



THIRD SPACE
LEARNING

Mathematics

Paper 2

(Calculator)

Higher Tier

Mark Scheme

Edexcel GCSE

SET 4

Question	Working	Answer	Notes
Q1a	$7 - 3 = 4$	p^4	A1 cao
Q1b	$3 \times 5 = 15$	q^{15}	A1 cao
Q1c		$2 \times 3 = 6$ so it should be $6x^7$	B1 Correct explanation
Q2	<p>5 litres of blue paint = £17.50</p> <p>1 litre of blue paint = $\text{£}17.50 \div 5 = \text{£}3.50$</p> <p>$\text{£}3.50 \div 5 \times 6 = \text{£}4.20$</p> <p>1 litre of yellow paint = £4.20</p> <p>$\text{£}4.20 \times 8 = \text{£}33.60$</p>	£33.60	<p>M1 1 litre of blue paint = £3.50</p> <p>M1 1 litre of yellow paint = £4.20</p> <p>M1 $\text{£}4.20 \times 8$</p> <p>A1 cao</p>
Q3a	<p>Factors of 80:</p> <p>1, 2, 4, 5, 8, 10, 16, 20, 40, 80</p> <p>Factors of 112:</p> <p>1, 2, 4, 7, 8, 14, 16, 28, 56, 112</p>	16	<p>M1 Lists the factors of 80 and 112 or draws prime factor trees</p> <p>A1 cao</p>
Q3b	<p>32, 64, 96, 128, 160, ...</p> <p>40, 80, 120, 160, ...</p>	160	<p>M1 Lists the multiples of 32 and 40 or draws prime factor trees</p> <p>A1 cao</p>
Q4a	$\frac{1}{0.4} = 2.5$	2.5	A1 cao
Q4b		$225 \leq x < 235$	<p>B1 Lower bound correct</p> <p>B1 Upper bound correct</p>

Question	Working	Answer	Notes
Q5	$3t + 4c = 10.80$ $2t + 5c = 11.40$ $6t + 8c = 21.60$ $6t + 15c = 34.20$ $7c = 12.60$ $c = £1.80$ $3t + 4 \times 1.80 = 10.80$ $3t = 3.60$ $t = £1.20$ $4t + c = 4 \times 1.20 + 1.80$ $= £6.60$	£6.60	M1 Forms 2 equations M1 $t = 1.2(0)$ or $c = 1.8(0)$ seen M1 $t = 1.2(0)$ and $c = 1.8(0)$ seen M1 Substitutes 'their' values for total cost, $4 \times 1.20 + 1.80$ A1 cao
Q6	Planet B $9.05 \times 10^{11} = \frac{4}{3}\pi r^3$ $r = \sqrt[3]{\frac{9.05 \times 10^{11}}{\frac{4}{3}\pi}} = 6000.489175$ $\frac{6000.489175}{4 \times 10^3} = 1.500122294$	1.5	M1 $9.05 \times 10^{11} = \frac{4}{3}\pi r^3$ A1 Radius $B = 6000$ M1 Divides by 4000 to find scale factor A1 cao

Question	Working	Answer	Notes
Q7	60% of 80% = 48%	48%	M1 60% of 80% seen or indicated A1 cao
Q8	$5x = 2f - p$ $5x + p = 2f$ $\frac{5x + p}{2} = f$	$f = \frac{5x + p}{2}$	M1 Correct first step A1 cao
Q9	3.312038647	3.31	M1 3.312(038647) A1 cao
Q10	$8 \times 9 \times d = 360$ $d = \frac{360}{8 \times 9} = 5$	5	M1 8×9 seen or implied A1 cao
Q11a		Yes - the upper quartile is 29, so three quarters of patients were seen in 29 minutes or less	B1 Yes with correct explanation
Q11b	*The median was lower after the change *The smallest and largest values were both smaller after the change *The lower and upper quartiles were lower after the change *The range was smaller after the change *The interquartile range was smaller after the change		B1 A correct statement comparing location or range B1 Two correct statements comparing location and range

Question	Working	Answer	Notes
Q12a		Yes - 2 was rolled considerably more times than any other number	B1 A correct statement
Q12b		Repeat the experiment more times	B1 A correct statement
Q13a	$\sqrt{(3 - -6)^2 + (-8 - 4)^2}$ $= \sqrt{81 + 144}$ $= 15$	15cm	M1 Attempts to use Pythagoras theorem with x coordinates and y coordinates A1 cao
Q13b	Gradient of AB : $\frac{4 - -8}{-6 - 3} = \frac{12}{-9} = -\frac{4}{3}$ Gradient of line: $4y = 3x + 34$ $y = \frac{3}{4}x + \frac{34}{4}$ Gradient = $\frac{3}{4}$ $-\frac{4}{3} \times \frac{3}{4} = -1$ therefore perpendicular		M1 Correct gradient for AB or the line $4y = 3x + 34$ M1 Both gradients correct A1 Both gradients correct and conclusion given
Q14	$BC^2 = 7^2 + 11^2 - 2 \times 7 \times 11 \cos(65)$ $BC^2 = 170 - 154 \cos(65)$ $BC = \sqrt{170 - 154 \cos(65)}$ $BC = 10.24288962$	10.2cm	M1 Correct substitution of values into cosine rule M1 Attempt to solve, reaching $BC =$ A1 cao

Question	Working	Answer	Notes												
Q15	<p>First difference: 6, 8, 10</p> <p>Second difference 2, 2</p> <table><tr><td>5</td><td>11</td><td>19</td><td>29</td></tr><tr><td>1</td><td>4</td><td>9</td><td>16</td></tr><tr><td>4</td><td>7</td><td>10</td><td>13</td></tr></table> <p>nth term of 4, 7, 10, 13 is $3n + 1$</p>	5	11	19	29	1	4	9	16	4	7	10	13	$n^2 + 3n + 1$	<p>M1 Finds second difference and equates to n^2</p> <p>M1 Finds nth term of remaining sequence, $3n + 1$</p> <p>A1 cao</p>
5	11	19	29												
1	4	9	16												
4	7	10	13												
Q16a	<p>$x_1 = \sqrt[3]{8 - 3 \times 2} = 1.25992105$</p> <p>$x_2 = \sqrt[3]{8 - 3 \times 1.25992105} = 1.616015822$</p> <p>$x_3 = \sqrt[3]{8 - 3 \times 1.616015822} = 1.466200026$</p>	<p>$x_1 = 1.25992105$</p> <p>$x_2 = 1.616015822$</p> <p>$x_3 = 1.466200026$</p>	<p>A1 $x_1 = 1.25992105$</p> <p>A1 $x_2 = 1.616015822$</p> <p>A1 $x_3 = 1.466200026$</p>												
Q16b		<p>The values are getting closer to the solution to the equation $x^3 + 3x - 8 = 0$</p>	<p>B1 Correct explanation</p>												

Question	Working	Answer	Notes
Q17	<p>Angle $ABC = 90 + 21 = 111^\circ$ Angle $ADC = 90 + 55 = 145^\circ$ Angle $BCD = 21 + 55 = 76^\circ$ Angle $DAB = 360 - 111 - 145 - 76 = 28^\circ$</p> <p>Or</p> <p>Angle $BCD = 21 + 55 = 76^\circ$ Angle $BOD = 2 \times 76 = 152^\circ$ Angle $ABO = 90^\circ$ Angle $ADO = 90^\circ$ Angle $ABD = 360 - 90 - 90 - 152 = 28^\circ$</p>	28°	<p>M1 Angles ABO and ADO or ABC and ADC identified</p> <p>M1 Angle $BCD = 76^\circ$ or Angle $BOD = 152^\circ$ seen</p> <p>M1 Angle $BCD = 76^\circ$ and Angle $BOD = 152^\circ$ seen</p> <p>A1 cao</p>
Q18	<p>Curved surface area of whole cone $\pi \times 12 \times 30 = 360\pi$</p> <p>Curved surface area of small cone $\pi \times 6 \times 15 = 90\pi$</p> <p>Curved surface area of frustum $360\pi - 90\pi = 270\pi$</p> <p>Area of base $\pi \times 12^2 = 144\pi$</p> <p>Area of top $\pi \times 6^2 = 36\pi$</p> <p>Total: $270\pi + 144\pi + 36\pi = 450\pi = 1413.716694$</p>	$1410cm^2$	<p>M1 Curved surface area of whole cone $\pi \times 12 \times 30 = 360\pi$</p> <p>M1 Curved surface area of frustum $360\pi - 90\pi = 270\pi$</p> <p>M1 Area of base $\pi \times 12^2 = 144\pi$ oe and Area of top $\pi \times 6^2 = 36\pi$ oe seen</p> <p>A1 cao</p>

Question	Working	Answer	Notes
Q19	<p>Frequency density for</p> $180 < t \leq 210 = \frac{18}{30} = 0.6$ <p>Height = $3 \times FD$</p> <p>Frequency density for</p> $210 < t \leq 240 = \frac{12}{30} = 0.4$ <p>Height = $3 \times 0.4 = 1.2$</p>	1.2cm	<p>M1 Calculates frequency density for $180 < t \leq 210$</p> <p>M1 $1.8 \div 0.6 = 3$ or 3×0.4 seen</p> <p>A1 cao</p>
Q20	<p>$P(gg) = 0.4 \times 0.4 = 0.16$</p> <p>$24 = \frac{16}{100}$ of spins</p> <p>Total spins = $24 \times 100 \div 16 = 150$</p> <p>$P(yy) = 0.6 \times 0.6 = 0.36$</p> <p>$0.36 \times 150 = 54$</p>	54	<p>M1 $P(gg) = 0.4 \times 0.4 = 0.16$ or</p> <p>$24 \div 0.16 = 150$ spins</p> <p>M1 $P(yy) = 0.6 \times 0.6 = 0.36$ or 150×0.36 seen</p> <p>A1 cao</p>
Q21	<p>$7x = 3y$</p> <p>$y = \frac{7x}{3}$</p> <p>$2x + \frac{7x}{3} = 117$</p> <p>$\frac{13x}{3} = 117$</p> <p>$x = 117 \times 3 \div 13 = 27$</p> <p>$y = 27 \div 3 \times 7 = 63$</p> <p>$x + 2y = 27 + 2 \times 63 = 153$</p>	153	<p>M1 $2x + \frac{7x}{3} = 117$ oe or $y + \frac{6y}{7} = 117$ oe</p> <p>M1 $x = 27$ $y = 63$</p> <p>A1 cao</p>

Question	Working	Answer	Notes
Q22a	$\sqrt{(2x)^2 + (x+5)^2 + x^2} > 7$ $4x^2 + x^2 + 10x + 25 + x^2 > 49$ $6x^2 + 10x - 24 > 0$		M1 Uses Pythagoras theorem to obtain an expression for the length of AG M1 Sets length of $AG > 7$ A1 Reaches $6x^2 + 10x - 24 > 0$ with no errors
Q22b	$3x^2 + 5x - 12 > 0$ $(3x - 4)(x + 3) > 0$ $x < -3$ or $x > \frac{4}{3}$ $x < -3$ not valid as cannot have negative length	$x > \frac{4}{3}$	M1 Factorises $3x^2 + 5x - 12$ M1 Finds critical values -3 and $\frac{4}{3}$ A1 $x > \frac{4}{3}$ only, must discount $x < -3$
Q23a	$\vec{BC} = -10\mathbf{a} + 20\mathbf{b}$ $\vec{BM} = -5\mathbf{a} + 10\mathbf{b}$ $\vec{AM} = 10\mathbf{a} - 5\mathbf{a} + 10\mathbf{b}$ $\vec{AM} = 5\mathbf{a} + 10\mathbf{b}$		M1 Finds vector BM or CM A1 Fully correct working
Q23b	$\vec{BD} = -10\mathbf{a} + \frac{40}{3}\mathbf{b}$ $\vec{BN} = \frac{3}{5}(-10\mathbf{a} + \frac{40}{3}\mathbf{b})$ $\vec{BN} = -6\mathbf{a} + 8\mathbf{b}$ $\vec{AN} = 10\mathbf{a} - 6\mathbf{a} + 8\mathbf{b} = 4\mathbf{a} + 8\mathbf{b}$ $\vec{AN} = 4(\mathbf{a} + 2\mathbf{b})$ $\vec{AM} = 5(\mathbf{a} + 2\mathbf{b})$	Both lines are multiples of $\mathbf{a} + 2\mathbf{b}$ therefore parallel, and they share the point A . Therefore ANM is a straight line	M1 Finds vector BN or DN M1 Finds vector AN M1 Compares AN and AM A1 Correct conclusion from correct working

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