



Mathematics

Paper 6

(Calculator)

Higher Tier

Mark Scheme

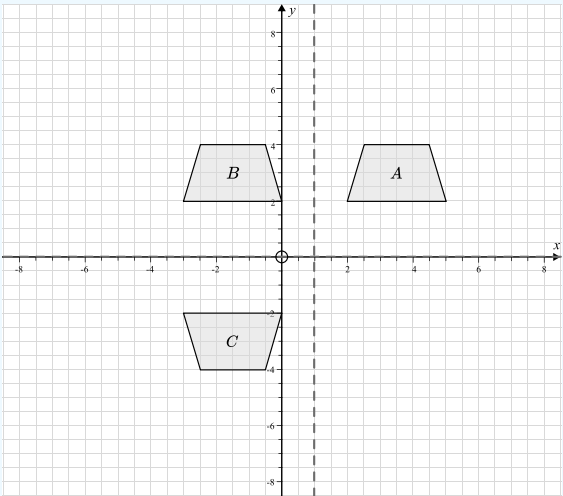
OCR GCSE

SET 3

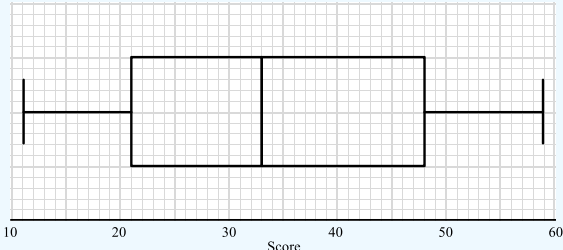
Question	Working	Answer	Notes
Q1a	$(5m + 4) - (m + 2) = 4m + 2$ $4m + 2 = 12$ $4m = 10$ $m = 2.5$	$m = 2.5$	M1 $4m + 2$ or $4m = 10$ seen A1 cao
Q1b	$9m + 6 = 9 \times 2.5 + 6 = 28.5$	28.5	A1
Q2a		5	A1
Q2b		5000	A1
Q3a	$8 + 3 \times 10 + 5 \times 12 + 2 \times 14 + 3 \times 16 +$ $2 \times 18 = 210$ $210 \div 16 = 13.125$	13.125	M1 Adds all values and divides by 16 A1 cao
Q3b		*No clothes size 13.125 *Doesn't give us useful information about actual sizes of clothes sold	B1 A relevant statement
Q3c		Mode - it gives us information about the most common clothes size - useful for stock	B1 Mode B1 A relevant statement
Q4	$Q: (\frac{0+12}{2}, \frac{10+2}{2}) = (6, 6)$ 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 $30 \times \frac{5}{60}$ 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 $2.5 \div 20$ A1 Correct conclusion following correct working
Q6	$T = \frac{D}{S} = \frac{147.1 \times 10^6 \times 10^3}{3 \times 10^8} = 490.3333...$	490 seconds	M1 Attempt to substitute into $T = \frac{D}{S}$ M1 147.1 million <i>km</i> converted to <i>m</i> M1 $\frac{147.1 \times 10^6 \times 10^3}{3 \times 10^8}$ oe A1 490 seconds
Q7a		<i>B</i> and <i>D</i>	B1
Q7bi		SSS	B1
Q7bii		Could be congruent	B1
Q8a		$x = 2$ $y = 3$	B1

Question	Working	Answer	Notes										
Q8b	$5y + 4x - 23 = 0$ $5y = -4x + 23$ $y = -\frac{4}{5}x + \frac{23}{5}$	$-\frac{4}{5}$	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										
Q8c	$-\frac{4}{5} \times 3 = -\frac{12}{5} \neq -1$	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										
Q9a	<table border="1"><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									
Q9b	$15\% = 135$ $1\% = 135 \div 15 = 9$ $25\% = 9 \times 25 = 225$	225	M1 $15\% = 135$ or equivalent statement A1 cao										
Q9c	135 red counters 900 counters altogether $900 - 135 = 765$ non red counters $\frac{765}{900} \times \frac{764}{899} \times \frac{763}{898} = 0.6137631271...$	0.614	M1 900 counters M1 $\frac{765}{900}$ seen M1 $\frac{765}{900} \times \frac{764}{899} \times \frac{763}{898}$ A1 cao										

Question	Working	Answer	Notes
Q10		Rotation 180° centre $(1, 0)$	M1 Shapes <i>B</i> and <i>C</i> correctly drawn B1 Rotation B1 180° and centre $(1, 0)$
Q11	After function <i>A</i> : $3x - 2$ After function <i>A</i> and <i>B</i> : $4(3x - 2 + 1) = 12x - 4$	$12x - 4$	M1 $3x - 2$ seen A1 cao
Q12ai	Acceleration = $\frac{3}{1.5} = 2m/s^2$	$2m/s^2$	M1 Attempt to find gradient A1 cao
Q12aii		$0m/s^2$	B1
Q12aiii	Distance - area under graph $\frac{1}{2}(7.5 + 9) \times 3 = 24.75$ $\frac{1}{2}(3 + 2.4) \times 6 = 16.2$ $5 \times 2.4 = 12$ $24.75 + 16.2 + 12 = 52.95m$	$52.95m$	M1 Attempt to find area under graph M1 Divides the graph into sections and correctly finds the area of at least 2 sections M1 Correctly finds the area of each of their sections A1 cao

Question	Working	Answer	Notes
Q12b	$20m/sec = 1200m/min$ $= 72000m/h$ $= 72km/h$ $= 45mph$	45mph	M1 Reaches 72km/hour A1 cao
Q13	$14 \div 4 = 3.5$, scale factor = 3.5 $BC = 6 \times 3.5 = 21$ $EC = 21 - 6 = 15cm$	15cm	M1 Scale factor = $14 \div 4 (= 3.5)$ M1 $BC = 6 \times 3.5 (= 21)$ A1 cao
Q14	$2c = 6$ $c = 3$ $b = 3^3 = 27$	$b = 27$ $c = 3$	M1 $2c = 6$ A1 $c = 3$ A1 $b = 27$
Q15a	$2000 \times 1.04^3 = £2249.728$	£2249.73	M1 1.04^3 seen or valid attempt to find compound interest after 3 years A1 cao
Q15b	$2000 \times \left(\frac{100+x}{100}\right)^3 = 2275.79$ $\left(\frac{100+x}{100}\right)^3 = 1.137895$ $\frac{100+x}{100} = \sqrt[3]{1.137895} = 1.044$ $100+x = 104.4$ $x = 4.4$	4.4%	M1 $2000 \times \left(\frac{100+x}{100}\right)^3 = 2275.79$ seen or implied M1 Reaches 104.4 or 1.0439... A1 cao

Question	Working	Answer	Notes
Q16a Median = 33, $LQ = 21$, $UQ = 48$ 			M1 Median correct M1 LQ and UQ correct A1 Fully correct
Q16b $60\% \text{ of } 60 = 36$ 13 scored over 36 $\frac{13}{27} \times \frac{12}{26} = \frac{2}{9}$	$\frac{2}{9}$		M1 Pass mark = 36 M1 $\frac{13}{27} \times \frac{12}{26}$ A1 $\frac{2}{9}$ oe
Q17 $A: \frac{1}{2} \times \pi \times 2^2 \times 9 = 18\pi$ $B: \frac{4}{3} \times \pi \times 3^3 = 36\pi$	2 times bigger		M1 $\frac{1}{2} \times \pi \times 2^2 \times 9 (= 18\pi)$ or $\frac{4}{3} \times \pi \times 3^3 = (36\pi)$ M1 18π and 36π M1 $36\pi \div 18\pi (= 2)$ A1 cao
Q18a $2^3 - 6 \times 2 + 2 = -2$ $3^3 - 6 \times 3 + 2 = 11$ Sign change implies there is a solution between 2 and 3			M1 Substitutes 2 or 3 into $x^3 - 6x + 2$ M1 Substitutes both 2 and 3 into $x^3 - 6x + 2$ A1 Conclusion following correct working

Question	Working	Answer	Notes
Q18b	$2.1^3 - 62.1 + 2 = -1.339$ $2.2^3 - 62.2 + 2 = -0.552$ $2.3^3 - 62.3 + 2 = 0.367$ $2.25^3 - 62.25 + 2 = -0.109$	2.3	M1 Tries at least 2 values between 2 and 3 for x M1 Determines that x is between 2.2 and 2.3 A1 cao following correct working
Q19	Let M be the midpoint of AC and N be the midpoint of AD . $MN = 3\text{cm}$, $ME = 9\text{cm}$ $NE = \sqrt{3^2 + 9^2} = 3\sqrt{10}$ 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 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
Q20	$a : a + b = \frac{a}{a} : \frac{a+b}{a} = 1 : \frac{a+b}{a}$ $k = \frac{a+b}{a}$ $ak = a + b$ $ak - a = b$ $a(k - 1) = b$ $a = \frac{b}{k - 1}$		M1 Divides by a to get $1 : \frac{a+b}{a}$ M1 $k = \frac{a+b}{a}$ and attempts to make a the subject A1 Reaches $a = \frac{b}{k - 1}$ through correct working

Question	Working	Answer	Notes
Q21	$\frac{x+1}{x-3} = \frac{x-7}{3x-1}$ $(x+1)(3x-1) = (x-7)(x-3)$ $3x^2 + 2x - 1 = x^2 - 10x + 21$ $2x^2 + 12x - 22 = 0$ $x = \frac{-12 \pm \sqrt{12^2 - 4 \times 2 \times -22}}{2 \times 2}$ $x = 1.472135955... \text{ or } x = -7.42135955...$	$x = 1.36 \text{ or}$ $x = -7.36$	<p>M1 $(x+1)(3x-1) = (x-7)(x-3)$</p> <p>M1 $3x^2 + 2x - 1 = x^2 - 10x + 21$</p> <p>M1 $2x^2 + 12x - 22 = 0$</p> <p>M1 $x = \frac{-12 \pm \sqrt{12^2 - 4 \times 2 \times -22}}{2 \times 2}$</p> <p>A1 $x = 1.47 \text{ or } x = -7.42$</p>
Q22	$q = 4$ $\binom{2p-4}{6} = k \binom{4}{1}$ $2p - 4 = 4k$ $2 \times 4 - 2 = k \Rightarrow k = 6$ $2p - 4 = 24$ $p = 14$	$p = 14$	<p>M1 $q = 4$</p> <p>M1 $2p - 4$ and 6 seen</p> <p>M1 $\binom{2p-4}{6} = k \binom{4}{1}$</p> <p>M1 $k = 6$</p> <p>A1 cao</p>
Q23	<p>Distance from centre of octagon to any vertex is $\sqrt{50}$</p> <p>Area of $\frac{1}{8}$ of octagon =</p> $\frac{1}{2} \times \sqrt{50} \times \sqrt{50} \times \sin(45) = \frac{25}{2} \sqrt{2}$ <p>Total area = $8 \times \frac{25}{2} \sqrt{2} = 100\sqrt{2}$</p>	$100\sqrt{2}$	<p>M1 $\sqrt{50}$ seen</p> <p>M1 Attempt to use area of a triangle with $\sqrt{50}$ and 45°</p> <p>A1 Area of 1 triangle = $\frac{25}{2} \sqrt{2}$</p> <p>M1 Multiplies by 8</p> <p>A1 cao</p>

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