JustMaths

Countdown to your final Maths exam ... part 4 (2019)

"Working Above"
Markscheme & Examiners Report

Q1. No Examiner's Report available for this question

Q2. In part (a), the majority of candidates scored at least one mark, usually for identifying the transformation as a reflection. Whilst the correct line was often quoted, many were confused or contradicted themselves with incorrect alternatives. For example, "a reflection in the y -axis (y = 0)" was quite common. In part (b), the correct answer was the modal answer. However many correctly rotated the given shape through 90° clockwise but not about the given point. Some candidates offered 'correct' rotations of either 90° anticlockwise or 180°.

Q3. A popular incorrect method was to evaluate $\frac{1}{3} \times \pi \times 15^2 \times 20$. Some candidates were able to write down a correct expression for the volume of the large cone but then did not realise that the radius of the smaller cone was 7.5 cm and so failed to make further progress. There was evidence of the wrong formula being used for the volume of a cone despite this being given on the formula sheet at the front of the paper; formulae for the volume of a cylinder or surface area of a cone were commonly seen. It was common to see the volume of the large cone being found correctly, and then halved for the volume of the frustum.

Q4. 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 $(4x-9)(2x+3)$.

Q5. This was a well understood question as almost all students realised they had to find the area of the cross section and multiply it by the length however many students had difficulty with the sloping section of the prism. Some tried to use the area of a trapezium formula on the pentagonal cross section whilst others forgot to divide by two when they split the shape into two rectangles and a triangle and gave the triangle area as 5 × 5 and not $\frac{1}{2} \times 5 \times 5$.

Some also did not realise that if they used two 8 × 3 rectangles the two rectangles would overlap. There were a few attempts made to work by subtracting the 5 × 5 × 8 triangular prism from the square prism with 8 × 8 cross section but these were usually unsuccessful too.

Q6. 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.

Q7. A few students scored both marks for a correct answer to this question. The most common incorrect responses seen were 200 and 8 000 000 (200 × 200 × 200).

Q8. Many candidates started this problem correctly by intending to multiply the three expressions. But few were

then able to manipulate the expressions in order to produce a simplification. Over-simplification spoilt some answers that would otherwise have been correct. Candidates earned little credit when adding the expressions, trying to find the surface area, or failing to divide by 2 for a triangle, of which there were a significant number. As with all formulae, there was a need for a left hand side to the formula; very few included "V=" in their stated formula, which regrettably was a mark lost, an issue worth raising with future candidates.

Q9. This question proved to be a good test of algebraic techniques including the use of brackets, expansion of brackets and working with negative signs. The most common approach involved attempting to subtract the area of the triangle from the area of the rectangle; here the use of brackets and negative signs was poor. The final mark for the quality of written communication could only be awarded if the candidate had clearly shown, with fully correct algebra, that the shaded area is $18x - 30$. Some candidates arrived at an answer of $18x - 30$ with working that was unclear or incorrect.

Q10. Students were equally successful in parts (a) and (b) though many did not gain full marks. Many students did not realise the connection between parts (a) and (b) and even those who gained full marks in part (a) often lost the mark in part (b). Likewise, students who were unable to gain full marks in part (a), sometimes even scoring zero in part (a), then wrote in a fully correct coordinates for their answer to part (b). In part (a) weaker students were often able to write $(x - 4)^2$ or wrote $p = 4$ to gain one mark and slightly more able students correct completed the square, writing $(x - 4)^2 - 10$ or equivalent but then gave the answer $p = -4$ with $q = -10$.

Q11. Most candidates attempted to draw triangles B and C with a majority placing them correctly on the grid. Errors in the correct positioning of triangle B or triangle C were sometimes due to candidates not being able to identify the line $x = 1$ and some confused the x- and y-axes. In some cases it was difficult to determine how the candidate had come up with their images. The majority of the candidates who drew triangles B and C in the correct positions were able to give a correct description of the transformation, although a common mistake was to give the centre of rotation as (0, 1) instead of (1, 0). A small number of candidates lost a mark because their description of the rotation did not include an angle or because they wrote the centre of rotation as a vector. Fewer candidates than in the past gave more than one transformation.

Q12. In part (a) most used the formula for the area of a trapezium and gained the first mark for this; the second mark was more difficult to achieve as the processes used were either incomplete or unconvincing. In part (b) a surprising number of candidates made no attempt to use the quadratic formula to find the value of x. Of those who did, most were able to substitute the correct values into the formula and many were able to complete the process leading to the correct answer. A few candidates lost the accuracy mark by suggesting a negative value was acceptable for the value of x. In some cases answers to the two parts were mixed up or poorly organised. Resorting to trial and improvement did not always help.

Q13. Some students did not read the question carefully enough and attempted to find the volume of the triangular prism. However, many did attempt to find the total surface area but struggled to find the area of the two triangular end faces, often using $(50 \times 60) \div 2$ as their method which meant they could only score a maximum of one mark for showing the correct method to obtain the area of two different rectangular faces.

Q14. Again, many candidates demonstrated their inability to find the area of a triangle. Area of triangle = $3 \times 2 = 6$ was common. This was often followed by $18 (6 \times 3) - 6 = 12$. Even though the formula for the area of a trapezium is now on the Higher tier formula sheet, its use was scarce and often inaccurate. Many candidates correctly found the base of the trapezium as 4 cm but then multiplied it by 6. Some correctly found the area of the trapezium but then went on to subtract the area of the triangle.

The vast majority of candidates scored one mark, irrespective of their answer, by quoting the correct units of cm^2.

Q15. No Examiner's Report available for this question

Mark Scheme

Q1.

Paper 1MA1: 1H			
Question	**Working**	**Answer**	**Notes**
		75π	P1 starts process by using $\frac{250}{3}\pi$ and $\frac{1}{2}\times\frac{4}{3}\pi r^3$ to find radius as 5 P1 starts process using ½ curved surface area eg $(4\times\pi\times5^2)\div2$ P1 complete process shown eg $(4\times\pi\times5^2)\div2+(\pi\times5^2)$ A1 for 75π

Q2.

PAPER: 5MB3H 01				
Question	**Working**	**Answer**	**Mark**	**Notes**
(a)		Reflection in $x = 0$ or y-axis	2	B1 for reflection B1 for $x = 0$ or y-axis (NB: a combination of transformations gets B0)
(b)		Triangle (1, 0)(4, 0)(1, −2)	2	M1 for any correct rotation of 90° clockwise OR for any correct rotation about the point (0, 2) A1 for a triangle with vertices at (1, 0), (4, 0) and (1, −2)

Q3.

		Working	Answer	Mark	Notes
		$\frac{1}{3}\times\pi\times15^2\times40-\frac{1}{3}\times\pi\times7.5^2\times20$	8250	4	B1 for 15cm as diameter or 7.5 cm as radius of smaller cone (may be marked on diagram or used in a formula) M1 for a numerical expression for the volume of one cone eg. $\frac{1}{3}\times\pi\times15^2\times40$ (=9424...) **or** $\frac{1}{3}\times\pi\times7.5^2\times20$ (=1178...) M1 for $\frac{1}{3}\times\pi\times15^2\times40$ oe $-\frac{1}{3}\times\times\pi\times7.5^2\times20$ oe A1 for answer in the range 8240 – 8250 **OR** B1 for 2^3 M1 for a numerical expression for the volume of the large cone eg. $\frac{1}{3}\times\pi\times15^2\times40$ (=9424...) M1 volume of frustrum = $\frac{7}{8}\times\frac{1}{3}\times\pi\times15^2\times40$ oe A1 for answer in the range 8240 – 8250

Q4.

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]

Q5.

Question		Working	Answer	Mark	Notes
			618	4	M1 for a method to find an area which is part of the cross section M1 (dep) for a complete method to find the total area of the cross section M1 (dep M1) for their cross sectional area × 12 A1 cao **OR** M1 for a method to find the volume of cuboid, 8 × 8 × 12 (= 768) M1 for a method to find the volume of the triangular prism, ½ ×5 × 5 × 12(= 150) M1 (dep M2) for a complete method for the volume of the prism A1 cao

Q6.

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

Q7.

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
		2 000 000	2	M1 for 2 × 100 × 100 × 100 A1 oe

Q8.

Question		Working	Answer	Mark	Notes
		½ × 2x × x × (x + 10)	$V = x^3 + 10x^2$	3	M1 for ½ × 2x × x × (x + 10) A1 for $x^3 + 10x^2$ or x^2(x + 10) B1 for V = cubic expression in x

Q9.

Question		Working	Answer	Mark	Notes
		Rectangle – unshaded triangle (x + 6)(3x – 5) – ½×2x(3x – 5) =$3x^2$ + 18x – 5x – 30 – ($3x^2$ – 5x) =$3x^2$ + 18x – 5x – 30 – $3x^2$ + 5x QED OR (x + 6)(3x – 5) – ½×2x(3x – 5) = (x + 6)(3x – 5) – x(3x – 5) = (3x – 5)(x + 6 – x) = 6(3x – 5) = 18x – 30 QED OR Shaded trapezium + shaded triangle ½(x + 6 – 2x + x + 6)(3x – 5) =6(3x – 5) = 18x – 30 QED	Proof	4	M1 for using two lengths to find an area M1(dep) for '(x + 6)(3x – 5)' – '½ × 2x(3x – 5)' M1 for $3x^2$ + 18x – 5x – 30 or ½×($6x^2$ – 10x) or $3x^2$ – 5x C1 for a correct completion of the proof resulting in 18x – 30 from fully correct working OR M1 for using two lengths to find an area M1(dep) for '(x + 6)(3x – 5)' – '½ × 2x(3x – 5)' M1 for factorising process with (3x – 5) as the common factor C1 for a correct completion of the proof resulting in 18x – 30 from fully correct working OR M1 for x + 6 – 2x (= 6 – x) M2 for ½(x + 6 – 2x + x + 6)(3x – 5) C1 for a correct completion of the proof resulting in 18x – 30 from fully correct working

Q10.

5MB3H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
(a)		$p = 4$, $q = -10$	3	M1 for sight of $(x - 4)^2$ or $p = 4$ M1 for $(x - 4)^2 - 16 + 6$ A1 for $p = 4$, $q = -10$ OR M1 for $x^2 - 2px + p^2 + q$ or $-2p = -8$ or $p^2 + q = 6$ M1 for $-2p = -8$ and $p^2 + q = 6$ A1 for $p = 4$, $q = -10$
(b)		(4, -10)	1	B1 ft

Q11.

		Working	Answer	Mark	Notes
		B at (3, –1), (5, –1), (5, –4) **C** at (–1, –1), (–3, –1), (–3, –4)	Rotation of 180° about (1,0)	3	M1 for showing **C** correctly on the grid without showing **B** or for showing **B** and **C** correctly on the grid A1 for rotation of 180° A1 for (centre) (1,0) OR M1 for showing **C** correctly on the grid without showing **B** or for showing **B** and **C** correctly on the grid A1 for enlargement scale factor –1 A1 for (centre) (1,0) **NB** Award no marks for any correct answer from an incorrect diagram and no A marks if more than one transformation is given

Q12.

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
(a)		'show'	2	M1 for $\frac{1}{2} \times (x-4+x+5) \times 2$ or $2x \times (x-4) + \frac{1}{2} \times 2x \times 9$ A1 for completion with correct processes seen
(b)		13	3	M1 for $\frac{-1 \pm \sqrt{1^2 - 4 \times 2 \times -351}}{2 \times 2}$ condone incorrect sign for 351 M1 for $\frac{-1 \pm \sqrt{2809}}{4}$ A1 for 13 NB for either M mark accept + only in place of ± **OR** M2 for $(2x+27)(x-13)$ (M1 for $(2x \pm 27)(x \pm 13)$) A1 for 13

Q13.

Question	Working	Answer	Mark	Notes
		15 200	3	M1 for a method to obtain at least 2 different areas from 50×80 (= 4000), $\frac{1}{2} \times 40 \times 60$ (= 1200), 60×80 (= 4800) M1 (dep on M1) for adding at least 4 correct face areas A1 cao

Q14

Question		Working	Answer	Mark	Notes
		½ (6 + 4) × 3 OR 6 × 3 – ½ × 2 × 3 OR 4 × 3 + ½ × 2 × 3	15 cm^2	4	M2 for ½ (6 + 4) × 3 oe A1 for 15 cao B1 for cm^2 OR M1 for 6 × 3 (=18) or ½ × 2 × 3 (=3) M1 (dep on "6 × 3" and "½ × 2 × 3") for "18" – "3" from correct methods A1 for 15 cao B1 for cm^2 OR M1 for 4×3 (=12) or ½ × 2 × 3 (=3) M1 (dep on "4×3" and "½ × 2 × 3") for "12" + "3" from correct methods A1 for 15 cao B1 for cm^2

Q15.

Paper 1MA1:3H			
Question	**Working**	**Answer**	**Notes**
		431	B1 for use of Pythagoras involving the unknown length P1 for setting up an equation equivalent to $x^2 = 15^2 - 5^2 - 7^2$ P1 for finding the volume using their "$\sqrt{15^2 - 5^2 - 7^2}$" A1awrt 430.5