 4)$ or $x(x + 1)+4(x + 1)$)
	(b)	$3x(2x + 5) - 1(2x + 5)$ $6x2 + 15x - 2x - 5$	$6x^2 + 13x - 5$	2	B2 for fully correct (B1 for 3 out of not more than 4 terms including signs or 4 terms correct ignoring signs)
	(c)	$^{15}/_{30x} + {}^{6}/_{30x} - {}^{10}/_{30x}$	$^{11}/_{30x}$	2	M1 for attempt to use a correct common denominator with at least 2 correct equivalent fractions A1 for $^{11}/_{30x}$ oe

Q13.

5MB3H_01 November 2015					
Question		Working	Answer	Mark	Notes
			$t = \frac{ap^2}{3}$	3	M1 for squaring both sides of the equation as the first step M1 (dep) for isolating the t term A1 for $t = \frac{ap^2}{3}$ oe

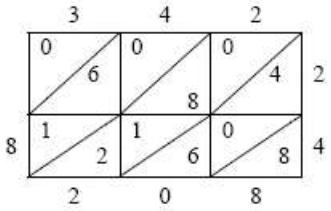
Q14.

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 $\frac{-5y}{y-3}$

Q15.

5MB2F_01 November 2015					
Question		Working	Answer	Mark	Notes
	(a)		5r	1	B1
	(b)		14t	1	B1
	(c)		2ab	1	B1

Q16.

Question	Working	Answer	Mark	Notes
	342 ×24 6840 1368 8208 24 ×342 7200 960 48 8208  300 40 2 6000 800 40 20 1200 160 8 4 6000+800+40+1200+160+8=8208	8208	3	M1 for a complete method with relative place value correct. Condone 1 multiplication error, addition not necessary. M1 (dep) for addition of all the appropriate elements of the calculation. A1 cao M1 for a complete grid with not more than 1 multiplication error, addition not necessary (inside numbers) M1 (dep) for addition of all the appropriate elements of the calculation (eg outside numbers) A1 cao M1 for sight of a complete partitioning method, condone 1 multiplication error, addition not necessary. M1 (dep) for addition of all the appropriate elements of the calculation. A1 cao

Q17.

PAPER: 5MB2H_01					
Question		Working	Answer	Mark	Notes
	(a)		$e + 7f$	2	B2 for $e + 7f$ (B1 for e or $7f$)
	(b)		$10c + 15d$	1	B1 cao
	(c)		$2x - 7$	4	M1 for $x + x + 3 + 2x$ $(= 4x + 3)$ M1 for $2(3x - 2)$ $(= 6x - 4)$ M1 for '$6x$' – '$4x$' – '4' ± '3' oe A1 cao OR M1 for $2(3x - 2)$ $(= 6x - 4)$ M1 for '$6x$' $- x - x - 2x$ $(=2x)$ oe M1 for '-4' ± 3 A1 cao

Q18.

Paper: 5MB3F_01					
Question		Working	Answer	Mark	Notes
			$h = \frac{x-8}{5}$	2	M1 for intention to either subtract 8 from both sides or divide each term by 5 as a first stage of working A1 for $h = \frac{x-8}{5}$ oe

Examiner's Report

Q1. 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.

Q2. Many candidates were able to find a route starting and ending at C. Many showed their route by writing down the arc lengths rather than the nodes. This was acceptable for part (i).

Most candidates were able to get a sensible answer, with 27.9 km (from CYHSC) being a close runner to 25.1 km (from CYSHSC) A significant number of candidates ignored the information for Gordon to visit all 4 villages and gave the route as CSYC (22.3 km).

Some gave the route that went round the top loop first and then the outer loop. CSYCSHYC (50.2 km).

Q3. Candidates who did not initially multiply out the brackets correctly ran into problems soon after. Many errors resulted from poor rearrangement and $2y - 3$ was frequently seen.

Q4. Part (a) was done quite well. Many students were able to factorise the given expression correctly. Common incorrect answers here were $8e^2$, $8e^3$, and $3e(e + 5)$. A significant number of students gave their answer in the form $1e(e + 5)$, which was accepted.

In part (b), many students were able to expand the brackets correctly, but relatively few could then go on to solve the equation correctly. Frequently students did not show all the stages in their working by writing down a correct process on both sides of an equation, eg $7k - 21 \underline{+ 21} = 3k - 5 \underline{+ 21}$. A common error here was to expand $7(k - 3)$ as $7k - 3$

In part (c), many students were able to score at least 1 mark for starting to expand the brackets. Often these expansions contained sign or algebraic errors, eg $2x \times x$ worked out as $3x$ and $+3 \times -8$ worked out as -5. A significant number of students having obtained a correct 4 term expression went on to simplify this incorrectly, eg $2x^2 - 16x + 3x - 24$ incorrectly simplified to $2x^2 - 19x - 24$

In part (d), many students were able to write down a correct first stage in solving the algebraic equation, usually by multiplying both side if the equation by 4. A significant number of these were then unable to solve the resulting linear equation, often making a sign error in the calculation, eg $7 - 3f = 8$ incorrectly simplified to $3f = 1$; or by writing the final answer in an incorrect form, eg $\frac{1}{-3}$ or -0.3

Q5. Part (a) was successfully answered by about 80% of candidates. Others generally involved indices in their answers with not only d^4 commonly seen but also 4^d. Candidates could be reminded of the need for clear writing in their answers so that $4d$ never looks more like 4^d.

In part (b) the negative sign associated with the $2f$ term caused difficulties. Some candidates ignored it and added $2f$ to $3f$ instead. Others linked it with the preceding 4 instead and often gave $f - 10$ as their final answer. It may be helpful to encourage students to circle or underline each like term together with its preceding sign. Many candidates who gave the correct expression $f + 10$ in their working spoilt their final answer by further incorrect simplification to $11f$.

Q6. It was nice to see the occasional ± to give a fully complete answer. Many candidates, however, interpreted $6m^2$ as $(6m)^2$ and ended up with $m = \frac{\sqrt{k}}{6}$. Some candidates were not careful enough with the placing of the square root sign so it was difficult to distinguish $m = \frac{\sqrt{k}}{6}$ from $m = \sqrt{\frac{k}{6}}$

Q7. 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.

Q8. Answers to parts (a) and (c) were good. Many candidates knew how to expand brackets correctly for part (a). On part (c), many candidates knew they had to add the exponents.
Part (b) was answered much less surely, with correct answers rather rare. Some candidates who spotted that y was a common factor then went on to write $y(y + 3y)$.

Q9. Students attempted this question well and many gained full marks. Those that only gained 1 or 2 marks, were often let down by their arithmetic or tried to solve the problem with one long chain of calculations and were unable to keep an accurate running total or missed a calculation out. The more able students realised that they could use the column or row totals, hence demonstrating a more efficient strategy and were more successful in solving this problem.

Q10. Two thirds of candidates had no success with this question and the marks that were awarded were generally given in part (a). Here, common mistakes included multiplying out just the first term in the bracket, failing to simplify, or failing to deal correctly with the 2. Some candidates attempted a grid method as if multiplying out a pair of linear expressions. Correct factorisation in part (b) was very rare indeed. When an attempt was made, candidates often worked with factors but gave a final answer involving 2 pairs of brackets. Partial factorisation using only an integer also seen but often not fully correct and when a common factor was identified, there was often an error with the terms inside the bracket.

Q11. Students were generally able to score at least 1 mark in part (a) generally for writing down 4 terms with at least 3 correct. The most common error was to multiply x by $2x$ and get an answer of $2x$. Students should, at this level, understand that the product of two linear expressions will result in a quadratic expression. In part (b) many students scored at least one mark for taking out a common factor with an answer of $2x$ $(2x + 4y)$ often seen.

Q12. Part (a) was usually answered correctly, probably because of the absence of minus signs, though some candidates did consider by including $(x - 1)$.

In part (b) weaknesses in algebra became clear, with many failed attempts to multiply out the brackets. Errors included $6x$ instead of $6x^2$, misplaced minus signs, and 6 or 4 as the number term. A significant number lost the final mark due to an inability to simplify their four terms. Part (c) was designed as a discriminator for those working towards grade A, and indeed it was only the more able who were able to show any understanding of what was needed. The x in the denominator caused problems for candidates who knew how to manipulate fractions. A number of candidates added all three fractions, which was unfortunate. Overall few made progress with this question.

Q13. From this point in the paper there were an increasing number of non-attempts. In this question it was only a minority who made an attempt, and usually no marks were gained because of an inability to square both sides to remove the square root sign as the first step in processing.

Q14. 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.
Q15. Most students were able to simplify the algebraic expressions correctly.

Q16. It was encouraging to see many successful attempts at this question, even from those whose arithmetic throughout the rest of the paper was poor. Partitioning methods were popular, but often contained errors caused by extra zeros. Other typical errors were $20 \times 30 = 5000$ instead of 6000, and $40 \times 4 = 120$ or 80. Grid methods were also popular, but here it was usually poor totalling that let candidates down. Repeated addition was usually unsuccessful.

Q17. Parts (a) and (b) of this question were done well. Common incorrect answers in part (a), were $3e + f$, $2 + 7f$ and $e + f$. A common incorrect answer in part (b) was $10c + 3d$. In part (c), most candidates were able to find an expression for the length of AD $(4x + 3)$ and/or twice the length of PQ $(6x - 4)$, but many were unable to find the difference in these expression correctly. The difference in the expressions was often written as $6x - 4 - 4x + 3$ rather than $6x - 4 - (4x + 3)$, generally leading to the popular incorrect answer $2x - 1$. Candidates should be advised to use brackets when subtracting algebraic expressions. A surprising number of candidates continued their calculations by putting their expressions for DE equal to 0 and solving them for x (this was condoned on this paper).

Q18. Students had little success with changing the subject of this formula with a few managing the first step, invariably to subtract 8 from both sides. Errors with algebraic manipulation were common with addition of 8 or even subtraction of 5 from both sides seen.