



THIRD SPACE
LEARNING

Mathematics

Paper 4

(Calculator)

Higher Tier

Mark Scheme

OCR GCSE

SET 4

Question	Working	Answer	Notes
Q1a		493039	A1 cao
Q1b	$\frac{1.816581405}{0.5}$	3.63	M1 3.633162809 A1 cao
Q2a	$7 - 3 = 4$	p^4	A1 cao
Q2b	$3 \times 5 = 15$	q^{15}	A1 cao
Q2c		$2 \times 3 = 6$ so it should be $6x^7$	B1 correct explanation
Q3	<p>5 litres of blue paint = £17.50</p> <p>1 litre of blue paint = $£17.50 \div 5 = £3.50$</p> <p>$£3.50 \div 5 \times 6 = £4.20$</p> <p>1 litre of yellow paint = £4.20</p> <p>$£4.20 \times 8 = £33.60$</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 $£4.20 \times 8$</p> <p>A1 cao</p>
Q4	$60\% \text{ of } 80\% = 48\%$	48%	<p>M1 60% of 80% seen or indicated</p> <p>A1 cao</p>
Q5a	<p>Multiples of 40: 40, 80, 120, 160, 200, ...</p> <p>Multiples of 32: 32, 64, 96, 128, 160, ...</p> <p>$LCM = 160$</p> <p>160 minutes = 2 hours 40 minutes</p> <p>9.10am + 2 hours 40 mins = 11.50am</p>	11.50am	<p>M1 Lists multiples of 40 and multiples of 32 or finds prime factors of 40 and 32</p> <p>M1 Identifies $LCM = 160$</p> <p>M1 Converts to hours and minutes</p> <p>A1 allow omission of am</p>

Question	Working	Answer	Notes
Q5b	<p>Factors of 72: 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72</p> <p>Factors of 108: 1, 2, 3, 4, 6, 9, 12, 18, 27, 36, 54, 108</p> <p>$HCF = 36$</p> <p>Each box contains 36 pieces of fruit</p> <p>2 boxes of apples + 3 boxes of oranges = 5 boxes</p>	<p>36 pieces of fruit</p> <p>5 boxes</p>	<p>M1 Lists factors of 72 and 108 or finds prime factors of 72 and 108</p> <p>M1 Identifies $HCF = 36$</p> <p>A1 36 pieces of fruit in each box</p> <p>A1 5 boxes</p>
Q6	<p>$3t + 4c = 10.80$</p> <p>$2t + 5c = 11.40$</p> <p>$6t + 8c = 21.60$</p> <p>$6t + 15c = 34.20$</p> <p>$7c = 12.60$</p> <p>$c = £1.80$</p> <p>$3t + 4 \times 1.80 = 10.80$</p> <p>$3t = 3.60$</p> <p>$t = £1.20$</p> <p>$4t + c = 4 \times 1.20 + 1.80 = £6.60$</p>	<p>£6.60</p>	<p>M1 Forms 2 equations</p> <p>M1 Multiplies equations to give equal coefficients of 't' or 'c'</p> <p>M1 Subtracts equations and solves for t or c</p> <p>M1 Substitutes their value and solves for the other variable</p> <p>A1 cao</p>

Question	Working	Answer	Notes																
Q7	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																
Q8	<table border="1" data-bbox="286 660 831 938"> <tr> <td></td><td>M</td><td>F</td><td></td></tr> <tr> <td>T</td><td>19</td><td>36</td><td>55</td></tr> <tr> <td>NT</td><td>53</td><td>42</td><td>95</td></tr> <tr> <td></td><td>72</td><td>78</td><td>150</td></tr> </table> Male $\frac{19}{72}$ by train Female $\frac{36}{78}$ by train		M	F		T	19	36	55	NT	53	42	95		72	78	150	Female	M1 78 females and 95 not travelling by train M1 36 females by train M1 53 males not by train M1 19 males by train A1 Male $\frac{19}{72}$ by train, Female $\frac{36}{78}$ by train B1 Correct conclusion following correct working
	M	F																	
T	19	36	55																
NT	53	42	95																
	72	78	150																
Q9		y is inversely proportional to x	B1 cao																
Q10	$8 \times m \times d = 360$ $m \times d = 45$ $m = 9, d = 5$	5	M1 $360 \div 8 = 45$ seen or implied M1 m and d such that $m \times d = 45$ A1 cao																

Question	Working	Answer	Notes
Q11a	$45 - 2 = 43$	43 minutes	M1 45 and 2 seen A1 cao
Q11b		Correct because the upper quartile is 29, so three quarters of patients were seen in 29 minutes or less	B1 Correct with correct explanation
Q11c	*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
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
Q12c	Even number = $\frac{34}{60}$ $\frac{34}{60} \times \frac{34}{60} \times \frac{34}{60} = \frac{4913}{27000}$	$\frac{4913}{27000}$	M1 Even number = $\frac{34}{60}$ M1 $\frac{34}{60} \times \frac{34}{60} \times \frac{34}{60}$ A1 $\frac{4913}{27000}$ oe

Question	Working	Answer	Notes												
Q12d		It is based on experimental probability – we do not know the exact probability	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	<p>Gradient of AB: $\frac{4 - -8}{-6 - 3} = \frac{12}{-9} = -\frac{4}{3}$</p> <p>Gradient of line: $4y = 3x + 34$</p> $y = \frac{3}{4}x + \frac{34}{4}$ <p>Gradient = $\frac{3}{4}$</p> $-\frac{4}{3} \times \frac{3}{4} = -1 \text{ therefore perpendicular}$		M1 Correct method for finding gradient of AB M1 Correct gradient the line $4y = 3x + 34$ M1 Both gradients correct A1 Both gradients correct and conclusion given												
Q14	<p>First difference: 6, 8, 10</p> <p>Second difference 2, 2</p> <table border="1" data-bbox="286 1203 842 1378"> <tbody> <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> </tbody> </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	$a = 1$ $b = 3$ $c = 1$	M1 Finds first and second differences M1 Compares with sequence n^2 M1 Finds n th term of remaining sequence A1 cao
5	11	19	29												
1	4	9	16												
4	7	10	13												

Question	Working	Answer	Notes
Q15	$\frac{\sin C}{7} = \frac{\sin 65}{11}$ $\sin C = \frac{7\sin 65}{11} = 0.576741319$ $C = \sin^{-1} 0.576741319 = 35.22166925$ $\text{Angle } B = 180 - 65 - 35.22166925$ $= 79.77833075$ $\frac{AC}{\sin 79.77833075} = \frac{11}{\sin 65}$ $AC = \frac{11\sin 79.77833075}{\sin 65} = 11.944523$	11.9cm	<p>M1 $\frac{\sin C}{7} = \frac{\sin 65}{11}$</p> <p>M1 $C = \sin^{-1} 0.576741319 = 35.22166925$</p> <p>M1 Angle $B = 180 - 65 - 35.22166925$ $= 79.77833075$</p> <p>M1 $\frac{AC}{\sin 79.77833075} = \frac{11}{\sin 65}$</p> <p>M1 $C = \frac{11\sin 79.77833075}{\sin 65}$</p> <p>A1 11.9cm</p>
Q16	<p>Angle $ABC = 90 + 21 = 111^\circ$</p> <p>Angle $ADC = 90 + 55 = 145^\circ$</p> <p>Angle $BCD = 21 + 55 = 76^\circ$</p> <p>Angle $DAB = 360 - 111 - 145 - 76 = 28^\circ$</p> <p>Or</p> <p>Angle $BCD = 21 + 55 = 76^\circ$</p> <p>Angle $BOD = 2 \times 76 = 152^\circ$</p> <p>Angle $ABO = 90^\circ$</p> <p>Angle $ADO = 90^\circ$</p> <p>Angle $ABD = 360 - 90 - 90 - 152 = 28^\circ$</p>	28°	<p>M1 Angle $BCD = 76^\circ$</p> <p>M1 Angle $BOD = 152^\circ$</p> <p>M1 $360 - 90 - 90 - 152$ oe</p> <p>A1 correct answer following correct working</p>

Question	Working	Answer	Notes
Q17	<p>Curved surface area of whole cone</p> $\pi \times 12 \times 30 = 360\pi$ <p>Curved surface area of small cone</p> $\pi \times 6 \times 15 = 90\pi$ <p>Curved surface area of frustum</p> $360\pi - 90\pi = 270\pi$ <p>Area of base $\pi \times 12^2 = 144\pi$</p> <p>Area of top $\pi \times 6^2 = 36\pi$</p> <p>Total:</p> $270\pi + 144\pi + 36\pi = 450\pi = 1413.716694$	1410cm^2	<p>M1 Curved surface area of whole cone</p> $\pi \times 12 \times 30 = 360\pi$ <p>M1 Curved surface area of smaller cone</p> $\pi \times 6 \times 15 = 90\pi$ <p>M1 Curved surface area of frustum</p> $360\pi - 90\pi = 270\pi$ <p>M1 Area of base</p> $\pi \times 12^2 = 144\pi$ and <p>Area of top $\pi \times 6^2 = 36\pi$</p> <p>A1 cao</p>
Q18	<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</p> $180 < t \leq 210$ <p>M1 Realises that height = $3 \times FD$</p> <p>A1 3×0.4</p> <p>A1 cao</p>

Question	Working	Answer	Notes
Q19	$P(gg) = 0.4 \times 0.4 = 0.16$ $24 = \frac{16}{100}$ of spins Total spins = $24 \times 100 \div 16 = 150$ $P(yy) = 0.6 \times 0.6 = 0.36$ $0.36 \times 150 = 54$	54	M1 $P(gg) = 0.4 \times 0.4 = 0.16$ M1 Calculates 150 spins A1 cao
Q20	$7x = 3y$ $y = \frac{7x}{3}$ $2x + \frac{7x}{3} = 117$ $\frac{13x}{3} = 117$ $x = 117 \times 3 \div 13 = 27$ $y = 27 \div 3 \times 7 = 63$ $x + 2y = 27 + 2 \times 63 = 153$	153	M1 $7x = 3y$ M1 $2x + \frac{7x}{3} = 117$ M1 $x = 27$ $y = 63$ A1 cao
Q21a	$\sqrt{(2x)^2 + (x+5)^2 + x^2} > 7$ $4x^2 + x^2 + 10x + 25 + x^2 > 49$ $6x^2 + 10x - 24 > 0$		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

Question	Working	Answer	Notes
Q21b	$3x^2 + 5x - 12 > 0$ $(3x - 4)(x + 3) > 0$ $x < -3$ or $x > \frac{4}{3}$ $x < -3$ not valid as cannot have negative length	$x > \frac{4}{3}$	M1 Valid attempt to solve $6x^2 + 10x - 24 > 0$ or $= 0$ using one of the methods for solving quadratics M1 Finds critical values -3 and $\frac{4}{3}$ M1 $x > \frac{4}{3}$ A1 $x > \frac{4}{3}$ only
Q22a	$\vec{BC} = -10\mathbf{a} + 20\mathbf{b}$ $\vec{BM} = -5\mathbf{a} + 10\mathbf{b}$ $\vec{AM} = 10\mathbf{a} - 5\mathbf{a} + 10\mathbf{b}$ $\vec{AM} = 5\mathbf{a} + 10\mathbf{b}$		M1 Finds vector BM A1 Correct working
Q22b	$\vec{BD} = -10\mathbf{a} + \frac{40}{3}\mathbf{b}$ $\vec{BN} = \frac{3}{5}(-10\mathbf{a} + \frac{40}{3}\mathbf{b})$ $\vec{BN} = -6\mathbf{a} + 8\mathbf{b}$ $\vec{AN} = 10\mathbf{a} - 6\mathbf{a} + 8\mathbf{b} = 4\mathbf{a} + 8\mathbf{b}$ $\vec{AN} = 4(\mathbf{a} + 2\mathbf{b})$ $\vec{AM} = 5(\mathbf{a} + 2\mathbf{b})$	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 BD M1 Finds vector BN M1 Finds vector AN M1 Compares AN and AM A1 Correct conclusion

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