



THIRD SPACE
LEARNING

Mathematics

Paper 3

(Calculator)

Higher Tier

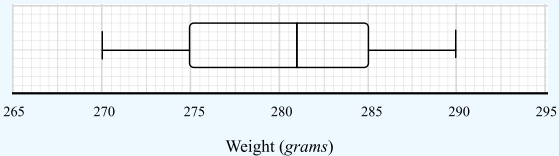
Mark Scheme

AQA GCSE

SET 5

Question	Working	Answer	Notes
Q1a		q^{12}	
Q1b		$2p^7$	M1 2 or 7 correct A1 cao
Q1c	$4 \times 3 = 12$ $2^3 = 8$	$a = 4$ $b = 8$	B1 $a = 4$ B1 $b = 8$
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
Q5a	$5^2 + 8^2 = 89$ $\sqrt{89} = 9.433981132$	9.43cm	M1 $5^2 + 8^2 = 89$ A1 cao

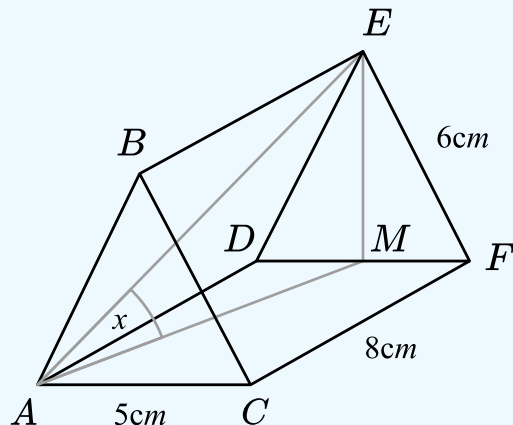
Question	Working	Answer	Notes
Q5b	<p>Area of semi circle: $\frac{1}{2} \times \pi \times \left(\frac{\sqrt{89}}{2}\right)^2$</p> <p>$= \frac{1}{2} \times \pi \times 4.71699^2$</p> <p>$= 34.950(21827\dots)$</p> <p>Area of triangle: $\frac{1}{2} \times 5 \times 8 = 20$</p> <p>Shaded area:</p> <p>$34.950(218\dots) - 20 = 14.950(218\dots)$</p>	14.95cm ²	<p>M1 ft their radius in (a) = their “9.433(981...) ÷ 2</p> <p>M1 ft $\frac{1}{2} \times \pi \times$ their r squared</p> <p>M1 $\frac{1}{2} \times 5 \times 8 = 20$</p> <p>A1 cao</p>
Q6	<p>$\frac{3a + 5a + 2 + 2a + 8}{3} = 120$</p> <p>$10a + 10 = 360$</p> <p>$10 = 350$</p> <p>$a = 35$</p> <p>Smallest value: $2 \times 35 + 8 = 78$</p>	78	<p>M1 Sets up equation or multiplies 120 by 3</p> <p>A1 $a = 35$</p> <p>M1 Substitutes a into at least one expression</p> <p>A1 cao</p>
Q7		47 ⁹³	
Q8	<p>$3 \times 8 = 24$ builder hours</p> <p>$24 \div 4 = 6$ hours for 20m wall</p> <p>12 hours for 40m wall</p>	12 hours	<p>M1 $3 \times 8 = 24$ builder hours</p> <p>M1 $24 \div 4 = 6$ hours for 20m wall</p> <p>A1 cao</p>
Q9	<p>$2 + 9$</p> <p>$3 + 8$</p> <p>$4 + 7$</p> <p>$5 + 6$</p>	6, 7, 8, 9	<p>M1 At least 3 correct values</p> <p>A1 All 4 values with no extras</p>

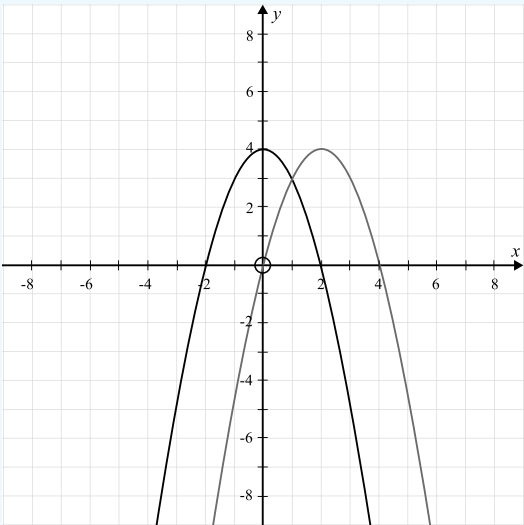
Question	Working	Answer	Notes
Q10	<p>Surface area of cylinder:</p> $2 \times \pi \times 2.5^2 + 2 \times \pi \times 2.5 \times 4.5 = 35\pi$ <p>(=109.9557429...)</p> <p>Surface area of sphere $4\pi r^2 = 250 - 35\pi$</p> <p>or $250 - 35\pi = 140.0442571$ and</p> $4\pi r^2 = 140.0442571$ $r^2 = \frac{250 - 35\pi}{4\pi} (=11.14436789)$ $r = \sqrt{\frac{250 - 35\pi}{4\pi}} (=3.3383181...)$	3.34m	<p>M1 Calculates surface area of cylinder</p> <p>M1 forms correct equation for SA of sphere</p> <p>or</p> <p>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</p> <p>A1 cao</p>
Q11a	<p>Machine A</p>  <p>Weight (grams)</p>		<p>B1 Lowest and highest values correct</p> <p>B1 Median correct</p> <p>B1 Quartiles correct</p>
Q11b	<p>e.g. The median weight of cakes produced by machine B is greater than the median weight of cakes produced by machine A.</p> <p>e.g. The interquartile range for machine B is smaller than the interquartile range for machine A.</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>

Question	Working	Answer	Notes																																																	
<div>Q13</div>	<div>First differences: 4, 6, 8, 10</div> <div>Second differences 2, 2, 2</div> <table><tr><td>S</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>	S	7	11	17	25	35	n^2	1	4	9	16	25	$S - n^2$	6	7	8	9	10	$n^2 + n + 5$	<div>M1 Finds second differences and halves to give n^2</div> <div>M1 Subtracts n^2 from S and attempts to find nth term</div> <div>A1 cao</div>																															
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<div>Q14</div>	<table><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> <div>or lists combinations</div> <div>(e.g. 2+6 3+5 3+6...)</div>	÷	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	$\frac{15}{36}$	<div>M1 P(each combination) = $\frac{1}{36}$ (can be implied by a denominator of 36)</div> <div>M1 Uses a table to show options</div> <div>or lists combinations, identifying at least 12 different combinations</div> <div>A1 $\frac{15}{36}$ or equivalent fraction</div>
÷	1	2	3	4	5	6																																														
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<div>Q15a</div>		$(p + q)(p - q)$																																																		
<div>Q15b</div>	$(51 + 49)(51 - 49) = 100 \times 2 = 200$	200	<div>M1 $(51 + 49)(51 - 49)$</div> <div>A1 cao</div>																																																	

Question	Working	Answer	Notes
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	<p>When $n = 10$: $F = 4200 \times 0.96^{10}$ $(= 2792.297\dots)$</p> <p>Decrease is $4200 - 4200 \times 0.96^{10}$ $(= 1407.702\dots)$</p> <p>$\frac{4200 - 4200 \times 0.96^{10}}{4200} \times 100 = 33.5 (\dots) \%$ decrease</p>	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	$\frac{x}{x+3} + \frac{2x}{3x-1} - 5$ $= \frac{x(3x-1) + 2x(x+3) - 5(x+3)(3x-1)}{(x+3)(3x-1)}$ $= \frac{3x^2 - x + 2x^2 + 6x - 15x^2 - 40x + 15}{(x+3)(3x-1)}$ $= \frac{-10x^2 - 35x + 15}{(x+3)(3x-1)} (= \frac{-5(2x^2 + 7 - 3)}{(x+3)(3x-1)})$	$= \frac{-10x^2 - 35x + 15}{(x+3)(3x-1)}$	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
Q21 	$AM^2 = 8^2 + 2.5^2 \text{ or } AE^2 = 8^2 + 6^2$ $AM = 8.382 \text{ or } AE = 10$ $EM^2 = 6^2 - 2.5^2$ $EM = 5.454(\dots)$ $\tan(x) = \frac{5.454(\dots)}{8.382(\dots)}$ or $\sin(x) = \frac{5.454(\dots)}{10}$ $x = 33.0512$	33.1°	<p>M1 Calculates length <i>AM</i> or length <i>AE</i></p> <p>M1 Calculates length <i>EM</i></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 <i>EM</i>, <i>AM</i> or <i>AE</i> 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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