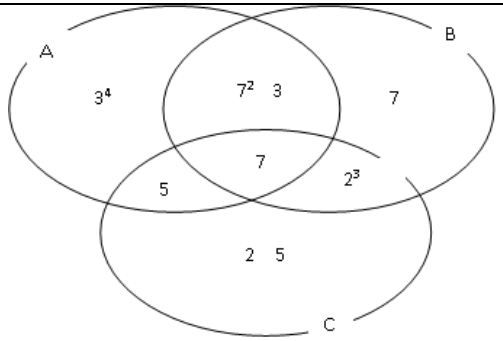
International GCSE Maths 4MA1 1H					
Apart from questions 3c, 11b and 20 (where the mark scheme states otherwise) the correct answer, unless clearly obtained from an incorrect method, should be taken to imply a correct method.					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	a		$0 < p \leq 1$	1	B1
	b	$0.5 \times 19 + 1.5 \times 12 + 2.5 \times 5 + 3.5 \times 2 + 4.5 \times 2$ (=56) **or** 9.5 + 18 + 12.5 + 7 + 9 (=56)	1.4	4	M2 for at least 4 correct products added (need not be evaluated) If not M2 then award M1 for consistent use of value within interval (including end points) for at least 4 products which must be added **OR** correct mid-points used for at least 4 products and not added
		"56" ÷ 40			M1 dep on at least M1 Allow division by their $\sum f$ provided addition or total under column seen A1 for 1.4 or $1\frac{2}{5}$

Question	Working	Answer	Mark	Notes
2	170 ÷ 2 (=85) **or** 170 ÷ 2 × 7 (=595) **or** 7 ÷ 2 (=3.5) 7 × "85" + 170 (=765) **or** 9 × "85" (=765) **or** "595" + 170 (=765) **or** 170 × "3.5" + 170 (=765) "765" ÷ 3 (=255) **or** "765" ÷ 3 × 5 (=1275) "255" × 2 **or** "1275" – "765" **or** "1275" ÷ 5 × 2	510	5	M1 M1 award of this mark implies the first M1 M1 dep on M2 M1 A1
	Alternative scheme			
2	(girls =) $\frac{2}{9}$ (of children) (girls =) $\frac{2}{9}\times\frac{3}{5}\left(=\frac{2}{15}\right)$ (of total) **or** G : C : A = $\frac{2}{9}\times\frac{3}{5}:\frac{3}{5}:\frac{2}{5}\left(=\frac{2}{3}:3:2\right)$ "$\frac{15}{2}$"×170 (=1275) **or** G : A = 2 : 6 oe "1275" ÷ 5 × 2 **or** 3 × 170	510	5	M1 M1 award of this mark implies the first M1 M1 dep on M2 M1 A1

Question		Working	Answer	Mark	Notes	
3	a		y^{14}	1	B1	
	b		$16m^{12}$	2	B2	if not B2 then B1 for am^{12} **or** $16m^{b}$ **or** 2^4m^{12} $b \neq 0, 12$ $a \neq 1, 16$
	c	$5x + 15 = 3x - 4$ **or** $x + 3 = \frac{3x}{5} - \frac{4}{5}$ e.g. $5x - 3x = -4 - 15$	$-\frac{19}{2}$ oe	3	M1 M1 A1	for removing bracket in a correct equation or dividing all terms by 5 in a correct equation ft from $ax + b = cx + d$ for correctly isolating terms in x on one side of equation and constant terms on the other side dep on at least M1
	d (i)		$(x - 4)(x + 6)$	2	M1 A1	for $(x + a)(x + b)$ where either $ab = -24$ **or** $a + b = +2$ e.g $(x - 6)(x + 4)$
	(ii)		$4, -6$	1	B1	cao **or** ft from any $(x + p)(x + q)$
4	a (i)		1, 2, 3, 4, 6, 12	1	B1	cao
	(ii)		1, 3, 5, 7, 9, 10, 11	1	B1	cao
	b		Yes with reason	1	B1	e.g. no numbers in both A and C **or** A and C do not intersect **or** A and C do not overlap **or** A and C are mutually exclusive
	c		$\frac{10}{12}$ oe	2	M1 A1	for $12 - 2$ (=10) **or** $\frac{a}{12}$ with $a < 12$ **or** 10 and 12 used with incorrect notation E.g. 10 : 12 for $\frac{10}{12}$ oe **or** 0.83(3…) **or** 83(.3..)%

Question	Working	Answer	Mark	Notes
5 a		80 000	1	B1
b	$0.5 \times 10^{5-8}$ **or** 0.0005 **or** 5×10^{n} **or** 5.0×10^{n}	5×10^{-4}	2	M1 A1 for 5×10^{-4} or 5.0×10^{-4} SC : B1 for $\frac{1}{2000}$ **or** $\frac{1}{2\times10^{3}}$
6	$9.7^2 + 3.5^2$ (=106.34) $\sqrt{9.7^2+3.5^2}$ or $\sqrt{"106.34"}$ (=10.3…) $\pi \times$ "10.3…" **or** $2 \times \pi \times \frac{"10.3..."}{2}$	32.4	4	M1 M1 for the use of *MN* and a correct angle (70.1… or 70.2, 19.8…) in a correct trig statement eg $\cos 70.2 = \frac{3.5}{MN}$ M1 M1 for a complete method to find *MN* eg $MN = \frac{3.5}{\cos 70.2}$ (=10.3…) M1 dep on M2 A1 for answer in range 32.3 – 32.41

Question	Working	Answer	Mark	Notes	
7 a	$\frac{4}{100}$ × 160 000 oe (=6400)	141 558	3	M1	M2 for 160 000 × 0.96^3 **or** 160 000 × 0.96^4 (=135 895.44..))
	$\frac{4}{100}$ × (160 000 – "6400") (= 6144) $\frac{4}{100}$ × (160 000 – "6400" – "6144") (= 5898.24) 160 000 – "6400" – "6144" − "5898.24"			M1 for a complete method (condone 4 years rather than 3)	If not M2 then award M1 for 160 000 ×0 .96 **(=**153 600) **or** 160 000 × 0.96^2 (=147 456)
				accept (1 – 0.04) in place of 0.96 throughout	
				A1 for 141 557.76 - 141 558 **SC** If no other marks gained, award B1 for 160 000 × 0.12 oe (=19 200) **or** 160 000 × 0.88 oe (=140 800) **or** an answer of 140 800 **or** an answer of in the range 179 978 – 179 978.24	
b	E.g. 252 000 ÷ 1.05	240 000	3	M2 If not M2 then M1 for x × 1.05 = 252 000 **or** 252 000 ÷ 105 oe A1 NB: An answer of 239 400 scores M0 M0 A0	

Question	Working	Answer	Mark	Notes
8 a (i)		3×7^3	1	B1 for 3×7^3 oe **or** 1029
(ii)		$2^3 \times 3^5 \times 5 \times 7^4$	1	B1 for $2^3 \times 3^5 \times 5 \times 7^4$ oe **or** 23 337 720
b		4, 2, 1	2	M1 for $r = 1$ **or** for $p = 4$ **and** $q = 2$ **or** correct representation of C in terms of prime factors on a Venn diagram A1

Question	Working	Answer	Mark	Notes
9	E.g. $\tan 72 = \frac{12.8}{a}$ **or** $\tan(90-72) = \frac{o}{12.8}$ **or** $\sin 72 = \frac{12.8}{h}$ **or** $\cos(90-72) = \frac{12.8}{h}$	110	5	M1 substitutes correctly into a trig ratio (including the Sine rule)
	E.g.(shortest side) = $\frac{12.8}{\tan 72}$ **or** 12.8tan(90 – 72) **or** 4.15(89…) **or** 4.16 **or** (hypotenuse =) $\frac{12.8}{\sin 72}$ **or** $\frac{12.8}{\cos(90-72)}$ **or** 13.4(58…) **or** 13.5			M1 for a complete method to find one side of the triangle
	One of (shortest side =) $\frac{12.8}{\tan 72}$ **or** 12.8tan(90 – 72) **or** 4.15(89…) **or** 4.16 **or** $\sqrt{"13.4..."^2 - 12.8^2}$ **AND** **One of** (hypotenuse =) $\frac{12.8}{\sin 72}$ **or** $\frac{12.8}{\cos(90-72)}$ **or** 13.4(58…) **or** 13.5 **or** $\sqrt{12.8^2 + "4.15..."^2}$			M1 for a complete method to find both missing sides of triangle NB Could use Pythagoras's theorem with side found – must be a complete correct method
	5 × ("13.4(58…)" – "4.15(89…)") + 5 × 12.8 **or** 5 × ("13.4…" + "4.15…" + 12.8) – 10 × "4.15…"			M1 for method to use found lengths to find perimeter
				A1 for answer in range 110 - 111

Question	Working	Answer	Mark	Notes
10 a	Readings from graph at cf 20 and cf 60 eg. readings of 103 and 123	20.5	2	M1 A1 for answer in range 19 – 21
b	Reading from graph from time = 120 (=55) **or** 80 – 55 (=25) 0.35 × 80 (=28) **or** e.g. $\frac{80-"55"}{80}\times 100$ oe (=31(.25)) **or** $\frac{"55"}{80}\times 100$ oe (= 68(.75))	No with correct figures	3	M1 accept reading in range 55 – 56 M1 accept a value in the range 30 – 31.25 **or** a value in the range 68 – 70 for this mark unless clearly from incorrect working A1 eg. No with 28 and 25 **or** No with 31.25% (accept value in range 30% – 31.25%) **or** No with 68.75% and 65% (accept value in range 68% – 70%)
	Alternative scheme 0.65 × 80 (=52) Reading from graph from cf = 52 (=118) **or** Reading from graph from time = 120 (=55)	No with correct figures	3	M1 M1 accept reading in range 55 – 56 A1 eg. No with 118 (minutes) **or** No with 52 and 55

Question	Working	Answer	Mark	Notes
11 a	$2x^2 - x + 6x - 3$ **or** $2x^2 + 5x - 3$ **or** $x^2 + 3x - 5x - 15$ **or** $x^2 - 2x - 15$ **or** $2x^2 - 10x - x + 5$ **or** $2x^2 - 11x + 5$ eg. $2x^3 + 5x^2 - 3x - 10x^2 - 25x + 15$ **or** $2x^3 - 4x^2 - 30x - x^2 + 2x + 15$ **or** $2x^3 - 11x^2 + 5x + 6x^2 - 33x + 15$	$2x^3 - 5x^2 - 28x + 15$	3	M1 for expansion of any 2 of the 3 brackets (at least 3 of 4 terms correct) M1 (dep) ft for at least half of their terms correct in second expansion (the correct number of terms **must** be present) A1
	Alternative scheme			
	$2x^3 - 10x^2 - x^2 + 5x + 6x^2 - 30x - 3x + 15$	$2x^3 - 5x^2 - 28x + 15$	3	M2 for a complete expansion with 8 terms present, at least 4 of which must be correct A1

Question	Working	Answer	Mark	Notes
11 b	$\frac{-6\pm\sqrt{96}}{6}$ or $\frac{-6\pm\sqrt{6^2--60}}{6}$ Accept 9.79 – 9.8(0) in place of $\sqrt{96}$ NB: denominator must be 2 × 3 or 6 **and** there must be evidence for correct order of operations in the numerator	0.633, −2.63	3	M2 If not M2 then award M1 for $\frac{-6\pm\sqrt{6^2-4\times3\times-5}}{2\times3}$ condone one sign error in substitution; allow evaluation of individual terms e.g 36 in place of 6^2 A1 dep on M1 for answers in range 0.63 to 0.633 , −2.63 to −2.633 Award M2A1 for correct answer with correct working that would gain at least M1
	Alternative scheme e.g $3((x + 1)^2 – 1) – 5 (= 0)$ **or** $(x+1)^2-1-\frac{5}{3}(=0)$ $(x =)\ -1\pm\sqrt{\frac{5}{3}+1}$ oe	0.633, −2.63	3	M1 for completing the square M1 for correct method to isolate x A1 dep on M1 for answer in range 0.63 to 0.633 , −2.63 to −2.633 Award M2A1 for correct answer with correct working that would gain at least M1

Question	Working	Answer	Mark	Notes
12 (a)		3, 4	1	B1
(b)		see graph at end of mark scheme	3	B3 for correct region identified If not B3 then award B2 for $x + y = 4$ drawn (with no additional lines drawn) **and** a region identified that satisfies at least 3 of the 5 given inequalities If not B2 then award B1 for line $x + y = 4$ drawn NB. May shade wanted or unwanted regions; lines may be solid or dashed
13 a (i)		54	1	B1 cao
(ii)		angle at centre is twice angle at circumference	1	B1 dep on B1 in (a)(i) accept alternative reasons eg. angle at circumference is half the angle at the centre
b (i)		27	1	B1 ft from (a)(i) for $\frac{"54"}{2}$
(ii)		alternate segment theorem	1	B1 dep on B1 in (b)(i) accept alternative reason angle between tangent and radius is 90^o If answer for (b)(i) is ft from (a)(i) then reason must be angle between tangent and radius is 90^o

Question		Working	Answer	Mark	Notes
14	a		−6.5 oe	1	B1
	b	$4y = 3x - 5$ **or** $4x = 3y - 5$	$\frac{4x+5}{3}$ oe	2	M1 A1
	c	$\sqrt{19-3}$ oe **or** f(4) **or** $\frac{3\sqrt{19-3}-5}{4}$ **or** $\frac{3\sqrt{19-x}-5}{4}$ oe	1.75 oe	2	M1 A1 for 1.75oe (and no other solution)
	d		$x > 19$	2	B2 for $(x) > 19$ or an equivalent statement in words If not B2 then award B1 for $(x) \geq 19$

Question	Working	Answer	Mark	Notes
15 a	E.g. $\left(\frac{y^8}{256x^{20}}\right)^{\frac{1}{4}}$ **or** $\left(\frac{4x^5}{y^2}\right)^{-1}$ **or** $\frac{x^{-5}}{4y^{-2}}$ **or** $\frac{\frac{1}{4}x^{-5}}{y^{-2}}$ **or** $k\frac{y^a}{x^b}$ **or** $\frac{ky^a}{x^b}$ with 2 of $k = \frac{1}{4}$ oe , $a = 2$, $b = 5$ **or** $\frac{y^a}{mx^b}$ with 2 of $m = 4$, $a = 2$, $b = 5$	$\frac{y^2}{4x^5}$	2	M1 for a correct first step leading to a correct partially simplified expression A1 for $\frac{y^2}{4x^5}$ **or** $\frac{\frac{1}{4}y^2}{x^5}$ **or** $0.25\frac{y^2}{x^5}$ **or** $0.25y^2x^{-5}$
b	$\frac{1}{(3x-5)(3x+5)} - \frac{1}{2(3x+5)}$ E.g. $\frac{2}{2(3x-5)(3x+5)} - \frac{1(3x-5)}{2(3x-5)(3x+5)}$ **or** $\frac{6x+10}{(9x^2-25)(6x+10)} - \frac{9x^2-25}{(9x^2-25)(6x+10)}$	$\frac{7-3x}{2(3x-5)(3x+5)}$	3	M1 indep for $(3x + 5)(3x – 5)$ M1 for two correct fractions with a common denominator if there is any expansion at this stage then it must be correct A1 accept equivalents eg. $\frac{7-3x}{18x^2-50}$
	Alternative scheme $\frac{6x+10}{(9x^2-25)(6x+10)} - \frac{9x^2-25}{(9x^2-25)(6x+10)}$	$\frac{7-3x}{2(3x-5)(3x+5)}$	3	M1 for two correct fractions with a common denominator

	$\frac{(7-3x)(3x+5)}{(9x^2-25)(6x+10)}$			M1 A1	Numerator expanded and then factorised correctly accept equivalents

Question	Working	Answer	Mark	Notes
16	$1-\frac{98}{125}\left(=\frac{27}{125}\right)$ **or** 0.216 **or** 125 – 98 (=27) $\sqrt[3]{"\frac{27}{125}"}\left(=\frac{3}{5}\right)$ **or** $\sqrt[3]{"\frac{125}{27}"}\left(=\frac{5}{3}\right)$ $1-"\frac{3}{5}"$ **or** $h-"\frac{3}{5}"h$ oe	$\frac{2}{5}h$ oe	4	M1 M1 for the length scale factor may be seen as a ratio E.g. 3 : 5 M1 A1 for $\frac{2}{5}h$ oe (may not be simplified)
	Alternative scheme $\frac{1}{3}\pi r^2h-\frac{1}{3}\pi(kr)^2kh = \frac{98}{125}\times\frac{1}{3}\pi r^2h$ oe $k=\frac{3}{5}$ $1-"\frac{3}{5}"$ **or** $h-"\frac{3}{5}"h$ oe	$\frac{2}{5}h$ oe	4	M1 sets up an equation using scale factor M1 for the length scale factor M1 A1 for $\frac{2}{5}h$ oe (may not be simplified)

Question	Working	Answer	Mark	Notes
17 a	$\left(\overrightarrow{BC} =\right)\begin{pmatrix}-2\\-7\end{pmatrix}+\begin{pmatrix}10\\11\end{pmatrix}\left(=\begin{pmatrix}8\\4\end{pmatrix}\right)$ $\begin{pmatrix}5\\8\end{pmatrix}+"\begin{pmatrix}8\\4\end{pmatrix}"$ **or** $\begin{pmatrix}10\\11\end{pmatrix}+"\begin{pmatrix}3\\1\end{pmatrix}"$	(13, 12)	3	M1 or coordinates (5 – 2, 8 – 7) (= (3, 1)) assigned to *A* (may be seen in vector form) **or** (13, *y*) or (*x*, 12) given as coordinates for *C* M1 for coordinates (5 – 2 + 10, 8 – 7 + 11) assigned to *C* A1
b	e.g. $\begin{pmatrix}63\\211\end{pmatrix}-\begin{pmatrix}5\\8\end{pmatrix}\left(=\begin{pmatrix}58\\203\end{pmatrix}\right)$ **with** e.g. "58" ÷ 2 (=29) **and** "203" ÷ 7 (=29) **OR** e.g. $\begin{pmatrix}63\\211\end{pmatrix}-\begin{pmatrix}3\\1\end{pmatrix}\left(=\begin{pmatrix}60\\210\end{pmatrix}\right)$ **with** e.g. "60" ÷ 2 (=30) **and** "210" ÷ 7 (=30)	Proof	2	M1 may work with *A* and *E*, in which case may need to ft for method mark from (a) A1 proof with justification eg. $\overrightarrow{BE} = 29\begin{pmatrix}2\\7\end{pmatrix}$ (**or** $\overrightarrow{AE} = 30\begin{pmatrix}2\\7\end{pmatrix}$) with *ABE* is a straight line **or** 210 ÷ 60 = 3.5 and 7 ÷ 2 = 3.5 so *ABE* is a straight line

Question	Working	Answer	Mark	Notes
18 a (i)		(3, −1)	1	B1
(ii)		(−2, −0.5) oe	1	B1
b		e.g. 2, 90, 1	3	B3 for all 3 correct values e.g. 2, 90, 1 **or** −2, 270, 1 If not B3 then B2 for any 2 correct values NB. 2 values from 2, 90, 1 **OR** 2 values from −2, 270, 1 NB: accept a value of (90 + 360*n*) in place of 90 or (270 + 360*n*) in place of 270 where *n* is an integer (could be negative) If not B2 then B1 for any 1 correct value **or** the graph of $y = \sin x^{o}$ for $0 \leq x \leq 360$

Question	Working	Answer	Mark	Notes
19	$\frac{1}{4}\times\frac{2}{5}\left(=\frac{2}{20}\right)$ **or** $\frac{3}{4}\times\frac{3}{5}\left(=\frac{9}{20}\right)$ **or** $\frac{1}{4}\times\frac{3}{5}\left(=\frac{3}{20}\right)$ **or** $\frac{3}{4}\times\frac{2}{5}\left(=\frac{6}{20}\right)$	$\frac{121}{400}$ oe	4	M1 for any one correct probability
	$\frac{1}{4}\times\frac{2}{5}+\frac{3}{4}\times\frac{3}{5}\left(=\frac{11}{20}\right)$ **or** $1-\left(\frac{1}{4}\times\frac{3}{5}+\frac{3}{4}\times\frac{2}{5}\right)\left(=\frac{11}{20}\right)$			M1 for a complete method
	$"\frac{11}{20}"\times"\frac{11}{20}"$ **or** $\left("\frac{2}{20}"+"\frac{9}{20}"\right)^2$			M1
				A1 for $\frac{121}{400}$ oe **or** 0.3025 **or** 30.25%

20	$y=\frac{2}{3}x\left(+\frac{12}{3}\right)$ **or** $y=\frac{2x+12}{3}$ **or** gradient = $\frac{2}{3}$ (gradient of perpendicular line =) $-\frac{3}{2}$ oe **or** $\frac{-1}{"\frac{2}{3}"}$ oe $37="-\frac{3}{2}"\times 4+c$ **or** $c = 43$ $y=-\frac{3}{2}x+43$	$3x + 2y = 86$	5	M1 M1 ft from their gradient M1 (dep on previous M1) and ft from their gradient — M1 for $y-37="-\frac{3}{2}"(x-4)$ A1 correct equation (equation in any form) — A1 for $y-37=-\frac{3}{2}(x-4)$ A1 for $3x + 2y = 86$ oe for a simplified equation with integer coefficients e.g. $3x = 86 – 2y$
	Alternative scheme $2y = −3x + c$ oe $2 \times 37 = -3 \times 4 + c$	$3x + 2y = 86$	5	M2 M1 A2 for $3x + 2y = 86$ oe for a simplified equation with integer coefficients e.g. $3x = 86 – 2y$