



THIRD SPACE  
LEARNING

# Mathematics

## Paper 2

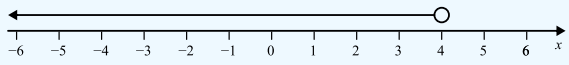
### (Calculator)

### Higher Tier

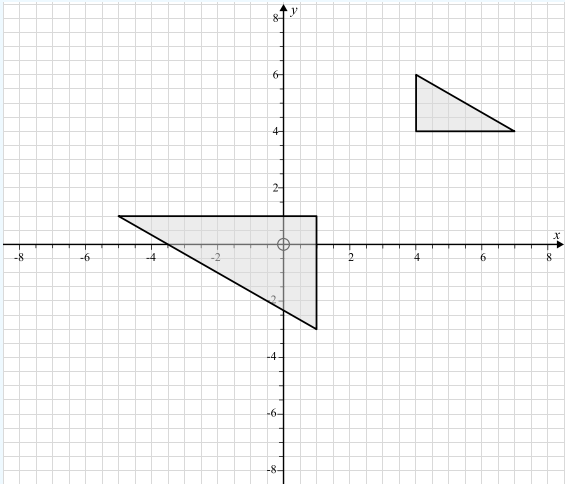
### Mark Scheme

Edexcel GCSE

SET 3

Question	Working	Answer	Notes
<b>Q1i</b>	$3x - 6 < 6$ $3x < 12$ $x < 4$	$x < 4$	M1 $3x - 6 < 6$ or $3x < 12$ seen A1 cao
<b>Q1ii</b>			M1 <i>ft</i> correctly represents their answer from <i>i</i> A1 cao
<b>Q2</b>	$\tan(x) = \frac{14}{6}$ $x = \tan^{-1}\left(\frac{14}{6}\right) = 66.80140949$	$66.8^\circ$	M1 $\tan(x) = \frac{14}{6}$ oe seen M1 Attempts $\tan^{-1}\left(\frac{14}{6}\right)$ A1 cao
<b>Q3a</b>		Jess as she has done the most trials	B1 Jess with the correct reason
<b>Q3bi</b>	$20 \div 6 = 3.33\dots$	Yes - in 20 rolls, we would expect around 3 6s	B1 Yes with a correct conclusion
<b>Q3bii</b>	$1 + 14 + 31 = 46$ $20 + 50 + 200 = 270$ $270 \div 6 = 45$ expected 6s	No - the overall results suggest that the dice is not biased, as we would expect about 45 6s and there were 46	B1 No with a correct conclusion
<b>Q4</b>	$12 \times 8 = 96$ machine hours $96 \div 9 = 10\frac{2}{3}$ $\frac{2}{3}$ hours = $\frac{2}{3} \times 60 = 40$ minutes	10 hours 40 minutes	M1 $12 \times 8 = 96$ machine hours M1 $96 \div 9 = 10\frac{2}{3}$ A1 cao
<b>Q5a</b>	$180 - 165 = 15$ $360 \div 15 = 24$	24	M1 $180 - 165 (= 15)$ or $360 \div 15 (= 24)$ seen A1 cao

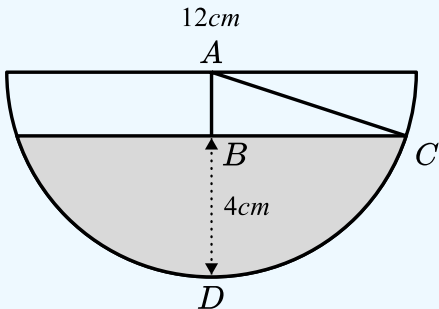
Question	Working	Answer	Notes
<b>Q5b</b>		No	B1 cao
<b>Q6a</b>		$2.38 \times 10^{-3}$	A1 cao
<b>Q6b</b>	$54000 - 3700 = 50300 = 5.03 \times 10^4$	$5.03 \times 10^4$	M1 54000 and 3700 or 50300 or 5.03 seen A1 cao
<b>Q6c</b>	$\frac{3 \times 10^p}{10^{p-1}} : \frac{4 \times 10^{p-1}}{10^{p-1}} : \frac{5 \times 10^{p+1}}{10^{p-1}}$ $= 3 \times 10 : 4 : 5 \times 10^2$ $= 30 : 4 : 500$ $= 15 : 2 : 250$	15 : 2 : 250	M1 30 : 4 : 500 oe A1 Correct simplified answer
<b>Q7a</b>		$\begin{pmatrix} 3x - 2 \\ 15 - 2y \end{pmatrix}$	M1 3x - 2 or 15 - 2y seen A1 cao
<b>Q7b</b>	$x + 1 = 4, x = 3$ $5 + y = 3, y = -2$	$x = 3, y = -2$	M1 $x + 1 = 4$ or $5 + y = 3$ seen M1 x or y correct A1 cao
<b>Q8</b>	2.474002393	2.47	M1 9.256869... and 3.741657... or 2.474002393 seen A1 2.47
<b>Q9</b>	$20\% = 54$ $100\% = 54 \times 5 = 270, \text{£}270 \text{ interest}$ $\frac{270}{6000} \times 100 = 4.5\% \text{ interest rate}$	4.5%	M1 20% = 54 seen or implied M1 £270 interest M1 Valid attempt to find 270 as a percentage of 6000 A1 cao

Question	Working	Answer	Notes
<b>Q10</b>	$10 \times 9 \times 5 = 450$	450	M1 10, 9 or 5 seen M1 $10 \times 9 \times 5$ A1 cao
<b>Q11</b>	$m^2 = \frac{3p}{4}$ $4m^2 = 3p$ $p = \frac{4m^2}{3}$	$p = \frac{4m^2}{3}$	M1 $m^2 = \frac{3p}{4}$ or $4m^2 = 3p$ seen A1 cao
<b>Q12a</b>	$m = \frac{75 - 55}{2 - 1} = 20$	20	M1 Attempt at change in $\frac{\text{change in } y}{\text{change in } x}$ A1 cao
<b>Q12b</b>		Gradient: Hourly charge Y intercept: Fixed initial charge	B1 Gradient correct interpretation B1 Y intercept correct interpretation
<b>Q13</b>			M1 An enlargement, scale factor 2 M1 An enlargement, scale factor -2 A1 Fully correct

Question	Working	Answer	Notes
<b>Q14</b>	<p>Angle <math>ADC = 90^\circ</math> as angle subtended from a diameter is <math>90^\circ</math></p> <p>Angle <math>CDE = 90^\circ</math> as angles on a straight line sum to <math>180^\circ</math></p> <p>Angle <math>ACE = 90^\circ</math> as a diameter meets a tangent at <math>90^\circ</math></p> <p>Angle <math>ACD = 21^\circ</math> as angles in the same sector are equal</p> <p>Angle <math>DCE = 90 - 21 = 69^\circ</math></p> <p>Angle <math>DEC = 180 - 90 - 69 = 21^\circ</math> as angles in a triangle sum to <math>180^\circ</math></p>	$21^\circ$	<p>M1 Angle <math>ACD = 21^\circ</math></p> <p>M1 Angle <math>ADC = 90^\circ</math></p> <p>M1 Angle <math>DAC = 69^\circ</math></p> <p>B1 At least 2 reasons correctly described</p> <p>A1 cao, dependent on M1M1M1</p>
<b>Q15a</b>	<p><math>y^3 + 296 = (y + 2)^3</math></p> <p><math>y^3 + 296 = (y^2 + 4y + 4)(y + 2)</math></p> <p><math>y^3 + 296 = y^3 + 6y^2 + 12y + 8</math></p> <p><math>6y^2 + 12y - 288 = 0</math></p> <p><math>y^2 + 2y - 48 = 0</math></p>		<p>M1 <math>y^3 + 296 = (y + 2)^3</math> oe</p> <p>M1 <math>6y^2 + 12y - 288 = 0</math></p> <p>A1 Reaches <math>y^2 + 2y - 48 = 0</math> with no incorrect working</p>
<b>Q15b</b>	<p><math>y^2 + 2y - 48 = 0</math></p> <p><math>(y + 8)(y - 6) = 0</math></p> <p><math>y = -8</math> (invalid) or <math>y = 6</math></p> <p>Volume: <math>6^3 = 216</math></p>	$216\text{cm}^3$	<p>M1 Valid attempt to solve <math>y^2 + 2y - 48 = 0</math></p> <p>M1 <math>y = 6</math></p> <p>A1 cao, must have discounted <math>y = -8</math></p>

Question	Working	Answer	Notes
<b>Q16</b>	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 $21 \div 7 = 3$ A1 cao
<b>Q17</b>	$F_0 = 50$ $F_1 = 1.4 \times 50 - 10 = 60$ $F_2 = 1.4 \times 60 - 10 = 74$ $F_3 = 1.4 \times 74 - 10 = 93.6$	94	M1 $F_1 = 1.4 \times 50 - 10 = 60$ M1 Attempts to apply iteration 2 more times A1 cao
<b>Q18</b>	$\frac{10x - 5}{4x + 3} \div \frac{8x^2 - 10x + 3}{16x^3 - 9x}$ $= \frac{10x - 5}{4x + 3} \times \frac{16x^3 - 9x}{8x^2 - 10x + 3}$ $= \frac{5(2x - 1)}{4x + 3} \times \frac{x(4x + 3)(4x - 3)}{(4x - 3)(2x - 1)}$ $= 5x$	5x	M1 Flips second fraction and multiplies M1 Factorised at least two expressions correctly M1 All expressions factorised and an attempt at cancelling A1 cao following correct working

Question	Working	Answer	Notes
Q19a			M1 Translation by 2 units in positive or negative $x$ direction A1 Translation by $-2$ units in $x$ direction
Q19b		(135, 0)	A1 $x$ coordinate correct A1 $y$ coordinate correct
Q20	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 used M1 Sum of frequencies $\times$ midpoints M1 Divide by 100 A1 cao

Question	Working	Answer	Notes
Q21	 <p> <math>AC = 6\text{cm}</math>  <math>AB = 2\text{cm}</math>  <math>\text{Angle } BAC =</math>  <math>\cos^{-1}\left(\frac{2}{6}\right) = 70.528779\dots</math>  <math>\text{Area of sector } ACD =</math>  <math>\frac{70.528779\dots}{360} \times \pi \times 6^2 = 22.157269\dots</math>  <math>BC = \sqrt{6^2 - 2^2} = 4\sqrt{2}</math>  <math>\text{Area of triangle } ABC = \frac{1}{2} \times 4\sqrt{2} \times 2 = 4\sqrt{2}</math>  <math>\text{Area of } BCD = 22.157269\dots - 4\sqrt{2}</math>  <math>= 16.50041475\dots</math>  <math>\text{Total shaded area} = 2 \times 16.50 =</math>  <math>33.0008295\dots</math>  <math>\text{Volume} = 33.0 \times 20 = 660.01659\dots</math>  <math>660 \div 1000 = 0.66001659 \text{ litres}</math> </p>	0.66l	<p>M1 Angle <math>BAC =</math>  <math>\cos^{-1}\left(\frac{2}{6}\right) = 70.528779\dots</math>  M1 Area of sector <math>ACD =</math>  <math>\frac{70.528779\dots}{360} \times \pi \times 6^2 = 22.157269\dots</math>  M1 Area of triangle <math>ABC =</math>  <math>\frac{1}{2} \times 4\sqrt{2} \times 2 = 4\sqrt{2}</math>  M1 Total shaded area =  <math>2 \times 16.50 = 33.0008295\dots</math>  M1 Volume =  <math>33.0 \times 20 = 660.01659\dots</math>  A1 cao </p>



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