



THIRD SPACE  
LEARNING

# Mathematics

## Paper 3

### (Calculator)

### Higher Tier

### Mark Scheme

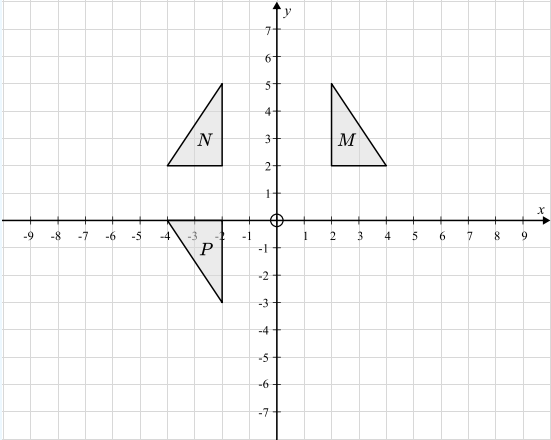
Edexcel GCSE

SET 4

Question	Working	Answer	Notes														
Q1		No, it should be $-2 \leq p \leq 3$	B1 Correct explanation														
Q2	$18 \times 2.5 = 45$ Circumference $= \pi \times 45 = 141.3716694$ $1km = 1000m = 100,000cm$ $100,000 \div 141.3716694 = 707.3553026$	707	M1 Converts from inches to <i>cm</i> M1 Calculates circumference M1 Divides 100,000 by circumference A1 cao														
Q3	$0 \times 4 + 1 \times 7 + 2 \times 10 + 3 \times 6 + 4 \times 3 = 57$ $\frac{57}{30} = 1.9$	1.9	M1 Multiplies number of siblings by frequencies M1 Divides by 30 A1 cao														
Q4a	$0.15 + 0.45 = 0.6$ $1 - 0.6 = 0.4$ $0.4 \div 4 = 0.1$ $0.1 \times 3 = 0.3$ <table><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 Green 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													
Q4b	$200 \times 0.15 = 30$	30	M1 $200 \times 0.15$ A1 cao														
Q5a	$(-2)^3 - 3 \times (-2) = -2$ $0^3 - 3 \times 0 = 0$ $3^3 - 3 \times 3 = 18$ <table><tr><td><i>x</i></td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td><i>y</i></td><td>-2</td><td>2</td><td>0</td><td>-2</td><td>2</td><td>18</td></tr></table>	<i>x</i>	-2	-1	0	1	2	3	<i>y</i>	-2	2	0	-2	2	18	-2, 0, 18	M1 2 values correct A1 All values correct
<i>x</i>	-2	-1	0	1	2	3											
<i>y</i>	-2	2	0	-2	2	18											

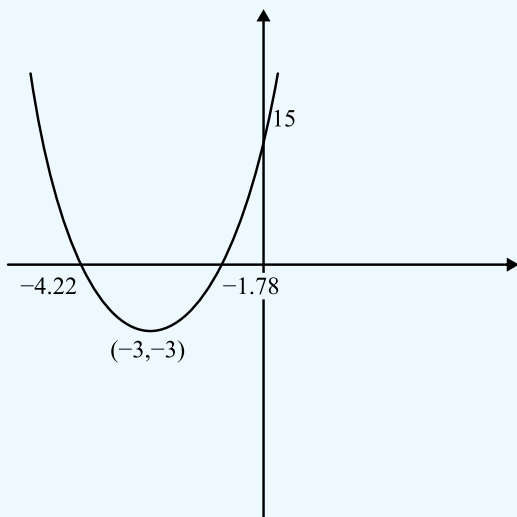
Question	Working	Answer	Notes
Q5b			M1 At least 4 points plotted correctly A1 All points correct and joined with a smooth curve
Q5c		$x = 2.6$	M1 Line $y = 10$ drawn A1 Accept answer in the range $2.4 - 2.8$
Q6	$\frac{4 - -2}{3 - a} = 2$ $\frac{6}{3 - a} = 2$ $\frac{6}{2} = 3 - a$ $3 = 3 - a$ $a = 0$	$a = 0$	M1 Attempt at $m = \frac{y_2 - y_1}{x_2 - x_1}$ or evidence of another valid method e.g. sketching graph M1 Fully correct substitution, giving $\frac{4 - -2}{3 - a} = 2$ and attempt to solve for $a$ , or correct step of another method A1 $a = 0$

Question	Working	Answer	Notes
<b>Q7a</b>		This is a reverse percentage question so $80\% = £360$ . 20% of the original is not 20% of the sale price	B1 A correct explanation
<b>Q7b</b>	$£612 = 85\%$ $1\% = \frac{612}{85} = 7.2$ $100\% = 7.2 \times 100 = £720$	£720	M1 Finds 1% or 10% A1 cao
<b>Q8a</b>	Exterior angle of regular octagon: $360 \div 8 = 45^\circ$ $GH = GI$ so angle $GIH = 45^\circ$ Angles in a triangle sum to $180^\circ$ so $180 - 45 - 45 = 90^\circ$		M1 Calculates exterior angle of octagon M1 States angle $GIH = 45^\circ$ with reason A1 $180 - 45 - 45 = 90^\circ$
<b>Q8b</b>	Angle $EHI = 90^\circ$ so angle $EHG = 45^\circ$ Angle $FGH = 135^\circ$ (interior angle of octagon) Angle $CGH = 135 \div 2 = 67.5^\circ$ Angle $y = 180 - 45 - 67.5 = 67.5^\circ$	$67.5^\circ$	M1 $EHG = 45^\circ$ M1 $CGH = 135 \div 2 = 67.5^\circ$ A1 Angle $y = 180 - 45 - 67.5 = 67.5^\circ$ (Allow alternative method using $BCG$ is corresponding to angle $y$ as $BC$ is parallel to $EH$ )
<b>Q8c</b>	Need length $GH$ $\cos(45) = \frac{GH}{5\sqrt{2}}$ $GH = 5\sqrt{2} \times \cos(45) = 5$ Perimeter $= 8 \times 5 = 40cm$	$40cm$	M1 Attempt at a method to find length $GH$ (trigonometry or Pythagoras theorem) A1 $GH = 5$ M1 <i>fit</i> their ' $5$ ' $\times 8$ A1 cao

Question	Working	Answer	Notes
Q9a		0.0000273	A1 cao
Q9b		$3.43 \times 10^5$	A1 cao
Q10		Rotation 180° about (0, 1)	M1 Triangle <i>N</i> correctly drawn M1 Triangle <i>P</i> correctly drawn A1 Transformation fully described
Q11	Over 21 angle = 230° Difference = 100° 100° = 3500 3500 ÷ 100 × 360 = 12600	12600	M1 360 – 130 = 230° M1 100° = 3500 or 3500 ÷ 100 seen A1 cao
Q12	$(2x^2 + 4x - x - 2)(3x + 2)$ $(2x^2 + 3x - 2)(3x + 2)$ $6x^3 + 9x^2 - 6x + 4x^2 + 6x - 4$ $6x^3 + 13x^2 - 4$	$6x^3 + 13x^2 - 4$	M1 Correctly expands any 2 brackets A1 cao

Question	Working	Answer	Notes
<b>Q13</b>	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 1 colour M1 dep Adds 'their' 4 probabilities A1 cao
<b>Q14a</b>	$\frac{50}{x} = \frac{4}{30}$ $x = \frac{50 \times 30}{4} = 375$	375	M1 $\frac{50}{x} = \frac{4}{30}$ A1 cao
<b>Q14b</b>		The building blocks with the dots are evenly distributed through the bag. The dots don't rub off.	B1 One correct assumption
<b>Q15</b>	$10.56 \div 4 = \text{€}2.64$ $2.64 \div 1.20 = \text{£}2.20$ 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 A1 Correct conclusion following correct working
<b>Q16</b>	$m^2 - n^2 = (m - n)(m + n)$ $9 = 2(m + n)$ $m + n = 4.5$	4.5	M1 $m^2 - n^2 = (m - n)(m + n)$ A1 cao

Question	Working	Answer	Notes
<b>Q17</b>	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: $2.65 \times 3.45 \times 8.15 (= 74.511\dots)$ M1 Upper bound density: $\frac{77.5}{74.511375} = 1.040109648$ A1 Correct conclusion following correct working
<b>Q18</b>	$4000 \times n^6 = 4638.77$ $n^6 = 1.1596925$ $n = \sqrt[6]{1.1596925} = 1.024999865$ $n = 1 + \frac{x}{100}$ $1.024999865 = 1 + \frac{x}{100}$ $0.024999865 = \frac{x}{100}$ $x = 2.49999865$ $x = 2.5\%$	2.5%	M1 $4000 \times n^6 = 4638.77$ M1 $n = 1.0249\dots$ A1 cao
<b>Q19a</b>	$2[x^2 + 6x] + 15$ $2[(x + 3)^2 - 9] + 15$ $2(x + 3)^2 - 3$	$2(x + 3)^2 - 3$	M1 Takes out factor of 2 M1 Completes the square for $x^2 + 6x$ oe A1 cao

Question	Working	Answer	Notes
<b>Q19b</b>	$2(x+3)^2 - 3 = 0$ $(x+3)^2 = \frac{3}{2}$ $x+3 = \pm\sqrt{\frac{3}{2}}$ $x = -3 + \sqrt{\frac{3}{2}} = -1.775255129$ $x = -3 - \sqrt{\frac{3}{2}} = -4.224744871$	$x = -1.78$ $x = -4.22$	M1 Attempts to solve using part (a) or using the quadratic formula A1 Both solutions correct
<b>Q19c</b>			M1 Positive quadratic curve with at least two key points correctly labelled A1 Correct curve with all four key points correctly labelled

Question	Working	Answer	Notes
<b>Q20</b>	<p>Volume scale factor: <math>\frac{128}{54}</math></p> <p>Linear scale factor: <math>\frac{4}{3}</math></p> <p>Area scale factor: <math>\frac{16}{9}</math></p> <p>Surface area of <math>A</math>: <math>160 \div \frac{16}{9} = 90</math></p>	$90\text{cm}^2$	<p>M1 Volume scale factor: <math>\frac{128}{54}</math> oe</p> <p>M1 Area scale factor: <math>\frac{16}{9}</math></p> <p>M1 <math>160 \div</math> 'their' area scale factor</p> <p>A1 cao</p>
<b>Q21a</b>		3	A1 cao
<b>Q21b</b>		270	A1 cao
<b>Q22</b>	<p>Sequence <math>n</math>th term: <math>8n + 3</math></p> <p><math>(8(n + 1) + 3)^2 - (8n + 3)^2</math></p> <p><math>= (8n + 11)^2 - (8n + 3)^2</math></p> <p><math>= 64n^2 + 176n + 121 - 64n^2 - 48n - 9</math></p> <p><math>= 128n + 112</math></p> <p><math>= 16(8n + 7)</math></p> <p>Therefore it is always a multiple of 16</p>		<p>M1 <math>n</math>th term of sequence <math>8n + 3</math></p> <p>M1 <math>(8(n + 1) + 3)^2 - (8n + 3)^2</math></p> <p>M1 Attempts to expand and simplify</p> <p>A1 <math>128n + 112 = 16(8n + 7)</math></p> <p>A1 Conclusion following correct working</p>

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