



THIRD SPACE
LEARNING

Mathematics

Paper 3

(Calculator)

Higher Tier

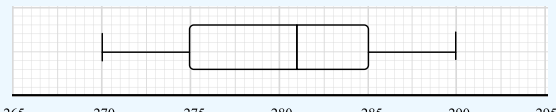
Mark Scheme

Edexcel GCSE

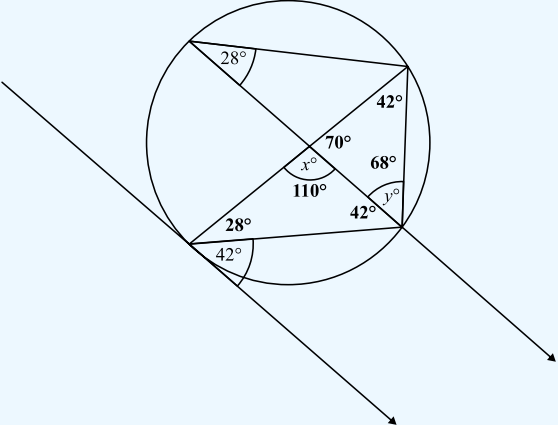
SET 5

Question	Working	Answer	Notes
Q1a		q^{12}	
Q1b		$2p^7$	M1 2 or 7 correct A1 cao
Q1c	$4 \times 3 = 12$ $2^3 = 8$	$a = 4$ $b = 8$	A1 One correct A1 Both correct
Q2	2% of 125 000 = 2500 5% of 80 000 = 4000 Total stamp duty = 2500 + 4000 = £6500 £330 000 + £6500 + £2000 = £338 500 Yes he can afford it	Yes	M1 2% of 125000 = 2500 M1 5% of 80 000 = 4000 M1 Total stamp duty = 2500 + 4000 = £6500 A1 Correct conclusion from correct working
Q3a	$1 - 0.7 = 0.3$	0.3	
Q3b	$200 \times 0.7 = 140$	140	
Q4a		3.4×10^{-5}	
Q4b		27100	
Q4c	$\frac{3 \times 10^8}{4.5 \times 10^9} = \frac{3}{45} = \frac{1}{15}$	$\frac{1}{15}$	A1 Fully simplified fraction

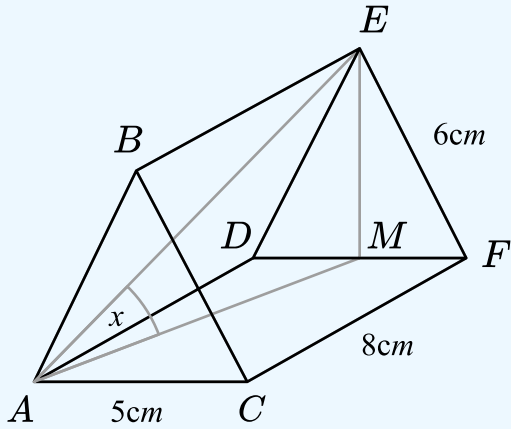
Question	Working	Answer	Notes
Q5a	$5^2 + 8^2 = 89$ $\sqrt{89} = 9.433981132$	9.43cm	M1 $5^2 + 8^2 = 89$ A1 cao
Q5b	Area of semi circle: $\frac{1}{2} \times \pi \times \left(\frac{\sqrt{89}}{2}\right)^2$ $= \frac{1}{2} \times \pi \times 4.71699^2$ $= 34.950(21827\dots)$ Area of triangle: $\frac{1}{2} \times 5 \times 8 = 20$ Shaded area: $34.950(218\dots) - 20 = 14.950(218\dots)$	14.95cm ²	M1 ft their radius in (a) = their "9.433(981...) ÷ 2" M1 ft $\frac{1}{2} \times \pi \times$ their r squared M1 $\frac{1}{2} \times 5 \times 8 = 20$ A1 cao
Q6	$\frac{3a + 5a + 2 + 2a + 8}{3} = 120$ $10a + 10 = 360$ $10 = 350$ $a = 35$ Smallest value: $2 \times 35 + 8 = 78$	78	M1 Sets up equation or multiplies 120 by 3 A1 $a = 35$ M1 Substitutes a into at least one expression A1 cao
Q7		47^{93}	
Q8	$3 \times 8 = 24$ builder hours $24 \div 4 = 6$ hours for 20m wall 12 hours for 40m wall	12 hours	M1 $3 \times 8 = 24$ builder hours M1 $24 \div 4 = 6$ hours for 20m wall A1 cao

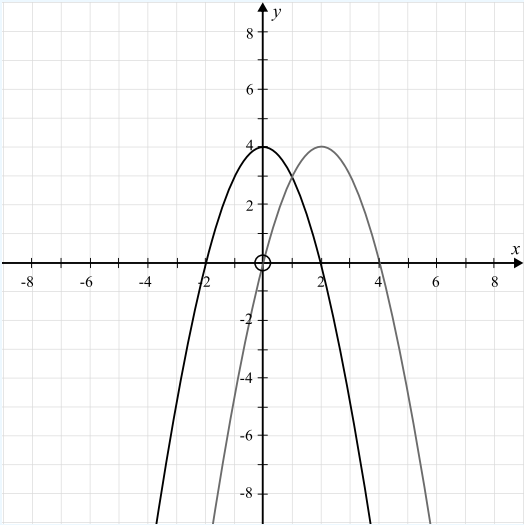
Question	Working	Answer	Notes
<p>Q9</p>	<p>2 + 9 3 + 8 4 + 7 5 + 6</p>	<p>6, 7, 8, 9</p>	<p>M1 At least 3 correct values A1 All 4 values with no extras</p>
<p>Q10</p>	<p>Surface area of cylinder: $2 \times \pi \times 2.5^2 + 2 \times \pi \times 2.5 \times 4.5 = 35\pi$ (=109.9557429...) Surface area of sphere $4\pi r^2 = 250 - 35\pi$ or $250 - 35\pi = 140.0442571$ and $4\pi r^2 = 140.0442571$</p> <p>$r^2 = \frac{250 - 35\pi}{4\pi}$ (=11.14436789) $r = \sqrt{\frac{250 - 35\pi}{4\pi}}$ (=3.3383181...)</p>	<p>3.34m</p>	<p>M1 Calculates surface area of cylinder M1 forms correct equation for SA of sphere or subtracts surface area of cylinder from 250 and interprets this as the maximum surface area of the sphere</p> <p>M1 Solves equation for surface area of sphere to find r A1 cao</p>
<p>Q11a</p>	<p style="text-align: center;">Machine A</p>  <p style="text-align: center;">Weight (grams)</p>		<p>B1 Lowest and highest values correct B1 Median correct B1 Quartiles correct</p>

Question	Working	Answer	Notes																																																	
Q11b	<p>e.g. The median weight of cakes produced by machine <i>B</i> is greater than the median weight of cakes produced by machine <i>A</i>.</p> <p>e.g. The interquartile range for machine <i>B</i> is smaller than the interquartile range for machine <i>A</i>.</p>		<p>C1 Correct comparison of medians</p> <p>C1 Correct comparison of measure of spread (range or IQR)</p>																																																	
Q12	$5 \times 8 + 8 \times 4 + 5 \times 8 \times 4 = 232$		<p>M1 Uses multiplicative method for counting</p> <p>A1 cao</p>																																																	
Q13	<p>First differences: 4, 6, 8, 10</p> <p>Second differences 2, 2, 2</p> <table border="1"> <tr> <td><i>S</i></td> <td>7</td> <td>11</td> <td>17</td> <td>25</td> <td>35</td> </tr> <tr> <td>n^2</td> <td>1</td> <td>4</td> <td>9</td> <td>16</td> <td>25</td> </tr> <tr> <td>$S - n^2$</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> </tr> </table>	<i>S</i>	7	11	17	25	35	n^2	1	4	9	16	25	$S - n^2$	6	7	8	9	10	$n^2 + n + 5$	<p>M1 Finds second differences and halves to give n^2</p> <p>M1 Subtracts n^2 from <i>S</i> and attempts to find <i>n</i>th term</p> <p>A1 cao</p>																															
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Q14	<table border="1"> <tr> <td>÷</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> <tr> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> </tr> <tr> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> </tr> <tr> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> </tr> <tr> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> </tr> </table> <p>or lists combinations (e.g. 2+6 3+5 3+6...)</p>	÷	1	2	3	4	5	6	1	2	3	4	5	6	7	2	3	4	5	6	7	8	3	4	5	6	7	8	9	4	5	6	7	8	9	10	5	6	7	8	9	10	11	6	7	8	9	10	11	12	$\frac{15}{36}$	<p>M1 $P(\text{each combination}) = \frac{1}{36}$ (can be implied by a denominator of 36)</p> <p>M1 Uses a table to show options or lists combinations, identifying at least 12 different combinations</p> <p>A1 $\frac{15}{36}$ or equivalent fraction</p>
÷	1	2	3	4	5	6																																														
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Question	Working	Answer	Notes
Q15a		$(p + q)(p - q)$	
Q15b	$(51 + 49)(51 - 49) = 100 \times 2 = 200$	200	M1 $(51 + 49)(51 - 49)$ A1 cao
Q16ab		$x = 110^\circ$ $y = 68^\circ$	M1 Correctly labels at least one other angle A1 Correct x M1 Correctly labels at least 1 other angle A1 Correct y
Q17a		4200	
Q17b	$4032 = 4200 \times a$ $a = \frac{4032}{4200} = 0.96$		M1 $4032 = 4200 \times a$ A1 $a = \frac{4032}{4200} = 0.96$
Q17c	When $n = 10$: $F = 4200 \times 0.96^{10}$ (= 2792.297...) Decrease is $4200 - 4200 \times 0.96^{10}$ (= 1407.702...) $\frac{4200 - 4200 \times 0.96^{10}}{4200} \times 100 = 33.5 (\dots) \%$ decrease	33.5% decrease which is more than 30%	M1 Calculates $F = 4200 \times 0.96^{10} = 2792$ M1 Calculates either percentage decrease or percentage remaining A1 Correct conclusion

Question	Working	Answer	Notes
Q18	$\frac{448}{1008} = \frac{4}{9} \text{ SA scale factor}$ $\text{V scale factor} = \frac{8}{27}$ $1134 \times \frac{8}{27} = 336$	336cm ³	M1 Finds SA scale factor M1 Finds volume scale factor A1 cao
Q19	$\frac{x}{x+3} + \frac{2x}{3x-1} - 5$ $= \frac{x(3x-1) + 2x(x+3) - 5(x+3)(3x-1)}{(x+3)(3x-1)}$ $= \frac{3x^2 - x + 2x^2 + 6x - 15x^2 - 40x + 15}{(x+3)(3x-1)}$ $= \frac{-10x^2 - 35x + 15}{(x+3)(3x-1)} \left(= \frac{-5(2x^2 + 7 - 3)}{(x+3)(3x-1)} \right)$	$= \frac{-10x^2 - 35x + 15}{(x+3)(3x-1)}$	M1 $\frac{x(3x-1) + 2x(x+3) - 5(x+3)(3x-1)}{(x+3)(3x-1)}$ M1 $\frac{3x^2 - x + 2x^2 + 6x - 15x^2 - 40x + 15}{(x+3)(3x-1)}$ A1 Correct simplified fraction
Q20	$W = \frac{14.05 - 2.355}{0.475} = 24.621(052\dots)$	24.62	M1 Correct use of bounds for u or v or t M1 Correct use of bound for two of u , v and t A1 cao

Question	Working	Answer	Notes
<p>Q21</p>	 <p> $AM^2 = 8^2 + 2.5^2$ or $AE^2 = 8^2 + 6^2$ $AM = 8.382$ or $AE = 10$ $EM^2 = 6^2 - 2.5^2$ $EM = 5.454(\dots)$ $\tan(x) = \frac{5.454(\dots)}{8.382(\dots)}$ or $\sin(x) = \frac{5.454(\dots)}{10}$ $x = 33.0512$ </p>	<p>33.1°</p>	<p>M1 Calculates length AM or length AE M1 Calculates length EM</p> <p>M1 ft $\tan(x) = \frac{\text{“their } EM\text{”}}{\text{“their } AM\text{”}}$</p> <p>or $\sin(x) = \frac{\text{“their } EM\text{”}}{\text{“their } AE\text{”}}$</p> <p>(their values for EM, AM or AE must be from a valid method)</p> <p>A1 cao</p>


Question	Working	Answer	Notes
Q22	$x = \frac{-6 \pm \sqrt{6 - 4ac}}{2a}$ $2a = 6 \text{ so } a = 3$ $\sqrt{36 - 4ac} = 2\sqrt{42}$ $36 - 4ac = 168$ $4ac = -132$ $c = \frac{-132}{12} = -11$	$a = 3$ $c = -11$	M1 $2a = 6$ so $a = 3$ M1 $\sqrt{36 - 4ac} = 2\sqrt{42}$ A1 cao
Q23a			B2 Translation 2 units right (B1 Translation 2 units left)
Q23b		$y = f(x + 3) + 1$	B1 +3 or +1 correctly placed B1 fully correct

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