



THIRD SPACE
LEARNING

Mathematics

Paper 6

(Calculator)

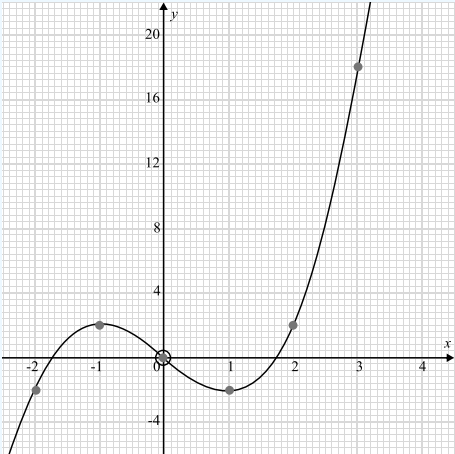
Higher Tier

Mark Scheme

OCR GCSE

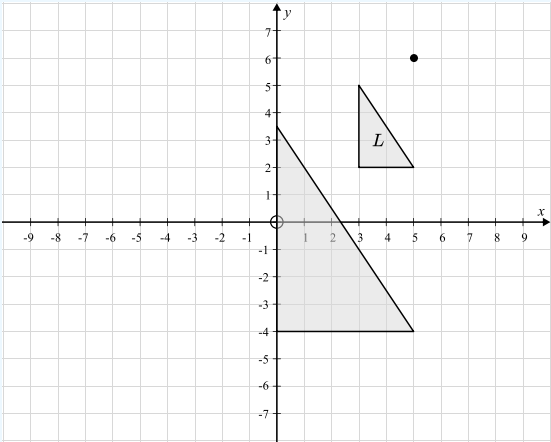
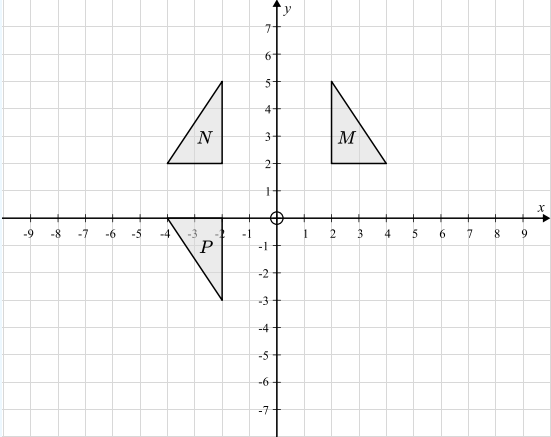
SET 4

Question	Working	Answer	Notes										
Q1		No, it should be $-2 \leq p \leq 3$	B1 Correct explanation										
Q2	$18 \times 2.5 = 45$ $\text{Circumference} = \pi \times 45 = 141.3716694$ $1km = 1000m = 100,000cm$ $100,000 \div 141.3716694 = 707.3553026$	707	M1 Converts from <i>inches</i> to <i>cm</i> M1 Calculates circumference M1 Divides 100000 by circumference A1 cao										
Q3a		2	B1 cao										
Q3b	$0 \times 4 + 1 \times 7 + 2 \times 10 + 3 \times 6 + 4 \times 3 = 57$ $\frac{57}{30} = 1.9$	1.9	M1 Multiplies number of siblings by frequencies M1 Divides by 30 A1 cao										
Q4		$y = \frac{2x^3}{x - 9}$	B1 cao										
Q5a		RHS	B1 cao										
Q5b		No, because they could be different sizes	B1 correct conclusion with a correct explanation										
Q6a	$0.15 + 0.45 = 0.6$ $1 - 0.6 = 0.4$ $0.4 \div 4 = 0.1$ $0.1 \times 3 = 0.3$ <table border="1"><tr><td>Colour</td><td>red</td><td>blue</td><td>yellow</td><td>green</td></tr><tr><td>Probability</td><td>0.15</td><td>0.45</td><td>0.3</td><td>0.1</td></tr></table>	Colour	red	blue	yellow	green	Probability	0.15	0.45	0.3	0.1	Yellow 0.3 Red 0.1	M1 Subtracts 0.15 and 0.45 from 1 A1 cao
Colour	red	blue	yellow	green									
Probability	0.15	0.45	0.3	0.1									

Question	Working	Answer	Notes														
Q6b	$200 \times 0.15 = 30$	30	M1 200×0.15 A1 cao														
Q6c	$18 = 45\%$ $2 = 5\%$ $40 = 100\%$	40	M1 Recognises that $18 = 45\%$ A1 cao														
Q7a	$(-2)^3 - 3 \times (-2) = -2$ $0^3 - 3 \times 0 = 0$ $3^3 - 3 \times 3 = 18$ <table border="1"><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>-2</td><td>2</td><td>0</td><td>-2</td><td>2</td><td>18</td></tr></table>	x	-2	-1	0	1	2	3	y	-2	2	0	-2	2	18	-2, 0, 18	M1 2 values correct A1 All values correct
x	-2	-1	0	1	2	3											
y	-2	2	0	-2	2	18											
Q7b			M1 At least 4 points plotted correctly A1 All points correct and joined with a smooth curve														
Q7c		$x = 2.6$	M1 Line $y = 10$ drawn A1 [2.4 – 2.8]														

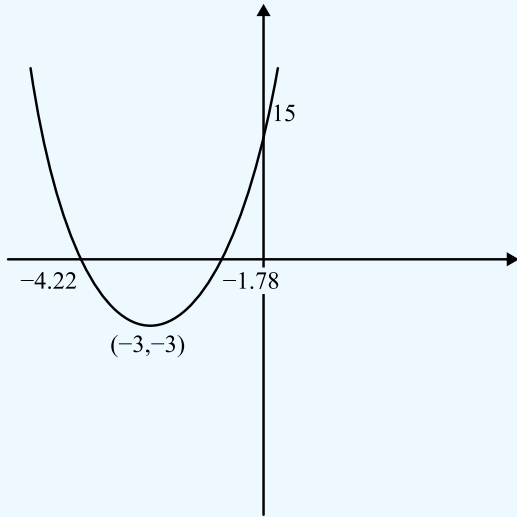
Question	Working	Answer	Notes
Q8	$\frac{4 - -2}{3 - a} = 2$ $\frac{6}{3 - a} = 2$ $\frac{6}{2} = 3 - a$ $3 = 3 - a$ $a = 0$	$a = 0$	<p>M1 Attempt at $m = \frac{y_2 - y_1}{x_2 - x_1}$ or evidence of another valid method e.g. sketching graph</p> <p>M1 Fully correct substitution, giving $\frac{4 - -2}{3 - a} = 2$ and attempt to solve for a, or correct step of another method</p> <p>A1 $a = 0$</p>
Q9a		<p>This is a reverse percentage question so</p> <p>80% = £360. 20% of the original is not 20% of the sale price</p>	B1 A correct explanation
Q9b	$£612 = 85\%$ $1\% = \frac{612}{85} = 7.2$ $100\% = 7.2 \times 100 = £720$	£720	<p>M1 £612 = 85% oe</p> <p>M1 Finds 1% or 10%</p> <p>A1 cao</p>
Q10a	<p>Exterior angle of regular octagon:</p> $360 \div 8 = 45^\circ$ <p>$HG = GI$ so angle $GIH = 45^\circ$</p> <p>Angles in a triangle sum to 180° so</p> $180 - 45 - 45 = 90^\circ$		<p>M1 Calculates exterior angle of octagon</p> <p>M1 States angle $GIH = 45^\circ$ with reason</p> <p>A1 $180 - 45 - 45 = 90^\circ$</p>

Question	Working	Answer	Notes
Q10b	<p>Angle $EHI = 90^\circ$ so angle $EHG = 45^\circ$</p> <p>Angle $HGF = 135^\circ$ (interior angle of octagon)</p> <p>Angle $HGC = 135 \div 2 = 67.5^\circ$</p> <p>Angle $y = 180 - 45 - 67.5 = 67.5^\circ$</p>	67.5°	<p>M1 $EHG = 45^\circ$</p> <p>M1 $HGC = 135 \div 2 = 67.5^\circ$</p> <p>A1 Angle $y = 180 - 45 - 67.5 = 67.5^\circ$</p>
Q10c	<p>Need length GH</p> $\cos(45) = \frac{GH}{5\sqrt{2}}$ $GH = 5\sqrt{2} \times \cos(45) = 5$ <p>Perimeter $= 8 \times 5 = 40cm$</p>	$40cm$	<p>M1 Attempt at a method to find length GH (trigonometry or Pythagoras theorem)</p> <p>A1 $GH = 5$</p> <p>M1 <i>ft</i> their '5' $\times 8$</p> <p>A1 <i>cao</i></p>
Q11a		0.0000273	A1 <i>cao</i>
Q11b		3.43×10^5	A1 <i>cao</i>
Q11ci		They are very small numbers – they would require lots of 0s	B1 correct explanation
Q11cii	$1.67 \times 10^{-27} \div 9.1 \times 10^{-31} = 1835.164835$	1.8×10^3	<p>M1 $1.67 \times 10^{-27} \div 9.1 \times 10^{-31}$</p> <p>M1 1835.164835</p> <p>A1 1.8×10^3 answer in standard form to $2sf$</p>

Question	Working	Answer	Notes
Q12a			<p>M1 Enlargement sf 2.5</p> <p>M1 Enlargement using centre (5,6)</p> <p>A1 Fully correct</p>
Q12b		Rotation 180° about (0, 1)	<p>M1 Triangle <i>N</i> correctly drawn</p> <p>M1 Triangle <i>P</i> correctly drawn</p> <p>M1 Rotation and 180° or 180° about (0, 1)</p> <p>A1 Fully described</p>
Q13	<p>Over 21 angle = 230°</p> <p>Difference = 100°</p> <p>100° = 3500</p> <p>3500 ÷ 100 × 360 = 12600</p>	12600	<p>M1 360 – 130 = 230°</p> <p>M1 100° = 3500</p> <p>M1 Valid attempt to convert to 360°</p> <p>A1 cao</p>

Question	Working	Answer	Notes
Q14	$(2x^2 + 4x - x - 2)(3x + 2)$ $(2x^2 + 3x - 2)(3x + 2)$ $6x^3 + 9x^2 - 6x + 4x^2 + 6x - 4$ $6x^3 + 13x^2 - 4$	$6x^3 + 13x^2 - 4$	M1 Correctly expands any 2 brackets M1 Multiplies by the third bracket to get terms in x^3 , x^2 , x and a constant A1 cao
Q15	Red $\frac{2}{7} \times \frac{2}{7} = \frac{4}{49}$ Green $\frac{2}{7} \times \frac{1}{7} = \frac{2}{49}$ Blue $\frac{1}{7} \times \frac{1}{7} = \frac{1}{49}$ Yellow $\frac{1}{7} \times \frac{1}{7} = \frac{1}{49}$ $\frac{4}{49} + \frac{2}{49} + \frac{1}{49} + \frac{1}{49} = \frac{8}{49}$	$\frac{8}{49}$	M1 Correct probability for any one colour M1 Correct probabilities for 4 colours A1 Adds 4 correct probabilities
Q16		$m = 2$ $n = 2$ $p = 1$	M1 one of, $m = 2$ or $n = 2$ or $p = 1$ correct M1 two of, $m = 2$ or $n = 2$ or $p = 1$ correct A1 All three correct
Q17	$10.56 \div 4 = \text{€}2.64$ $2.64 \div 1.20 = \text{£}2.20$ per drink in France $13.50 \div 4 = \text{£}2.25$ per drink in the UK	France	M1 Converts euros to pounds or pounds to euros M1 Finds cost of equal number of drinks in each country B1 Correct conclusion following correct working

Question	Working	Answer	Notes
Q18	$m^2 - n^2 = (m - n)(m + n)$ $9 = 2(m + n)$ $m + n = 4.5$	4.5	M1 $m^2 - n^2 = (m - n)(m + n)$ M1 $9 = 2(m + n)$ A1 cao
Q19	Upper bound density = $\frac{\text{Upper bound mass}}{\text{Lower bound volume}}$ Lower bound volume: $2.65 \times 3.45 \times 8.15 = 74.511375$ Upper bound mass: 77.5 Upper bound density: $\frac{77.5}{74.511375} = 1.040109648$	No – the upper bound for the density is 1.04, in which case the block will sink.	M1 Upper bound mass: 77.5g M1 Lower bound volume: $2.65 \times 3.45 \times 8.15$ M1 Upper bound density: $\frac{77.5}{74.511375} = 1.040109648$ A1 Correct conclusion following correct working
Q20	$4000 \times n^6 = 4638.77$ $n^6 = 1.1596925$ $n = \sqrt[6]{1.1596925} = 1.024999865$ $n = 1 + \frac{x}{100}$ $1.024999865 = 1 + \frac{x}{100}$ $0.024999865 = \frac{x}{100}$ $x = 2.4999865$ $x = 2.5\%$	2.5%	M1 $4000 \times n^6 = 4638.77$ M1 Divides by 4000 M1 Takes 6th root A1 cao

Question	Working	Answer	Notes
Q21a	$2[x^2 + 6x] + 15$ $2[(x + 3)^2 - 9] + 15$ $2(x + 3)^2 - 3$	$2(x + 3)^2 - 3$	M1 Takes out factor of 2 M1 Halves coefficient of x A1 cao
Q21b	$2(x + 3)^2 - 3 = 0$ $(x + 3)^2 = \frac{3}{2}$ $x + 3 = \pm \sqrt{\frac{3}{2}}$ $x = -3 + \sqrt{\frac{3}{2}} = -1.775255129$ $x = -3 - \sqrt{\frac{3}{2}} = -4.224744871$	$x = -1.78$ $x = -4.22$	M1 Attempts to solve using part a or using the quadratic formula A1 Both solutions correct
Q21c			M1 Positive quadratic curve with at least one key point correctly labelled M1 x intercepts correctly labelled A1 Correct curve with all four points correctly labelled

Question	Working	Answer	Notes
Q22	Volume scale factor: $\frac{128}{54}$ Linear scale factor: $\frac{4}{3}$ Area scale factor: $\frac{16}{9}$ Surface area of A : $160 \div \frac{16}{9} = 90$	90cm^2	M1 Volume scale factor: $\frac{128}{54}$ oe M1 Linear scale factor: $\frac{4}{3}$ M1 Area scale factor: $\frac{16}{9}$ A1 cao
Q23a		3	A1 cao
Q23b		270	A1 cao
Q24	Sequence n th term: $8n + 3$ $(8(n + 1) + 3)^2 - (8n + 3)^2$ $= (8n + 11)^2 - (8n + 3)^2$ $= 64n^2 + 176n + 121 - 64n^2 - 48n - 9$ $= 128n + 112$ $= 16(8n + 7)$ Therefore it is always a multiple of 16		M1 n th term of sequence $8n + 3$ M1 $(8(n + 1) + 3)^2 - (8n + 3)^2$ M1 Attempts to expand and simplify A1 $128n + 112 = 16(8n + 7)$ A1 Conclusion following correct working

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