



THIRD SPACE
LEARNING

Mathematics

Paper 4

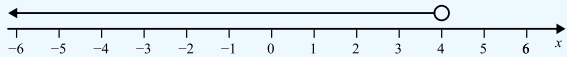
(Calculator)

Higher Tier

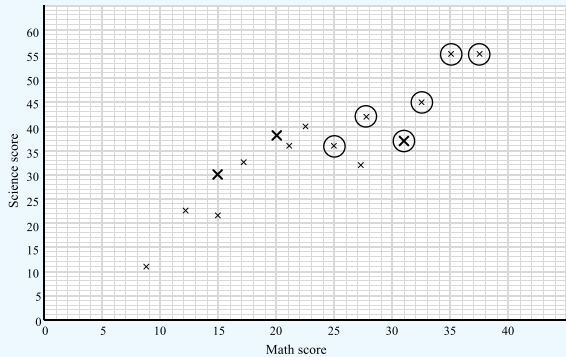
Mark Scheme

OCR GCSE

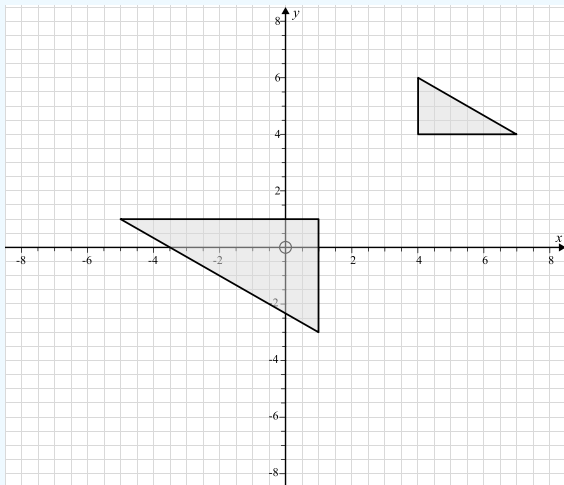
SET 3

Question	Working	Answer	Notes
Q1a	$3x - 6 < 6$ $3x < 12$ $x < 4$	$x < 4$	M1 $3x - 6 < 6$ or $3x < 12$ seen A1 cao
Q1b			M1 <i>ft</i> correctly represents their answer from a A1 cao
Q2	$\frac{\sqrt[3]{\sin(60)+3.8^5}}{14^{\frac{1}{2}}} = 2.474002393$	2.47	M1 2.474002393.... A1 cao
Q3	$\tan(x) = \frac{14}{6}$ $x = \tan^{-1}\left(\frac{14}{6}\right) = 66.80140949$	66.8°	M1 $\tan(x) = \frac{14}{6}$ oe seen M1 Attempts $\tan^{-1}\left(\frac{14}{6}\right)$ A1 cao
Q4	$250 \div 1.90 = 131.58 \text{ g/£}$ $400 \div 2.20 = 181.82 \text{ g/£}$ $600 \div 3.60 = 166.67 \text{ g/£}$ Or $190 \div 250 = 0.76 \text{ p/g}$ $220 \div 400 = 0.55 \text{ p/g}$ $360 \div 600 = 0.6 \text{ p/g}$	400g	M1 Attempt to divide weight by cost or cost by weight for each container M1 At least 2 correct answers M1 All 3 correct A1 Container <i>B</i> indicated following correct working
Q5		Jess as she has done the most trials	B1
Q5bi	$20 \div 6 = 3.33...$	Yes - in 20 rolls, we would expect around 3 6s	A1

Question	Working	Answer	Notes
Q5bii	$1 + 14 + 31 = 46$ $20 + 50 + 200 = 270$ $270 \div 6 = 45$ expected 6s	No - the overall results suggest that the dice is not biased, as we would expect about 45 6s and there were 46	A1
Q6a			M1 Two points correctly plotted A1 All three points correctly plotted
Q6b		Positive correlation	B1
Q6c			M1 Appropriate line of best fit drawn A1 44 – 46, from their line of best fit

Question	Working	Answer	Notes
Q6d	 $\frac{6}{15} = 40\%$	40%	M1 60% of 40 = 24 seen or implied M1 60% of 60 = 36 seen or implied M1 6 students identified A1 cao
Q7a		2.38×10^{-3}	A1
Q7b	$54000 - 3700 = 50300 = 5.03 \times 10^4$	5.03×10^4	M1 54000 and 3700 or 50300 or 5.03 seen A1 cao
Q7c	$\frac{3 \times 10^p}{10^{p-1}} : \frac{4 \times 10^{p-1}}{10^{p-1}} : \frac{5 \times 10^{p+1}}{10^{p-1}}$ $= 3 \times 10 : 4 : 5 \times 10^2$ $= 30 : 4 : 500$ $= 15 : 2 : 250$	15:2:250	M1 30:4:500 oe A1 cao
Q8	$360 - 30 = 330$ $330 \div 2 = 165$ $180 - 165 = 15$ $360 \div 15 = 24$	24	M1 $360 - 30 = 330$ M1 $330 \div 2 = 165$ or $180 - 165 = 15$ M1 $360 \div 15$ A1 cao

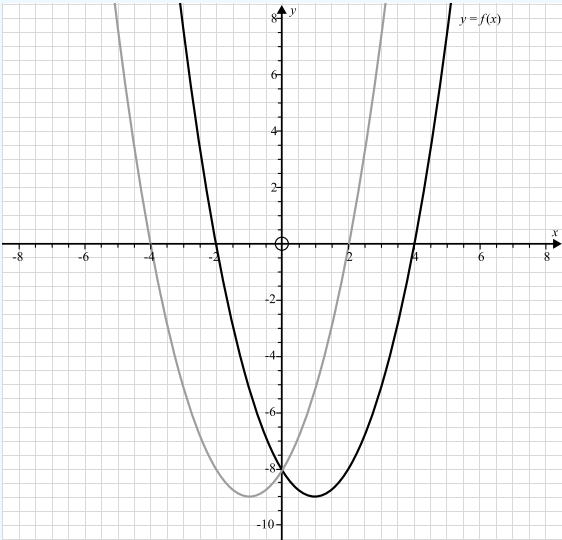
Question	Working	Answer	Notes
Q9	$20\% = 54$ $100\% = 54 \times 5 = 270, \text{ £}270 \text{ interest}$ $\frac{270}{6000} \times 100 = 4.5\% \text{ interest rate}$	4.5%	M1 $20\% = 54$ seen or implied M1 $\text{£}270$ interest M1 Valid attempt to find 270 as a percentage of 6000 A1 cao
Q10	$10 \times 9 \times 5 = 450$	450	M1 10, 9 or 5 seen M1 $10 \times 9 \times 5$ A1 cao
Q11	$m^2 = \frac{3p}{4}$ $4m^2 = 3p$ $p = \frac{4m^2}{3}$	$p = \frac{4m^2}{3}$	M1 $m^2 = \frac{3p}{4}$ or $4m^2 = 3p$ A1 cao
Q12a	$m = \frac{75 - 55}{2 - 1} = 20$	20	M1 Attempt at change in $\frac{\text{change in } y}{\text{change in } x}$ A1 cao
Q12b		Gradient: Hourly charge Y intercept: Fixed initial charge	B1 Gradient correct interpretation B1 Y intercept correct interpretation
Q13	Area upper bound = 2550 Length lower bound = 43.5 Width upper bound $= \frac{2550}{43.5} = 58.620889655....$	58.621m	M1 At least one of: Area upper bound = 2550 Length lower bound = 43.5 M1 $\frac{\text{Their upper bound for area}}{\text{Their lower bound for length}}$ A1 cao

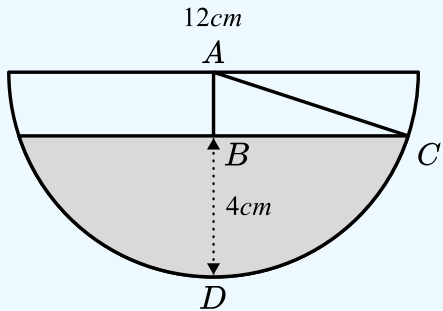
Question	Working	Answer	Notes																								
<div>Q14</div>	<div>First differences: 7, 11, 15, 19</div> <div>Second differences: 4, 4, 4</div> <table><tr><td>n</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>term</td><td>2</td><td>9</td><td>20</td><td>35</td><td>54</td></tr><tr><td>$2n^2$</td><td>2</td><td>8</td><td>18</td><td>32</td><td>50</td></tr><tr><td>term-$2n^2$</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr></table> <div>nth term: $2n^2 + n - 1$</div>	n	1	2	3	4	5	term	2	9	20	35	54	$2n^2$	2	8	18	32	50	term- $2n^2$	0	1	2	3	4	<div>$2n^2 + n - 1$</div>	<div>M1 Correct first and second differences</div> <div>M1 Calculates $2n^2$ and compares with original sequence</div> <div>A1 cao</div>
n	1	2	3	4	5																						
term	2	9	20	35	54																						
$2n^2$	2	8	18	32	50																						
term- $2n^2$	0	1	2	3	4																						
<div>Q15</div>			<div>M1 An enlargement, scale factor 2</div> <div>M1 An enlargement, scale factor -2</div> <div>A1 Fully correct</div>																								

Question	Working	Answer	Notes
Q16	<p>Angle $ADC = 90^\circ$ as angle subtended from a diameter is 90°</p> <p>Angle $CDE = 90^\circ$ as angles on a straight line sum to 180°</p> <p>Angle $ACE = 90^\circ$ as a diameter meets a tangent at 90°</p> <p>Angle $ACD = 21^\circ$ as angles in the same sector are equal</p> <p>Angle $DCE = 90 - 21 = 69^\circ$</p> <p>Angle $DEC = 180 - 90 - 69 = 21^\circ$ as angles in a triangle sum to 180°</p>	21°	<p>M1 Angle $ACD = 21^\circ$</p> <p>M1 Angle $ACE = 90^\circ$ or Angle $CAD = 69^\circ$</p> <p>M1 $180 - 69 - 90$</p> <p>B1 At least 2 reasons correctly described</p> <p>A1 cao with correct working</p>
Q17a	<p>$y^3 + 296 = (y + 2)^3$</p> <p>$y^3 + 296 = (y^2 + 4y + 4)(y + 2)$</p> <p>$y^3 + 296 = y^3 + 6y^2 + 12y + 8$</p> <p>$6y^2 + 12y - 288 = 0$</p> <p>$y^2 + 2y - 48 = 0$</p>		<p>M1 $y^3 + 296 = (y + 2)^3$</p> <p>M1 $6y^2 + 12y - 288 = 0$</p> <p>A1 Reaches $y^2 + 2y - 48 = 0$ with no incorrect working</p>
Q17b	<p>$y^2 + 2y - 48 = 0$</p> <p>$(y + 8)(y - 6) = 0$</p> <p>$y = -8$ (invalid) or $y = 6$</p> <p>Volume: $6^3 = 216$</p>	216cm^3	<p>M1 Valid attempt to solve $y^2 + 2y - 48 = 0$</p> <p>M1 $y = 6$</p> <p>A1 cao, must have discounted $y = -8$</p>

Question	Working	Answer	Notes
Q18	Single : twin = 1 : 6 = 5 : 30 Twin : family = 5 : 2 = 30 : 12 Single : twin : family = 5 : 30 : 12 $12 - 5 = 7$ $21 \div 7 = 3$ $3 \times (5 + 30 + 12) = 141$	141	M1 Single : twin : family = 5 : 30 : 12 oe M1 $21 \div 7 = 3$ or $15 + 90 + 36$ A1 cao
Q19	$(2n + 1)$ and $(2n + 3)$ are consecutive odd numbers: $(2n + 1)^2 + (2n + 3)^2$ $= 4n^2 + 4n + 1 + 4n^2 + 12n + 9$ $= 8n^2 + 16n + 10$ $= 2(4n^2 + 8n + 5)$ It has a factor of 2 and so it is even for all n		M1 Correctly uses two consecutive odd numbers, e.g. $(2n + 1)$ and $(2n + 3)$ or $(2n - 1)$ and $(2n + 1)$ M1 Squares both terms and expands each to form two correct quadratics A1 Factorises by 2 and concludes that it is always even
Q20a		£225000	B1
Q20b		The multiplier is greater than 1	B1
Q20c		3.2%	A1
Q20d	$225000 \times 1.0323 = £247298.57$	£247298.57	M1 225000×1.032^3 seen A1 cao

Question	Working	Answer	Notes
Q20e	$225000 \times 1.032 = \pounds 23220$ $\times 1.032 = \pounds 239630.40$ $\times 1.032 = \pounds 247298.57$ $\times 1.032 = \pounds 255212.13$ $\times 1.032 = \pounds 263378.92$ $\times 1.032 = \pounds 271807.04$ $\times 1.032 = \pounds 280504.87$ 7 years	2029	M1 Multiplies by 1.032 until a value over $\pounds 275000$ is found or tries different values of n in the equation A1 cao
Q21	$\frac{10x - 5}{4x + 3} \div \frac{8x^2 - 10x + 3}{16x^3 - 9x}$ $= \frac{10x - 5}{4x + 3} \times \frac{16x^3 - 9x}{8x^2 - 10x + 3}$ $= \frac{5(2x - 1)}{4x + 3} \times \frac{x(4x + 3)(4x - 3)}{(4x - 3)(2x - 1)}$ $= 5x$	5x	M1 Flips second fraction and multiplies M1 Factorises at least two expressions correctly M1 All expressions factorised and an attempt at cancelling A1 cao following correct working

Question	Working	Answer	Notes
Q22a			M1 Translation by 2 units in positive or negative x direction A1 Translation by -2 units in x direction
Q22b		(135, 0)	A1 x coordinate correct A1 y coordinate correct
Q23	Frequencies: $1 \times 10 = 10$ $0.5 \times 58 = 29$ $0.5 \times 98 = 49$ $2 \times 6 = 12$ $(10 \times 2) + (29 \times 2.75) + (49 \times 3.25)$ $+ (12 \times 4.5) = 313$ $313 \div 100 = 3.13$	3.13kg	M1 Frequencies found and at least 3 correct M1 Midpoints \times frequency M1 Sum of frequencies \times midpoints M1 Divide by 100 A1 cao

Question	Working	Answer	Notes
Q24	 <p> $AC = 6\text{cm}$ $AB = 2\text{cm}$ $\text{Angle } BAC =$ $\cos^{-1}\left(\frac{2}{6}\right) = 70.528779\dots$ $\text{Area of sector } ACD =$ $\frac{70.528779\dots}{360} \times \pi \times 6^2 = 22.157269\dots$ $BC = \sqrt{6^2 - 2^2} = 4\sqrt{2}$ $\text{Area of triangle } ABC = \frac{1}{2} \times 4\sqrt{2} \times 2 = 4\sqrt{2}$ $\text{Area of } BCD = 22.157269\dots - 4\sqrt{2}$ $= 16.50041475\dots$ $\text{Total shaded area} = 2 \times 16.50 =$ $33.0008295\dots$ $\text{Volume} = 33.0 \times 20 = 660.01659\dots$ $660 \div 1000 = 0.66001659 \text{ litres}$ </p>	0.66l	<p>M1 Angle $BAC =$ $\cos^{-1}\left(\frac{2}{6}\right) = 70.528779\dots$ M1 Area of sector $ACD =$ $\frac{70.528779\dots}{360} \times \pi \times 6^2 = 22.157269\dots$ M1 Area of triangle $ABC =$ $\frac{1}{2} \times 4\sqrt{2} \times 2 = 4\sqrt{2}$ M1 Total shaded area = $2 \times 16.50 = 33.0008295\dots$ M1 Volume = $33.0 \times 20 = 660.01659\dots$ A1 cao </p>

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