Mark Scheme (Results)

Summer 2022

Pearson Edexcel International GCSE
In Mathematics A (4MA1)
Paper 2FR

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Types of mark

- M marks: method marks
- A marks: accuracy marks
- B marks: unconditional accuracy marks (independent of M marks)

Abbreviations

- cao – correct answer only
- ft – follow through
- isw – ignore subsequent working
- SC - special case
- oe – or equivalent (and appropriate)
- dep – dependent
- indep – independent
- awrt – answer which rounds to
- eeoo – each error or omission

No working

- If no working is shown then correct answers normally score full marks
- If no working is shown then incorrect (even though nearly correct) answers score no marks.

With working

- If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
- If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.
- If a candidate misreads a number from the question. Eg. Uses 252 instead of 255; method marks may be awarded provided the question has not been simplified.
- Examiners should send any instance of a suspected misread to review. If there is a choice of methods shown, mark the method that leads to the answer on the answer line; where no answer is given on the answer line, award the lowest mark from the methods shown.
- If there is no answer on the answer line then check the working for an obvious answer.

Ignoring subsequent work

- It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. Incorrect cancelling of a fraction that would otherwise be correct.
- It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.
- Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

Parts of questions

- Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded to another.
  to another.

International GCSE Maths

Apart from Questions 5, 18, 20, 22 the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method

Q		Working	Answer	Mark	Notes
1	(a)		7, 58, 123, 180, 202	1	B1
	(b)		0.015, 0.15, 0.155, 1.15, 1.5	1	B1
	(c)		5203	1	B1
	(d)		tens	1	B1 oe eg 6 tens, 60, ten(s), sixty,
					Total 4 marks

2	(a)		Bar drawn of height 8	1	B1
	(b)		USA	1	B1
	(c)		France	1	B1
	(d)		13	1	B1 Allow 13 000 000
					Total 4 marks

3	(a)		3.76	1	B1
	(b)		Arrow pointing at 0.04	1	B1
	(c)		5.7	1	B1 Allow 5,7
					Total 3 marks

4	(a)		Parallelogram drawn	1	B1
	(b)(i)		Pyramid	1	B1 accept square based pyramid or rectangular based pyramid
	(ii)		5	1	B1 Allow five
					Total 3 marks

5	e.g. 5950 ÷ 1000 (= 5.95) **or** 9000 ÷ 1000 (= 9) **or** 14.5 × 1000 (= 14 500) **or** 30 × 1000 (= 30 000) **or** (5950 + 9000) ÷ 1000 (= 14.95)		3	M1 for one correct conversion
	e.g. "5.95" + 14.5 + "9" (= 29.45) **or** "14.95" + 14.5 (= 29.45) **or** **or** 5950 + "14 500" + 9000 (= 29 450) **or** 30 000 – (5950 + "14 500" + 9000) = 550 **or** 30 – ("5.95" + 14.5 + "9") = 0.55(0)			M1 for a complete method for adding with their adjusted figures
		Shown with correct figures		A1 e.g. Shown with 29.45 Shown with 29 450 Shown 550 Shown 0.55(0)
				Total 3 marks

6 (a)(i)		5.6	1	B1 oe e.g. $\frac{28}{5}$, $5\frac{3}{5}$
(ii)		2744	1	B1 Allow 2,744
(b)(i)		3	1	B1
(ii)		7	1	B1
				Total 4 marks

7 (a)(i)		31	1	B1	
(ii)		Correct explanation	1	B1	e.g. 'I added 6', 'add 6', +6, 6n – 5 (need to know 6 and we need to add/go up oe)
(b)		Correct explanation	1	B1	**Acceptable** e.g. • Should be 187 oe • 188 is even or not odd • 187 and 193 (are in the sequence) • Terms end in 1, 3, 5, 7, 9 or odd numbers • Sequence is odd • 6n – 5 = 188 gives a decimal or not a whole number • Need to minus 1 oe **Not acceptable** e.g. • It goes past 188 oe • 193 is after 188 oe
					Total 3 marks

8	256 ÷ 8 (= 32) **or** 8 × 32 = 256 **or** 2.48 ÷ 8 (= 0.31)		3	M1 for a correct first step
	"32" × 2.48 **or** 256 × "0.31"			M1 for a complete method or $\frac{1984}{25}$
		79.36		A1
				Total 3 marks

9	(a)		a^5	1	B1
	(b)		24bc	1	B1 oe
	(c)		3x + 12	1	B1 or 12 + 3x
	(d)	e.g. $5\times\left(\frac{1}{2}\right)^2-\frac{1}{4}$ or $5\times(0.5)^2-0.25$ oe or $5\times\frac{1}{4}-\frac{1}{4}$ oe or $5\times0.25-0.25$ oe		2	M1 for substituting values for v and w
			1		A1 oe e.g. $\frac{4}{4}$
					Total 5 marks

10	6 hrs 40 mins or $6\frac{2}{3}$ or $\frac{20}{3}$ or 400 mins		4	B1
	e.g. (6 × 60 + 40) × 60 (= 24 000) oe or "their 400" × 60 (= 24 000) oe or $\frac{60}{8}$ (= 7.5) oe or $\frac{60\times60}{8}$ (= 450) oe or 7.5×60 (= 450) oe			M1 for converting their time difference into seconds **or** finding the number of bolts produced in 1 minute oe **or** finding the number of bolts produced in one hour oe
	e.g. "24 000" ÷ 8 oe or "their 400" × "7.5" oe or "their $6\frac{2}{3}$"×"450" oe			M1 for a complete method to find how many bolts are produced
		3000		A1
				Total 4 marks

11		Correct triangle	2	B2	For a fully correct triangle with arcs shown (B1 for a correctly sized triangle with no arcs shown **or** for an incorrectly sized triangle with arcs shown where AC = BC **or** correct arcs not joined) (overlay required)
					Total 2 marks

12	(a)		BL, BM, BS CL, CM, CS DL, DM, DS	2	B2 (B1	for all 9 combinations with no extras or repeats for at least 4 correct combinations (ignoring repeats))
	(b)		$\frac{47}{100}$	1	B1	oe
	(c)		$\frac{49}{53}$	2	B2 (B1	oe accept 0.9245... or 92(.45...)% for $\frac{c}{53}$ where c < 53 **or** $\frac{49}{d}$ where d > 49)
						Total 5 marks

13	e.g. 0.5 × (6 + 13) × 3		2	M1	for a complete method
		28.5		A1	oe
					Total 2 marks

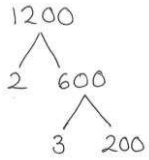
14	(−1, −3) (0, −1) (1, 1) (2, 3) (3, 5) (4, 7)	For a correct line between x = −1 and x = 4	3	B3 for a correct line between x = −1 and x = 4 B2 for a correct straight line segment through at least 3 of (−1, −3) (0, −1) (1, 1) (2, 3) (3, 5) (4, 7) **or** for all of (−1, −3) (0, −1) (1, 1) (2, 3) (3, 5) (4, 7) plotted but not joined B1 for at least 2 correct points stated (may be in a table) or plotted **or** for a line drawn with a positive gradient through (0, −1) **or** for a line with a gradient of 2
				Total 3 marks

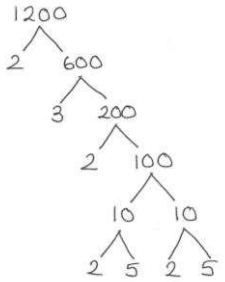
15	e.g. $\frac{4}{10}$ **or** 0.4 **or** 25% **or** 0.25		4	M1	for a correct conversion
	e.g. $1-"\frac{4}{10}"-\frac{1}{4}\left(=\frac{7}{20}\right)$ **or** 1 – "0.4" – "0.25" (= 0.35) **or** 100 – 40 – "25" (= 35)			M1	for a complete method to find proportion of money spent on petrol
	e.g. "their $\frac{7}{20}$":1 **or** "their 0.35" : 1 **or** "their 35" : 100			M1	for an equivalent ratio
		7 : 20		A1	cao SC M3 for 20 : 7
					Total 4 marks

16	(a)		2	1	B1	Do not allow 12
	(b)	e.g. $0 \times 1 + 1 \times 5 + 2 \times 12 + 3 \times 9 + 4 \times 11 + 5 \times 2$ (= 110) **or** 0 + 5 + 24 + 27 + 44 + 10 (= 110)		3	M1	for at least 4 correct products with intention to add
		e.g. "110" ÷ 40			M1	
			2.75		A1	oe If no other marks awarded, award SC B1 for an answer of 2.775
						Total 4 marks

17		$T = 0.2(12n + 50)$ oe	3	B3	for $T = 0.2(12n + 50)$ oe or $T = 0.2 \times (12n + 50)$ oe for $T = 0.2 \times (12 \times n + 50)$ oe or $T = \frac{12n + 50}{5}$ oe or $T = 2.4n + 10$ oe
				B2	for $0.2(12n + 50)$ oe or $0.2 \times 12n + 50$ oe or $T = 0.2 \times 12n + 50$ oe or $T = n \times 12 + 50 \times 0.2$ oe or $T = 12n + 50 \div 5$ oe or $T = n(12) + 50(0.2)$ oe
				B1	for $n \times 12 + 50 \times 0.2$ oe or $12n + 50 \div 5$ oe or $n(12) + 50(0.2)$ oe or T = a linear expression in n e.g. T = n
					Total 3 marks

18	(a)	enlargement, enlarge, enlarged	Enlargement	3	B1	for enlargement with no mention of translate, reflect, rotate, move, flip
		scale factor 3, SF 3, ×3, factor of 3, 'three' times	Scale factor 3		B1	for (scale factor =) 3 with no mention of a vector, line of symmetry or angle
		allow (3, 0) 3, 0	Centre (3, 0)		B1	for (centre =) (3, 0)
	(b)		Triangle drawn at (1, 4) (1, 6) (2, 4)	1	B1	condone missing label
						Total 4 marks

<table>
<tr>
<td>19</td>
<td>eg 2 × 2 × 300
2 × 5 × 120
2 × 3 × 200
3 × 5 × 80 or
eg
 

or
<table>
<tr><td>2</td><td>1200</td></tr>
<tr><td>3</td><td>600</td></tr>
<tr><td></td><td>200</td></tr>
</table></td>
<td></td>
<td>3</td>
<td>M1</td>
<td>for at least 2 correct stages in prime factorisation which give 2 prime factors – may be in a factor tree or a table or listed eg 2, 2, 300 (allow no more than one mistake ft (eg one mistake with 2 prime factors ft 1200 = 20 × 600 = 2 × 10 × 3 × 200))</td>
</tr>
<tr>
<td></td>
<td>2, 2, 2, 2, 3, 5, 5
or
 

oe
<table>
<tr><td>2</td><td>1200</td></tr>
<tr><td>3</td><td>600</td></tr>
<tr><td>2</td><td>200</td></tr>
<tr><td>5</td><td>100</td></tr>
<tr><td>2</td><td>20</td></tr>
<tr><td>5</td><td>10</td></tr>
<tr><td>2</td><td>2</td></tr>
<tr><td></td><td>(1)</td></tr>
</table></td>
<td></td>
<td></td>
<td>M1</td>
<td>for finding the correct prime factors condone inclusion of 1 (may be seen in a fully correct factor tree or ladder)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$2^4 \times 3 \times 5^2$</td>
<td></td>
<td>A1</td>
<td>(dep on M2 as working requested)
Can be in any order (allow $2^4 . 3 . 5^2$) but must be in index form as asked for.</td>
</tr>
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<td></td>
<td></td>
<td>Total 3 marks</td>
</tr>
</table>

20	eg $\frac{158+C}{2}=160$ **or** (C =) 160 + (160 – 158) (= 162) oe **or** (C =) 162		3	M1	for method to find Candela's height or Candela's height or Candela's height in the wrong place on the answer line
	eg (D =) 175 – 21 **(=** 154) oe			M1	indep for method to find Diana's height or Diana's height or Diana's height in the wrong place on the answer line
		Candela 162 Diana 154		A1	Correctly attributed If no marks awarded, SCB1 for Candela's height 179
					Total 3 marks

21 (a)(i)		9, 15	1	B1	no repeats
(a)(ii)		9, 11, 12, 13, 15, 17, 18, 19	1	B1	no repeats or omissions
(b)	**No must be ticked along with a reason for the award of this mark**	No with a correct reason	1	B1	No with eg 24/it is not in the universal set, 24/it is not between 9 and 20 (need some sort of reference that the numbers in the sets do not go beyond 20)
(c)		10, 18 and two from 9, 11, 13, 15, 17, 19	2	B2 (B1	for 10, 18 and two from 9, 11, 13, 15, 17, 19 a set of 4 numbers of which 3 are correct or a set of 5 numbers including 10, 18, and no more than one incorrect number or a set of 3 or more numbers from {10, 18, 9, 11, 13, 15, 17, 19})
					Total 5 marks

22	$\sqrt{36}$ (= 6) **or** 6 **or** 6 × 6		4	M1	for method to find the length of the square – may be seen in later working
	eg $\pi \times \left(\frac{[\text{their } 6]}{2}\right)^2 \div 2 (= 14.1... \text{ or } 4.5\pi \text{ or } \frac{9}{2}\pi)$ **or** $\pi \times \left(\frac{[\text{their } 6]}{2}\right)^2 (= 28.2... \text{ or } 9\pi)$			M1	for method to find the area of one semicircle **or** circle or the incorrect number of semicircles or circles provided correct area of circle formula is seen for [their 6] allow any value if there is a clear implication this is their side length of square.
	eg 4 × "14.1" (= 56.5... or 18π) **or** 2 × "28.2" (= 56.5... or 18π)			M1	for a complete method to find the total area of the semicircles ft from previous M1 [if the pupil multiplies again and uses the incorrect number of circles or semicircles this mark is not awarded]
		92.5		A1	accept 92.4 – 92.6 (not in terms of π)
					Total 4 marks

23 (a)	eg $10p = 3p - 5$ **or** $p = \frac{3p}{10} - \frac{5}{10}$ oe eg $p = 0.3p - 0.5$		3	M1	for a correct first step – multiplying both sides by 10 correctly or writing the RHS as 2 terms each over 10 or each term as a decimal [must be in a correct equation]
	eg $10p - 3p = -5$ **or** $7p = -5$ **or** $p - \frac{3p}{10} = -\frac{5}{10}$ **or** $0.7p = -0.5$			M1ft	(ft a 3 term equation) for collecting terms in p on one side and number the other
		$-\frac{5}{7}$		A1	(dep on at least M1) for $-\frac{5}{7}$ oe, accept −0.71(4...) allow –0.7 if you have seen $-\frac{5}{7}$ or $-5 \div 7$
(b)		1	1	B1	
(c)		$\frac{y^2}{2x}$	2	B2	for $\frac{y^2}{2x}$ oe eg $\frac{0.5y^2}{x}$, $0.5y^2x^{-1}$, $\frac{y^2x^{-1}}{2}$, $\frac{1}{2xy^{-2}}$ oe If not B2, award B1 for 2 of number, x, y correct eg $\frac{ky^2}{x}$ where $k \neq \frac{1}{2}$ **or** $\frac{y^2}{2x^m}$ where $m \neq 1$ **or** $0.5y^2$ **or** $\frac{y^p}{2x}$ where $p \neq 2$) **oe** [one term can be missing with 2 correct for B1]

(d)		$5cd^2(2c^2+3d^2)$	2	B2	for $5cd^2(2c^2+3d^2)$ B1 for a correct partial factorisation eg $5(2c^3d^2+3cd^4)$ or $cd^2(10c^2+15d^2)$ **or** $5d^2(2c^3+3cd^2)$ **or** $5c(2c^2d^2+3d^4)$ **or** 5cd(2c²d + 3d³) etc **or** 5cd²(a 2 term expression with just one error)
					Total 8 marks

24	$(4^n=)(2^2)^n$ **or** $(4^n=)2^{2n}$ oe eg $2^k\div 2^{2n}=2^x$ **or** $2^k=4^{\frac{1}{2}k}$ **and** $2^x=4^{\frac{1}{2}x}$ oe eg $\frac{4^{\frac{1}{2}k}}{4^n}=4^{\frac{1}{2}x}$		2	M1	for writing 4^n as $\left(2^2\right)^n$ or 2^{2n} or for writing each term in terms of 4 ie $2^k=4^{\frac{1}{2}k}$ **and** $2^x=4^{\frac{1}{2}x}$ If these things are seen in working, award this mark even if followed by incorrect working – if not a choice of methods
		k – 2n		A1	allow 2^{k-2n}
					Total 2 marks

25	1 + 0.12 (= 1.12) or 100(%) + 12(%) (=112(%)) or $\frac{18.20}{112}(=\frac{13}{80}=0.1625)$ or $x + 0.12x = 18.2(0)$ or $x \times 1.12 = 18.2(0)$			M1
	eg 18.2(0) ÷ (1 + 0.12) oe or $\frac{18.2(0)}{112} \times 100$ oe			M1 for a complete method
		16.25		A1
				Total 3 marks

26	(a)		8 800 000	1	B1	
	(b)		Barcelona	1	B1	accept 5.5×10^6
	(c)	$3.7 \times 10^7 - 7.7 \times 10^6$ **or** 29 300 000 oe or 37 000 000 – 7 700 000 or 29 000 000 oe or $0.29(3) \times 10^8$ or $29(.3) \times 10^6$		2	M1	allow $2.9(3) \times 10^n$ ($n \neq 7$)
			2.9×10^7		A1	accept -2.9×10^7 accept 2.93×10^7 or -2.93×10^7
						Total 4 marks

27	eg $\tan \text{BAP} = \frac{2}{5}$ or $\sin \text{BAP} = \frac{2}{\sqrt{5^2+2^2}}$ or $\frac{\sin \text{BAP}}{2} = \frac{\sin 90}{\sqrt{5^2+2^2}}$ $\cos \text{BAP} = \frac{5}{\sqrt{5^2+2^2}}$ or $\cos \text{BAP} = \frac{5^2+(\sqrt{5^2+2^2})^2-2^2}{2\times5\times\sqrt{29}}$		5	M1	for setting up a trig equation for angle BAP
	eg $(\text{BAP} =) \tan^{-1}\left(\frac{2}{5}\right) (= 21.8...)$ or $(\text{BAP} =) \sin^{-1}\left(\frac{2}{\sqrt{5^2+2^2}}\right)$ or $(\text{BAP} =) \sin^{-1}\left(\frac{2\sin 90}{\sqrt{5^2+2^2}}\right)$ $(\text{BAP} =) \cos^{-1}\left(\frac{5}{\sqrt{5^2+2^2}}\right)$ or $\text{BAP} = \cos^{-1}\left(\frac{5^2+(\sqrt{5^2+2^2})^2-2^2}{2\times5\times\sqrt{5^2+2^2}}\right)$			M1	for a complete method to find angle BAP (= 21.8….) [M2 for $90 - \tan^{-1}\frac{5}{2}$ ie 90 – 68.2]
	eg (int angle =) $(6-2)\times180\div6 (=120)$ **or** (ext angle =) $360\div6 (=60)$			M1	**Indep** for a method to find the size of one interior **or** one exterior angle in a regular hexagon – **could be seen on diagram**
	eg "120" – "21.8" **or** 180 – "60" – "21.8"			M1	for a complete method to find angle PAF where all values have come from a correct method
		98.2		A1	accept 98.1 – 98.3
					Total 5 marks

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