



THIRD SPACE  
LEARNING

# Mathematics

## Paper 3

### (Calculator)

### Higher Tier

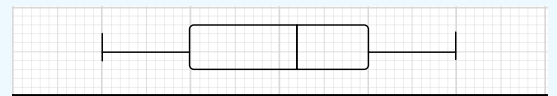
### Mark Scheme

Edexcel GCSE

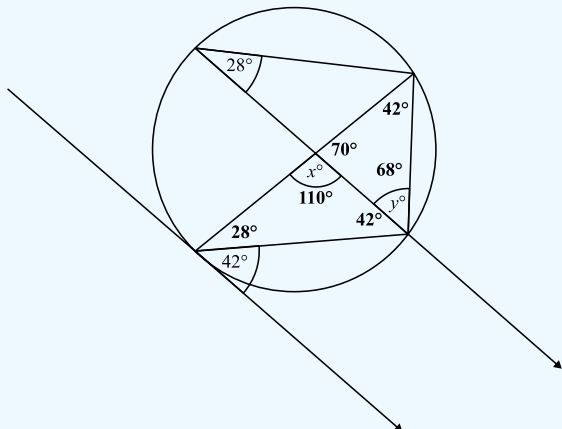
SET 5

Question	Working	Answer	Notes
<b>Q1a</b>		$q^{12}$	
<b>Q1b</b>		$2p^7$	M1 2 or 7 correct A1 cao
<b>Q1c</b>	$4 \times 3 = 12$ $2^3 = 8$	$a = 4$ $b = 8$	A1 One correct A1 Both correct
<b>Q2</b>	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
<b>Q3a</b>	$1 - 0.7 = 0.3$	0.3	
<b>Q3b</b>	$200 \times 0.7 = 140$	140	
<b>Q4a</b>		$3.4 \times 10^{-5}$	
<b>Q4b</b>		27100	
<b>Q4c</b>	$\frac{3 \times 10^8}{4.5 \times 10^9} = \frac{3}{45} = \frac{1}{15}$	$\frac{1}{15}$	A1 Fully simplified fraction

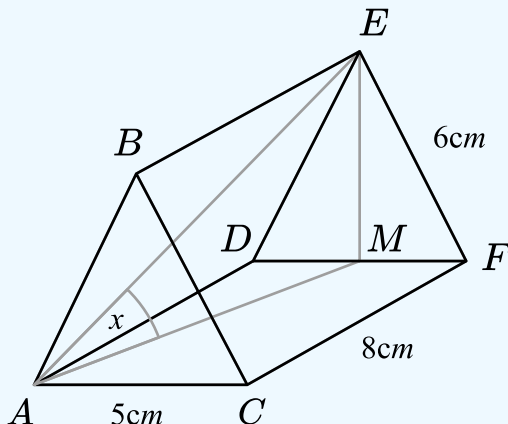
Question	Working	Answer	Notes
<b>Q5a</b>	$5^2 + 8^2 = 89$ $\sqrt{89} = 9.433981132$	9.43cm	M1 $5^2 + 8^2 = 89$ A1 cao
<b>Q5b</b>	Area of semi circle: $\frac{1}{2} \times \pi \times \left(\frac{\sqrt{89}}{2}\right)^2$ $= \frac{1}{2} \times \pi \times 4.71699^2$ $= 34.950(21827...)$ Area of triangle: $\frac{1}{2} \times 5 \times 8 = 20$ Shaded area: $34.950(218...) - 20 = 14.950(218...)$	14.95cm <sup>2</sup>	M1 ft their radius in <b>(a)</b> = 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
<b>Q6</b>	$\frac{3a + 5a + 2 + 2a + 8}{3} = 120$ $10a + 10 = 360$ $10 = 350$ $a = 35$ 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
<b>Q7</b>		$47^{93}$	
<b>Q8</b>	$3 \times 8 = 24$ 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
<b>Q9</b>	$2 + 9$ $3 + 8$ $4 + 7$ $5 + 6$	6, 7, 8, 9	M1 At least 3 correct values A1 All 4 values with no extras
<b>Q10</b>	<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 <math>4\pi r^2 = 250 - 35\pi</math>  <b>or</b> <math>250 - 35\pi = 140.0442571</math> <b>and</b>  <math>4\pi r^2 = 140.0442571</math></p> $r^2 = \frac{250 - 35\pi}{4\pi} (=11.14436789)$ $r = \sqrt{\frac{250 - 35\pi}{4\pi}} (=3.3383181...)$	3.34m	M1 Calculates surface area of cylinder M1 forms correct equation for SA of sphere <b>or</b> subtracts surface area of cylinder from 250 and interprets this as the maximum surface area of the sphere  M1 Solves equation for surface area of sphere to find $r$ A1 cao
<b>Q11a</b>	<p style="text-align: center;">Machine A</p>  <p style="text-align: center;">Weight (grams)</p>		B1 Lowest and highest values correct B1 Median correct B1 Quartiles correct

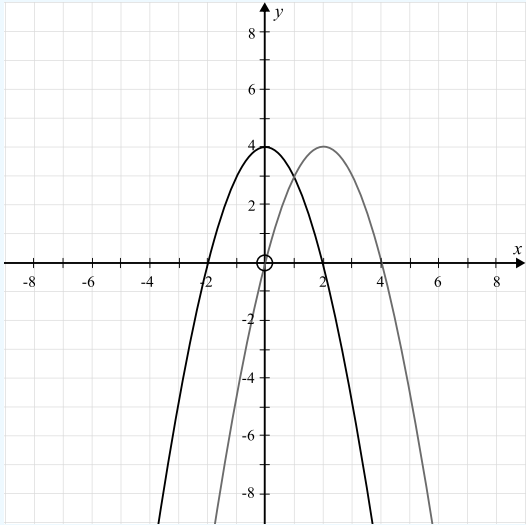
Question	Working	Answer	Notes																																																	
<b>Q11b</b>	<p>e.g. The median weight of cakes produced by machine <i>B</i> is greater than the median weight of cakes produced by machine <i>A</i>.</p> <p>e.g. The interquartile range for machine <i>B</i> is smaller than 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>																																																	
<b>Q12</b>	$5 \times 8 + 8 \times 4 + 5 \times 8 \times 4 = 232$		<p>M1 Uses multiplicative method for counting</p> <p>A1 cao</p>																																																	
<b>Q13</b>	<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><i>n</i><sup>2</sup></td><td>1</td><td>4</td><td>9</td><td>16</td><td>25</td></tr><tr><td><i>S</i> − <i>n</i><sup>2</sup></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	<i>n</i> <sup>2</sup>	1	4	9	16	25	<i>S</i> − <i>n</i> <sup>2</sup>	6	7	8	9	10	$n^2 + n + 5$	<p>M1 Finds second differences and halves to give <i>n</i><sup>2</sup></p> <p>M1 Subtracts <i>n</i><sup>2</sup> from <i>S</i> and attempts to find <i>n</i>th term</p> <p>A1 cao</p>																															
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<b>Q14</b>	<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(each combination) = <math>\frac{1}{36}</math> (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 <math>\frac{15}{36}</math> or equivalent fraction</p>
÷	1	2	3	4	5	6																																														
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Question	Working	Answer	Notes
<b>Q15a</b>		$(p + q)(p - q)$	
<b>Q15b</b>	$(51 + 49)(51 - 49) = 100 \times 2 = 200$	200	M1 $(51 + 49)(51 - 49)$ A1 cao
<b>Q16ab</b>		$x = 110^\circ$ $y = 68^\circ$	M1 Correctly labels at least one other angle A1 Correct $x$ M1 Correctly labels at least 1 other angle A1 Correct $y$
<b>Q17a</b>		4200	
<b>Q17b</b>	$4032 = 4200 \times a$ $a = \frac{4032}{4200} = 0.96$		M1 $4032 = 4200 \times a$ A1 $a = \frac{4032}{4200} = 0.96$
<b>Q17c</b>	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
<b>Q18</b>	$\frac{448}{1008} = \frac{4}{9} \text{ SA scale factor}$ $\text{V scale factor} = \frac{8}{27}$ $1134 \times \frac{8}{27} = 336$	336cm <sup>3</sup>	M1 Finds SA scale factor M1 Finds volume scale factor A1 cao
<b>Q19</b>	$\frac{x}{x+3} + \frac{2x}{3x-1} - 5$ $= \frac{x(3x-1) + 2x(x+3) - 5(x+3)(3x-1)}{(x+3)(3x-1)}$ $= \frac{3x^2 - x + 2x^2 + 6x - 15x^2 - 40x + 15}{(x+3)(3x-1)}$ $= \frac{-10x^2 - 35x + 15}{(x+3)(3x-1)} (= \frac{-5(2x^2 + 7 - 3)}{(x+3)(3x-1)})$	$= \frac{-10x^2 - 35x + 15}{(x+3)(3x-1)}$	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
<b>Q20</b>	$W = \frac{14.05 - 2.355}{0.475} = 24.621(052\dots)$	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	 <p> <math>AM^2 = 8^2 + 2.5^2</math> <b>or</b> <math>AE^2 = 8^2 + 6^2</math>  <math>AM = 8.382</math> <b>or</b> <math>AE = 10</math>  <math>EM^2 = 6^2 - 2.5^2</math>  <math>EM = 5.454(\dots)</math>  <math>\tan(x) = \frac{5.454(\dots)}{8.382(\dots)}</math>  <b>or</b> <math>\sin(x) = \frac{5.454(\dots)}{10}</math>  <math>x = 33.0512</math> </p>	33.1°	<p>M1 Calculates length <math>AM</math> <b>or</b> length <math>AE</math></p> <p>M1 Calculates length <math>EM</math></p> <p>M1 ft <math>\tan(x) = \frac{\text{“their } EM\text{”}}{\text{“their } AM\text{”}}</math></p> <p>or <math>\sin(x) = \frac{\text{“their } EM\text{”}}{\text{“their } AE\text{”}}</math></p> <p>(their values for <math>EM</math>, <math>AM</math> or <math>AE</math> 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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