



# Mathematics

## Paper 3

### (Calculator)

### Higher Tier

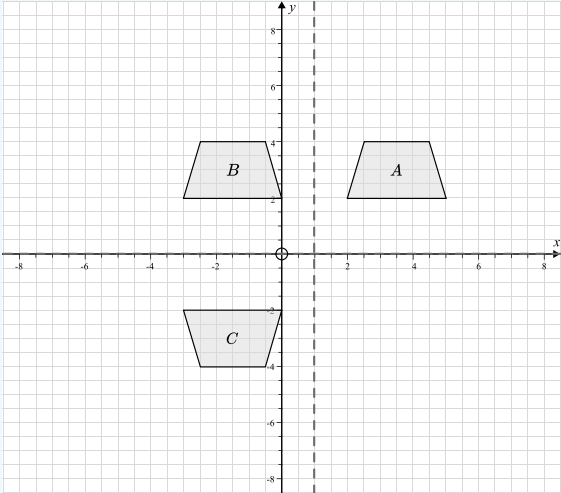
### Mark Scheme

Edexcel GCSE

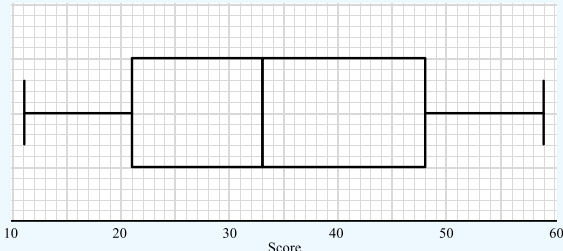
SET 3

Question	Working	Answer	Notes
<b>Q1a</b>	$(5m + 4) - (m + 2) = 4m + 2$ $4m + 2 = 12$ $4m = 10$ $m = 2.5$	$m = 2.5$	M1 $4m + 2$ or $4m = 10$ seen A1 cao
<b>Q1b</b>	$9m + 6 = 9 \times 2.5 + 6 = 28.5$	28.5	A1 cao
<b>Q2</b>	1, 2, 3, 4, 6, 8, 12, 16, 24, 48 1, 2, 4, 8, 16, 32, 64	16	M1 Correctly lists at least 4 factors of 48 and 64 or draws prime factor trees for 48 and 64 A1 cao
<b>Q3a</b>	$8 + 3 \times 10 + 5 \times 12 + 2 \times 14 + 3 \times 16 +$ $2 \times 18 = 210$ $210 \div 16 = 13.125$	13.125	M1 Adds all values and divides by 16 A1 cao
<b>Q3b</b>		*No clothes size 13.125 *Doesn't give us useful information about actual sizes of clothes sold	B1 A relevant statement
<b>Q3c</b>		Mode - it gives us information about the most common clothes size - useful for stock	B1 Mode B1 A relevant statement
<b>Q4</b>	$Q: (\frac{0 + 12}{2}, \frac{10 + 2}{2}) = (6, 6)$ P - Q: along 6, up 3 Q - R: along 12, up 6 R: (18, 12)	(18, 12)	M1 Point Q correct A1 x or y coordinate correct A1 cao

Question	Working	Answer	Notes										
Q5a	$D = S \times T$ $D = 30 \times \frac{5}{60} = 2.5 \text{ miles}$	2.5 miles	M1 Attempt to use $D = S \times T$ A1 cao										
Q5b	$T = \frac{D}{S}$ $T = \frac{2.5}{20} = \frac{1}{8} \text{ hour}$ $\frac{1}{8} \times 60 = 7.5 \text{ minutes}$ It will take 2.5 minutes longer	No - it will take 2.5 minutes longer	M1 Attempt to use $T = \frac{D}{S}$ A1 Correct conclusion following correct working										
Q6a		$x = 2$ $y = 3$	B1 cao										
Q6b	$5y + 4x - 23 = 0$ $5y = -4x + 23$ $y = -\frac{4}{5}x + \frac{23}{5}$	$-\frac{4}{5}$	M1 Attempt to rearrange the equation into the form $y = mx + c$ or use $\frac{\text{change in } y}{\text{change in } x}$ A1 cao										
Q6c	$-\frac{4}{5} \times 3 = -\frac{12}{5} \neq -1$	Neither The lines are not perpendicular as the product of their gradients is not $-1$ and they are not parallel as their gradients are not equal.	B1 Working is seen to show they are not perpendicular B1 Neither										
Q7a	<table><tr><td>Colour</td><td>red</td><td>blue</td><td>yellow</td><td>green</td></tr><tr><td>Probability</td><td>0.15</td><td>0.25</td><td>0.4</td><td>0.2</td></tr></table>	Colour	red	blue	yellow	green	Probability	0.15	0.25	0.4	0.2	0.4 0.2	M1 $1 - 0.15 - 0.26 (= 0.6)$ oe A1 cao
Colour	red	blue	yellow	green									
Probability	0.15	0.25	0.4	0.2									

Question	Working	Answer	Notes
Q7b	$15\% = 135$ $1\% = 135 \div 15 = 9$ $25\% = 9 \times 25 = 225$	225	M1 $15\% = 135$ or equivalent statement A1 cao
Q8		Rotation $180^\circ$ centre $(1, 0)$	M1 Shapes <i>B</i> and <i>C</i> correctly drawn B1 Rotation B1 $180^\circ$ and centre $(1, 0)$
Q9	$20\text{m/sec} = 1200\text{m/min}$ $= 72000\text{m/h}$ $= 72\text{km/h}$ $= 45\text{mph}$	45mph	M1 Reaches 72km/hour A1 cao
Q10	$14 \div 4 = 3.5$ , scale factor = 3.5 $BC = 6 \times 3.5 = 21$ $EC = 21 - 6 = 15\text{cm}$	15cm	M1 Scale factor = $14 \div 4$ ( = 3.5 ) M1 $BC = 6 \times 3.5$ ( = 21 ) A1 cao

Question	Working	Answer	Notes
<b>Q11</b>	$2c = 6$ $c = 3$ $b = 3^3 = 27$	$b = 27$ $c = 3$	M1 $2c = 6$ A1 $c = 3$ A1 $b = 27$
<b>Q12a</b>	$2000 \times 1.04^3 = £2249.728$	£2249.73	M1 $1.04^3$ seen or valid attempt to find compound interest after 3 years A1 cao
<b>Q12b</b>	$2000 \times \left(\frac{100+x}{100}\right)^3 = 2275.79$ $\left(\frac{100+x}{100}\right)^3 = 1.137895$ $\frac{100+x}{100} = \sqrt[3]{1.137895} = 1.044$ $100+x = 104.4$ $x = 4.4$	4.4%	M1 $2000 \times \left(\frac{100+x}{100}\right)^3 = 2275.79$ seen or implied M1 Reaches 104.4 or 1.044 A1 cao
<b>Q13a</b>	$11^2 - 2 = 119$	119	A1 cao
<b>Q13b</b>	$3 \times 9 + 1 = 28$ $28^2 - 2 = 782$	782	M1 $g(9) = 28$ A1 cao
<b>Q13c</b>		Lin should have subtracted 1 before dividing by 3 oe or Lin didn't divide throughout by 3	B1 Correct reason

Question	Working	Answer	Notes
<b>Q14a</b>  Median = 33, $LQ = 21$ , $UQ = 48$  			M1 Median correct M1 $LQ$ and $UQ$ correct A1 Fully correct
<b>Q14b</b>  60% of 60 = 36 13 scored over 36 marks $\frac{13}{27} \times \frac{12}{26} = \frac{156}{702}$		$\frac{156}{702}$	M1 Pass mark = 36 M1 $\frac{13}{27} \times \frac{12}{26}$ A1 $\frac{156}{702}$ oe
<b>Q15</b>  Let $M$ be the midpoint of $AC$ and $N$ be the midpoint of $AD$ . $MN = 3\text{cm}$ , $ME = 9\text{cm}$ $NE = \sqrt{3^2 + 9^2} = 3\sqrt{10}$ $\text{Area } ADE = \frac{1}{2} \times 6 \times 3\sqrt{10} = 9\sqrt{10}$ Total surface area = $36 + 4 \times 9\sqrt{10}$ $= 36 + 36\sqrt{10}$		$36 + 36\sqrt{10} \text{ cm}^2$	M1 $NE = \sqrt{3^2 + 9^2} = 3\sqrt{10}$ M1 $\text{Area } ADE = \frac{1}{2} \times 6 \times 3\sqrt{10} = 9\sqrt{10}$ M1 Total surface area = $36 + 4 \times 9\sqrt{10}$ A1 Correct exact answer

Question	Working	Answer	Notes
<b>Q16</b>	$a : a + b = \frac{a}{a} : \frac{a+b}{a} = 1 : \frac{a+b}{a}$ $k = \frac{a+b}{a}$ $ak = a + b$ $ak - a = b$ $a(k - 1) = b$ $a = \frac{b}{k - 1}$		<p>M1 Divides by <math>a</math> to get <math>1 : \frac{a+b}{a}</math></p> <p>M1 <math>k = \frac{a+b}{a}</math> and attempts to make <math>a</math> the subject</p> <p>A1 Reaches <math>a = \frac{b}{k - 1}</math> through correct working</p>
<b>Q17</b>	<p><math>(2n + 1)</math> and <math>(2n + 3)</math> are consecutive odd numbers:</p> $(2n + 1)^2 + (2n + 3)^2$ $= 4n^2 + 4n + 1 + 4n^2 + 12n + 9$ $= 8n^2 + 16n + 10$ $= 2(4n^2 + 8n + 5)$ <p>It has a factor of 2 and so it is even for all <math>n</math></p>		<p>M1 Correctly uses two consecutive odd numbers, e.g. <math>(2n + 1)</math> and <math>(2n + 3)</math> or <math>(2n - 1)</math> and <math>(2n + 1)</math></p> <p>M1 Squares both terms and expands each to form two 3 term quadratics</p> <p>M1 Collects like terms and shows there is a factor of 2</p> <p>B1 Concludes that it is always even</p>
<b>Q18</b>	$\frac{x+1}{x-3} = \frac{x-7}{3x-1}$ $(x+1)(3x-1) = (x-7)(x-3)$ $3x^2 + 2x - 1 = x^2 - 10x + 21$ $2x^2 + 12x - 22 = 0$ $x = 1.472135955 \text{ or } x = -7.472135955$	$x = 1.47 \text{ or}$ $x = -7.47$	<p>M1 <math>(x+1)(3x-1) = (x-7)(x-3)</math></p> <p>M1 <math>3x^2 + 2x - 1 = x^2 - 10x + 21</math></p> <p>M1 <math>2x^2 + 12x - 22 = 0</math></p> <p>M1 a correct method to solve the quadratic</p> <p>A1 <math>x = 1.47</math> or <math>x = -7.47</math></p>

Question	Working	Answer	Notes
<b>Q19</b>	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
<b>Q20</b>	$\vec{AC} = 6a + 3b$ $\vec{EC} = 2a + b$ $\vec{CD} = -6a$ $\vec{CF} = -3a$ $\vec{EF} = 2a + b - 3a$ $\vec{EF} = b - a$	$b - a$	M1 Vector $AC$ correct and finds vector $AE$ or $AC$ M1 Vector $CD$ correct and finds vector $CF$ or $DF$ M1 Adds vectors to from a path from $E$ to $F$ A1 cao
<b>Q21</b>	Distance from centre of octagon to any vertex is $\sqrt{50}$ Area of $\frac{1}{8}$ of octagon = $\frac{1}{2} \times \sqrt{50} \times \sqrt{50} \times \sin(45) = \frac{25}{2} \sqrt{2}$ Total area = $8 \times \frac{25}{2} \sqrt{2} = 100\sqrt{2}$	$100\sqrt{2}$	M1 $\sqrt{50}$ seen M1 Attempt to use area of a triangle with $\sqrt{50}$ and $45^\circ$ A1 Area of 1 triangle = $\frac{25}{2} \sqrt{2}$ M1 Multiplies by 8 A1 cao



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