International GCSE Maths

Apart from questions 1, 11, 12b, 15 (where the mark scheme states otherwise) the correct answer, unless clearly obtained from an incorrect method, should be taken to imply a correct method.

Question		Working	Answer	Mark	Notes
1		e.g. $\frac{14}{3}$ **and** $\frac{10}{9}$		3	M1 Both fractions expressed as improper fractions
		e.g. $\frac{14}{3} \times \frac{9}{10}$			M1 **or** for both fractions expressed as equivalent fractions with denominators that are a common multiple of 3 and 9 eg. $\frac{42}{9} \div \frac{10}{9}$ **or** $\frac{126}{27}, \frac{30}{27}$
		e.g. $\frac{14}{3}\times\frac{9}{10}=\frac{126}{30}=\frac{21}{5}=4\frac{1}{5}$ **or** $\frac{14}{3}\times\frac{9}{10}=\frac{126}{30}=4\frac{6}{30}=4\frac{1}{5}$ **or** $\frac{\cancel{14}^{7}}{\cancel{3}^{1}}\times\frac{\cancel{9}^{3}}{\cancel{10}^{5}}=\frac{21}{5}=4\frac{1}{5}$ **or** $\frac{126}{27}, \frac{30}{27}=\frac{126}{30}=\frac{21}{5}=4\frac{1}{5}$	Shown		A1 Dep on M2 for conclusion to $4\frac{1}{5}$ from correct working – either sight of the result of the multiplication e.g. $\frac{126}{30}$ must be seen or correct cancelling prior to the multiplication to $\frac{21}{5}$ NB: use of decimals scores no marks
					Total 3 marks

2	(a)	15 km/h or $\frac{25}{6}$ m/sec or 0.25 km/min or $\frac{15}{4}$ oe 12 km/h or $\frac{10}{3}$ m/sec or 0.2 km/min or $\frac{9}{3}$ oe	'before' with reason	1	B1	e.g. before as gradient is steeper **or** before as speed before is 15 km/h speed after is 12 km/h **or** before as she goes over 11(allow 11-12) km in ¾ hour but only goes 9 km in ¾ hour after oe NB: any figures used for the reason must be accurate if they haven't used 'gradient is steeper' oe
	(b)		line from (12:00, 24) to (12:45, 24) to (14:15, 0)	2	B2	If not B2 then B1 for a line from (12:00, 24) to (12:45, 24) **or** for a line from (*t*, 24) to (*t* + 1.5, 0) **or** for a time of 1.5 hours (oe) seen
	(c)	1h 45m + 1h 30m **or** 1 + 0.75 + 1.5 **or** 3h 15m **or** 3.25h **or** 195m oe		3	M1	ft from their graph for total time when cycling
		(24 × 2) ÷ "3.25" oe eg (48 ÷ 195) × 60			M1	ft dep on M1 for full method
			14.8		A1	awrt 14.8
						Total 6 marks

3	(a)		e^4	1	B1	
	(b)		y^{16}	1	B1	
	(c)	$x^2 + 9x - 2x - 18$		2	M1	for 3 correct terms **or** 4 correct terms ignoring signs **or** $x^2 + 7x +$ c **or** .... $+ 7x - 18$
			$x^2 + 7x - 18$		A1	
	(d)		$4cp^2(4c^3 + 5p)$	2	B2	if not B2 then award B1 for any correct factorisation with at least 2 factors outside the bracket eg $4cp(4c^3p + 5p^2)$, $cp^2(16c^3 + 20p)$, $2p(8pc^4 + 10cp^2)$ etc **or** the correct common factor **and** a 2 term expression with just one error
						Total 6 marks

4	(a)		9, 3, (−1), −3, (−3), −1, (3)	2	B2	If not B2 then award B1 for at least 2 correct values
	(b)			2	M1	dep on B1 ft from (a) for at least 5 points plotted correctly
			correct graph		A1	for the correct graph (clear intention to go through all the points and which must be curved at the bottom)
						Total 4 marks

5		$2x + 0.18 + 2x + 3x + 0.26 + x = 1$ **or** $1 - (0.18 + 0.26)$ (= 0.56)		4	M1
		$x = (1 - 0.18 - 0.26) \div (2 + 2 + 3 + 1)$ (=0.07)			M1
		eg (0.18 + 4 ×"0.07") × 200 **or** 0.46 × 200 **or** 36 + 42 + 14 oe			M1 dep on M2 and probabilities between 0 and 1 **or** $\frac{92}{200}$, oe with 92 seen
			92		A1
					Total 4 marks

6		12 × 8 × 5 (= 480)		3	M1
		"480" × 0.7			M1 Dep on M1
			336		A1
					Total 3 marks

7	(a)		5 700 000	1	B1
	(b)		4×10^{-3}	1	B1
	(c)		5 000 000 **or** 5×10^{6} oe	2	B2 If not B2 then award B1 for 320000 or 3.2×10^{5} oe or 5×10^{n} oe where $n \neq 6$
					Total 4 marks

8		0.08 × 170 000 (=13600) **or** 0.92 × 170 000 (=156400)		3	M1	oe eg 170 000 ÷ 12.5	M2 for $170\,000 \times 0.92^{3}$
		e.g. 0.92 × (0.92 × "156400")			M1	(dep)for a complete method	
			132377		A1	or 132376.96	
						(SCB2 for $170\,000 \times 0.92^{4}$)(=121786.(810)) (SCB1 for 170 000 × 0.24 (=40 800) **or** 170 000 ×0.76 (=129 200) **or** 170 000 × 1.08 (= 183 600) **or** 170 000 × 1.08^{3} (= 214151) **or** an answer of 129 200 **or** an answer of 214 151 – 214151.1(0))	
						Total 3 marks	

9		0.5 × 6 × 6 (=18)		5	M1	For area of triangle, or may use $\frac{1}{2}\times 6\times 6\sqrt{2}\sin 45$ or $\frac{1}{2}\times 6\sqrt{2}\times 3\sqrt{2}$ oe
		$(d^2 =)\ 6^2 + 6^2$ (=72) or $\frac{AC}{(\sin 90)} = \frac{6}{\sin 45}$			M1	
		$\sqrt{6^2+6^2}$ $(=\sqrt{72} = 6\sqrt{2}$ =8.4(85...)or 8.5) **or** $AC = \frac{6(\sin 90)}{\sin 45} = 6\sqrt{2}$ =8.4(85...)or 8.5) oe			M1	
		0.5 × π × $\left(\frac{"8.48.."}{2}\right)^2$ (= 9π or 28....)			M1	
			46.3		A1	for 46.2 – 46.3
						Total 5 marks

10		(8 =) 2 × 2 × 2 or 2^3 or 2^{3+n}		2	M1	For clearly writing 8 as a product of prime factors or as 2^3
			$2^{n+3}\times 3\times 5^m$		A1	
						Total 2 marks

11		5.5 or 6.5 or 12.5 or 17.5		3	M1	Accept $6.4\dot{9}$ for 6.5 and $17.4\dot{9}$ for 17.5
		17.5 – 5.5			M1	for UB – LB where 15 < UB ≤ 17.5 and 5.5 ≤ LB < 6
			12		A1	dep on M2
						Total 3 marks

12	(a)		$(2x - 3)(x - 2)$	2	B2	or $(3 - 2x)(2 - x)$ (B1 for $(2x + a)(x + b)$ where $ab = 6$ or $2b + a = -7$ eg $(2x + 3)(x + 2)$, $(2x - 5)(x - 1)$), etc or for
	(b)	$4m + 9 = 3(7 - 2m)$		4	M1	for removing fraction
		$4m + 9 = 21 - 6m$			M1	for correct expansion of bracket in a correct equation
		$4m + 6m = 21 - 9$ **or** $10m = 12$ **or** $-21 + 9 = -6m - 4m$ **or** $-10m = -12$			M1	for a correct equation with m terms isolated on one side ft their equation if first M1 awarded
			$\frac{12}{10}$ oe		A1	dep on at least M2 [SC: B2 for an answer of $m = 2$ with working shown (from $4m + 9 = 21 - 2m$ oe) **or** $m = -0.2$oe with working shown (from $4m + 9 = 7 - 6m$ oe)]
		Alternative				
		$\frac{4}{3}m + 3 = 7 - 2m$		4	M1	Division of each term on LHS by 3
		$\frac{4}{3}m + 2m = 7 - 3$ oe			M1	for a correct equation with m terms isolated on one side ft their equation if first M1 awarded

		$10m = 3 \times 4$ oe			M1	For removing fraction in a fully correct equation
			$\frac{12}{10}$ oe		A1	dep on at least M2
12 contd	(c)	$\frac{y^{\frac{1}{4}}}{y}$ **or** $\sqrt[4]{y} = y^{\frac{1}{4}}$ **or** $y^{\frac{1}{4}-1}$		2	M1	or b = $-\frac{3}{4}$
			$y^{-\frac{3}{4}}$		A1	
						Total 8 marks

13	(a)		$\frac{6}{14}, \frac{8}{14}$	2	B1	for $\frac{6}{14}\left(\frac{3}{7}\right), \frac{8}{14}\left(\frac{4}{7}\right)$ in correct positions. Allow decimals of 2dp or better (0.43, 0.57)
			$\frac{3}{10}, \frac{7}{10}, \frac{3}{10}, \frac{7}{10}$		B1oe	for $\frac{3}{10}, \frac{7}{10}, \frac{3}{10}, \frac{7}{10}$ in correct positions.
	(b)	$\frac{8}{14} \times \frac{7}{10}$		2	M1	ft from (a)
			$\frac{2}{5}$ oe		A1	
	(c)	$\frac{7}{13} \times \frac{6}{9}\left(= \frac{42}{117} = \frac{14}{39} = 0.35(897...)\right)$ **or** $\frac{8}{14} \times \frac{7}{13}\left(= \frac{56}{182} \text{oe}\right)$ **or** $\frac{7}{10} \times \frac{6}{9}\left(= \frac{42}{90}\right)$		3	M1	ft from (a) $(\frac{7}{13} = 0.54 \text{ to } 2\text{dp}$ $\frac{6}{9} = 0.67 \text{ to } 2\text{dp})$
		"$\frac{42}{117}$"×"$\frac{2}{5}$" or $\left(\frac{8}{14} \times \frac{7}{13}\right) \times \left(\frac{7}{10} \times \frac{6}{9}\right)$			M1	ft from (b)
			$\frac{28}{195}$ oe		A1	for $\frac{28}{195}$ oe, e.g. 0.14(3589...) from accurate working
						Total 7 marks

14	(a)		7, 8, 9, 10, 11	2	B2	completely correct. (B1 for 4 or 5 correct and no more than 1 incorrect **or** for all terms seen correctly placed in a Venn diagram or for a correct description of the numbers in the set but not listed, eg $7 \leq x < 12$)
	(b)		eg 2, 4, 6	1	B1	for any 3 of 2, 4, 6, 8, 10
						Total 3 marks

15		$x = 0.25454...$ $100x = 25.454...$ $10x = 2.5454...$ $1000x = 254.54...$		2	M1	For 2 recurring decimals that when subtracted give a whole number or terminating decimal eg 25.2 or 252 etc eg $100x = 25.454...$ and $x = 0.25454...$ **or** $1000x = 254.54...$ and $10x = 2.5454....$ with intention to subtract. (if recurring dots not shown then showing at least the digits 25454, ie 5sf) **or** $0.2 + 0.05\dot{4}$ **and** eg $x = 0.05454..., 100x = 5.4545...$ with intention to subtract.
		eg $100x - x = 25.454... - 0.254... = 25.2$ **and** $\frac{25.2}{99} = \frac{14}{55}$ **or** $1000x - 10x = 254.545... - 2.545... = 252$ **and** $\frac{252}{990} = \frac{14}{55}$ **or** $100x - x = 5.4545... - 0.05454... = 5.4$ **and** $\frac{5.4}{99} = \frac{54}{990}\left(= \frac{3}{55}\right)$ **and** $\frac{2\times 99 + 54}{990} = \frac{252}{990} = \frac{14}{55}$ or $\frac{5.4}{99} = \frac{54}{990} = \frac{3}{55}$ and $\frac{11+3}{55} = \frac{14}{55}$	show		A1	for completion to $\frac{14}{55}$

				Total 2 marks

16		$a = 7$ and $d = 3$ $\frac{100}{2}(2\times 7+(100-1)\times 3)$ **or** 100th term is $7 + (100 – 1) \times 3$ (= 304) **and** $100 \times (7 + \text{“}304\text{”}) \div 2$ **or** 100^{th} term is $3 \times 100 + 4$ (= 304) **and** $100 \times (7 + \text{“}304\text{”}) \div 2$		2	M1 for a method to find the sum - brackets (100 – 1) must be used correctly
			15 550		A1
					Total 2 marks

17	(a)	eg $\frac{24}{36}$ or 2 : 3 oe **or** $\frac{36}{24}$ or 3 : 2 oe		2	M1	for a correct scale factor
			2160		A1	
	(b)	$\left(\frac{24}{36}\right)^3$ or 2³ : 3³ oe **or** $\left(\frac{36}{24}\right)^3$ or 3³ : 2³ oe or $\frac{8}{27}$ or $\frac{27}{8}$ oe		2	M1	For correct SF for volume ft from linear scale factor in (a) or ft from $\sqrt{\frac{"2160"}{960}}$
			(**A** =) $\frac{8}{27}V$ oe		A1	oe eg $\frac{V}{3.375}$
						Total 4 marks

18		$17.8^2 + 26.3^2 - 2 \times 17.8 \times 26.3 \times \cos 36$		3	M1	
		e.g. 1008.5... – 757.... **or** 251(.06...)			M1	for correct order of operations
			15.8		A1	for ans in range 15.8 – 15.9
						Total 3 marks

19		15 ÷ 20 (=0.75) 48 ÷ 15 (=3.2) 21 ÷ 5 (=4.2) 16 ÷ 10 (=1.6)	correct histogram	3	B3	For a fully correct histogram [If not B3 then B2 for 3 correct frequency densities (can be implied by heights) or 3 correct bars drawn If not B2 then B1 for 2 correctly calculated frequency densities (can be implied by heights) or 2 correct bars drawn.]
						Total 3 marks

Students can use other methods to gain the correct answer						
20		angle *ABD* = 71 **or** angle *ACD* = 71 **or** using *O* as centre of circle, angle *ADO* = 90 – 71 (=19)		5	M1	clearly labelled or stated
		angle *ADB* = 71 **or** angle *ACB* **=** 71 **or** angle *BAD* = 19 × 2 (=38) **or** reflex angle *BOD* = 2 × 142 (=284)			M1	dep clearly labelled or stated
		angle *BCD* = 142	142		A1	Clearly labelled or stated, from no incorrect working for their method
					B2	dep on A1 for fully correct reasons for each stage of working, repeated if used more than once. eg alternate segment theorem, base angles in an isosceles triangle are equal, angles in a triangle sum to 180°, angle between tangent and radius(diameter) is 90° congruent triangles (equal triangles) oe opposite angles of a cyclic quadrilateral sum to 180° angles in the same segment angle at the centre is 2 × angle at circumference oe equal chords subtend equal angles at the circumference If not B2 then award B1 dep on M1 for any one correct circle theorem reason associated with angle(s) found
						Total 5 marks

21		$h = 3r$ or $r = \frac{h}{3}$		5	M1	for $h = 3r$ **or** $r = \frac{h}{3}$ oe stated or used correctly
		$\frac{1}{2} \times \frac{4}{3} \times \pi r^3$ oe **or** $\pi \times r^2 \times 3r$ oe			M1	**or** $\frac{1}{2} \times \frac{4}{3} \pi \left(\frac{h}{3}\right)^3$ or $\pi \left(\frac{h}{3}\right)^2 h$
		$\frac{1}{2} \times \frac{4}{3} \times \pi r^3 + \pi \times r^2 \times 3r = 792\pi$ oe			M1	**or** $\frac{1}{2} \times \frac{4}{3} \pi \left(\frac{h}{3}\right)^3 + \pi \left(\frac{h}{3}\right)^2 h = 792\pi$
		(r =) 6 or (h =) 18			A1	
			24		A1ft	their "6" × 4 **or** $"18" \times \frac{4}{3}$ correctly evaluated dep on M3
						Total 5 marks

22	(a)		correct graph (see end of mark scheme) [must go through (60, 2), (150, 0), (240, −2), (330, 0)] and not through (0, 0)	2	B2	if not B2 then award B1 for a graph of the correct shape going through 2 or 3 of the given points or for a clear stretch of SF2 (ie a maximum point on graph at (x_1, 2) and a minimum point at (x_2, −2)) or a clear translation of $\begin{pmatrix} -30 \\ 0 \end{pmatrix}$ (ie a point on graph at (150, y) and a point at (330, y))
	(b)(i)		$(x - 3)^2 + 1$	2	B2	(B1 for $(x - \frac{6}{2})^2 + n$ (where n ≠ 1) **or** for $(x - m)^2 + 1$ (where m ≠ 3) **or** for $x^2 - ax - ax + a^2 + b$ with $2a = 6$ or $a^2 + b = 10$)
	(b)(ii)		translation of $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$	2	B1	for translation
					B1	For $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$ ft from (b)(i) must be column vector
						Total 6 marks

23		$\left(\frac{10+2}{2}, \frac{7+19}{2}\right)$ **or** (6, 13)		5	M1	
		$\frac{19-7}{10-2}\left(=\frac{12}{8}\right)$ oe **or** 1.5 oe			M1	
		$m \times \frac{3}{2} = -1$ oe **or** $m = -\frac{2}{3}$			M1	for use of $m_1m_2 = -1$
		"13" = "$-\frac{2}{3}$" × "6" + c **or** $c = 17$ oe **or** $y - "13" = "-\frac{2}{3}"(x - "6")$			M1	Or for $y = -\frac{2}{3}x + 17$ [NB: "13", "6" and "$-\frac{2}{3}$" must come from correct working]
			$3y + 2x = 51$		A1	for $3y + 2x = 51$ **or** $3y = -2x + 51$ etc but must be integer coefficients
						Total 5 marks

24		(v =) $3t^2 - 6 \times 2t + 5$ (+ 0)		4	M1	for differentiating at least 2 terms correctly
		(a =) $3 \times 2t - 12$			M1	dep ft
		$6t - 12 = 3$			M1	dep on at least M1 for equating their acceleration in terms of t to 3
			2.5 oe		A1	
						Total 4 marks