Mark Scheme (Results)

January 2023

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

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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)

- o dep – dependent
- o indep – independent
- o awrt – answer which rounds to
- o 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.

International GCSE Maths A January 2023– Paper 2F Mark scheme

Apart from Questions 16, 17, 19, 20c, 22 where the mark scheme states otherwise, 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)		3567	1	B1	
	(b)		7536	1	B1	
	(c)		37 or 53 or 73 or 67	1	B1	
	(d)		56	1	B1	
						Total 4 marks

2	(a)		USA	1	B1	
	(b)		Pictogram completed with 1 and a half symbols	1	B1	
	(c)	$11 + 7$ oe eg $(2.75 + 1.75) \times 4$		2	M1	For two numbers added together, one of which is correct
		Correct answer scores full marks (unless from obvious incorrect working)	18		A1	
						Total 4 marks

3	(a)		554 correctly indicated	1	B1	Arrow or other mark shown clearly at 554 (2nd notch to right of 550)
	(b)		3250	1	B1	
						Total 2 marks

4	(a)		line of length 6.5 cm drawn	1	B1	$\pm$ 2 mm
	(b)		44	1	B1	Accept answers in the range 42-46 including decimals and fractions
						Total 2 marks

5	(a)	9.02 + 21.90		2	M1	
		Correct answer scores full marks (unless from obvious incorrect working)	30.92		A1	
	(b)	9.02 + 15.85 (= 24.87) or 33.89 – 9.02 (= 24.87) or 33.89 – 15.85 (= 18.04)		3	M1	allow for one correct and any incorrect cost added and then the total subtracted from 33.89 or 9.02 or 15.85 subtracted from 33.89 after subtraction of an incorrect cost
		33.89 – "24.87" (= 9.02) or 33.89 – 15.85 – 9.02 (= 9.02)			M1	a fully correct method to find the cost of the 3rd parcel
		Correct answer scores full marks (unless from obvious incorrect working)	2		A1	cao must come from correct working eg 9.02 from clear method If no marks awarded, SCB1 for any 2 costs from table subtracted from 33.89
						Total 5 marks

6	(a)		17 15	1	B1	allow 17.15 17:15 etc
	(b)		3 hours 40 minutes	2	B2	Accept 220 min or $3\frac{2}{3}$ hours (B1 for 3 (hours) or for 40 (minutes) or for an answer such as 2 hours 100 minutes)
						Total 3 marks

7	(a)		c^5	1	B1	
	(b)		7	1	B1	
	(c)		18	1	B1	Look in body of script if nothing on answer line
	(d)		$10 + 15h$	1	B1	
	(e)		$g(g + 7)$	1	B1	
						Total 5 marks

8	(a)		38	1	B1
	(b)		$\times 3$ or $+12$	1	B1
	(c)		29	1	B1
	(d)	$(61 - 5) \div 8$ oe **or** $5 + 8 + 8 + 8 + 8 + 8 + 8 + 8 = 61$ oe eg $13 + 8 + 8 + 8 + 8 + 8 + 8$ (allow one too few or one too many 8's if repeated addition used)		2	M1
		Correct answer scores full marks (unless from obvious incorrect working)	7		A1
					Total 5 marks

9	(a)		Road	Mountain	Hybrid	Total			3	B3 for all 6 entries correct
		Professional	26	*22*	*19*	67				B2 for 4 or 5 correct entries
		Amateur	*13*	32	*8*	*53*				B1 for 2 or 3 correct entries
		Total	39	54	*27*	120				

	(b)	$\frac{54}{120}\left(=\frac{9}{20}=0.45\right)$ oe or $\frac{54}{120}\times 100$ oe		2	M1
		Correct answer scores full marks (unless from obvious incorrect working)	45		A1 cao
	(c)	$\frac{41}{120}\times 360$ oe eg $0.34(166\ldots)\times 360$ or 41×3 or $360 \div \frac{120}{41}$ or $360 \div 2.9(268\ldots)$		2	M1
		Correct answer scores full marks (unless from obvious incorrect working)	123		A1
					Total 7 marks

10	(a)		11	1	B1
	(b)	$21 \div 2$ (=10.5) or 11th oe or 10,11,11,11,,,,,12,12,13… etc with no more than one error		2	M1 For a correct method to find position of median
			13		A1
	(c)	$10\times1+11\times7+12\times2+13\times5+14\times4+15\times2$ or $10 + 77 + 24 + 65 + 56 + 30$ oe		2	M1 For at least 4 correct products
		Correct answer scores full marks (unless from obvious incorrect working)	262		A1 (NB: an answer of 12.476.. alone or with $262 \div 21$ gains M1 only)
					Total 5 marks

11	(a)		169	1	B1	
	(b)		3	1	B1	
	(c)		1.45582(0007)	2	B2	(B1 for 5.590… or 3.84 or 1.45, 1.46, 1.455, 1.456, 1.4558)
						Total 4 marks

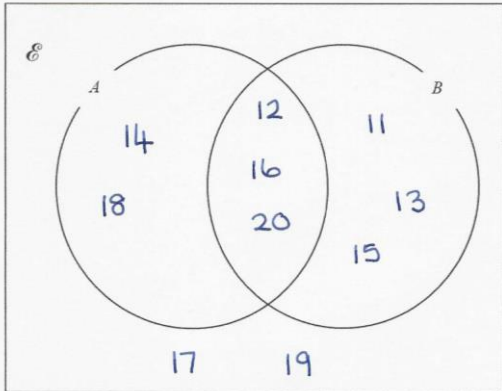| 12		$\frac{39}{n}$ where n = 3, 4 or 7 or "(7 – 4)" or for 13 or 9.75 or 5.57… or 4 : 7 8 : 14 12 : 21 16 : 28 20 : 35 etc to 32 : 56 or more (don't have to include all trials: ratios must be correct)		3	M1	or allow for this mark eg $\frac{39 \times 4}{7}(= \frac{156}{7} = 22.8)$ or $\frac{39 \times 7}{4}(= \frac{273}{4} = 68.25)$
		$\frac{39}{7-4} \times 4$ oe eg $\frac{4}{3} \times 39$ or for 52 : 91			M1	working with figures obtained from a correct method
		Correct answer scores full marks (unless from obvious incorrect working)	52		A1	(52 : 91 or 91 is M2 unless Alisha = 52 clearly shown in working)
						Total 3 marks

13	eg $\dfrac{380+20}{2}(=200)$ or $\dfrac{380-20}{2}(=180)$ or $\dfrac{380}{2}+10\,(=200)$ or $\dfrac{380}{2}-10(=180)$		4	M1	For a correct method to find the number of students in the U6 or the L6
	$\dfrac{2}{5}\times n$ oe **or** (U6 Maths =) 72 **or** $0.32\times m$ oe **or** (L6 Maths =) 64 [where n and m are positive numbers]			M1	
	$\dfrac{2}{5}\times n\ +\ 0.32\times m$ **or** $72+64$			M1	
	Correct answer scores full marks (unless from obvious incorrect working)	136		A1	cao
					Total 4 marks

14	eg 6×14 (= 84) **or** 13.5×14 (= 189) **or** $7.5 \times x$ (= 7.5x) **or** $924 \div 8$ (= 115.5) **or** any correct calculation that leads to an area linked to the cross section of the shape	eg $14 \times 6 \times 8$ (= 672) **or** $7.5 \times x \times 8$ (= 60x) **or** $13.5 \times 14 \times 8$ (= 1512) any correct calculation that leads to a volume linked to the 3D shape		4	M1	a correct calculation linked to the area of the cross section of the shape – can be numerical or algebraic and maybe part of another calculation. **or** a correct calculation linked to the volume of the shape – can be numerical or algebraic and may be part of another calculation
	$\dfrac{924}{8} - 84 (=115.5 - 84 = 31.5)$ oe **or** $6 \times 14 + 7.5x = $ "115.5"oe	$\dfrac{924 - "672"}{8} \left(= \dfrac{252}{8} = 31.5 \right)$ or $\dfrac{924 - "672"}{7.5} \left(= \dfrac{252}{7.5} = 33.6 \right)$ **or** $8(6 \times 14 + 7.5x) = 924$ oe			M1	a calculation that leads to a value one step away from the value of x eg a calculation leading to 31.5 (one step remains which is to divide by 7.5) or a correct equation in x
	eg $\left(\dfrac{924}{8} - "84" \right) \div 7.5$ $(= 31.5 \div 7.5)$ **or** $\dfrac{"115.5" - "84"}{7.5}$ oe **or** "33.6" $\div$ 8				M1	a fully correct calculation that leads to the value for x
	Correct answer scores full marks (unless from obvious incorrect working)		4.2		A1oe	
						Total 4 marks

15	angle *ABE* = 73 **or** angle *BEF* = 73 **or** angle *GEF* = 180 – 73 (=107) **or** angle *DEB* = 180 – 73 (=107) **or** 360 – 73 – 124 **or** 180 – (124 – "107")		4	M1	**could be on diagram**
	A correct angle scores 2 marks	163		A1	
				B2	**dep on M1 and a complete method** for all reasons appropriate for their method (B1 dep on M1 for one reason appropriate for their method) eg Angles on a straight <u>line</u> sum to <u>180</u>° Angles on a straight <u>line</u> sum to 180° <u>Vertically</u> <u>opposite</u> angles are equal. Vertically <u>opposite angles</u> are equal. <u>Corresponding</u> angles are equal. <u>Alternate</u> angles are equal <u>Allied</u> angles sum to 180° (or <u>co-interior</u> angles) Angles at a <u>point</u> (or <u>full turn</u>) add up to <u>360</u>° (or <u>angles</u> at a <u>point</u>)
					Total 4 marks

16	$\dfrac{26}{7}, \dfrac{13}{8}$		3	M1	both fractions expressed as improper fractions, no need for $\div$ or $\times$ may be equivalent to those given eg $\dfrac{52}{14}$ or $\dfrac{26}{16}$ etc. A student could invert $\dfrac{13}{8}$ and show multiplication - as shown in the 2nd M1, this mark is then implied.
	$\dfrac{26}{7} \times \dfrac{8}{13}$ oe or eg $\dfrac{208}{56} \div \dfrac{91}{56}$			M1	**or** for both fractions expressed as equivalent fractions with denominators that are a common multiple of 7 and 8 eg $\dfrac{208}{56} \div \dfrac{91}{56}$
	eg $\dfrac{26}{7} \times \dfrac{8}{13} = \dfrac{208}{91} = \dfrac{16}{7} = 2\dfrac{2}{7}$ **or** $\dfrac{26}{7} \times \dfrac{8}{13} = \dfrac{208}{91} = 2\dfrac{26}{91} = 2\dfrac{2}{7}$ **or** $\dfrac{\cancel{26}^{2}}{7} \times \dfrac{8}{\cancel{13}^{1}} = \dfrac{16}{7} = 2\dfrac{2}{7}$ **or** $\dfrac{26}{7} \div \dfrac{13}{8} = \dfrac{208}{56} \div \dfrac{91}{56} = \dfrac{208}{91} = \dfrac{16}{7} = 2\dfrac{2}{7}$ **or** correct working to $\dfrac{16}{7}$ **and** writing $2\dfrac{2}{7} = \dfrac{16}{7}$ *working required*	shown		A1	dep on M2 **NB: use of decimals scores no marks (unless used as a check)**
					Total 3 marks

Question	Working	Answer	Mark		Notes	
17	$90 \times 1000 \ (= 90\ 000)$ or $\dfrac{90}{60 \times 60} \ (= 0.025$ or $\dfrac{1}{40})$ or $\dfrac{1000}{60 \times 60} \ (= \dfrac{5}{18} = 0.277...)$ or sight of 1500		3	M1	For one of $\times 1000$ (eg sight of 90 000) or $(\div 60 \div 60)$ or $\div 3600$ oe ie correct conversion of distance units or of time units	M2 for $90 \div 3.6$ **or** $90 \times \dfrac{5}{18}$
	$\dfrac{90 \times 1000}{60 \times 60}$ oe eg$(1.5 \times 1000) \div 60$			M1	For a fully correct method with correct use of brackets eg $90\ 000 \div 60 \times 60$ is M1 only if not recovered	
	Working required	25		A1	dep on M1	
						Total 3 marks

Question	Working	Answer	Mark	Notes
18			3	B3 Fully correct (B2 for 2 or 3 'regions' correct, B1 for one 'region' correct)
				Total 3 marks

Question	Working	Answer	Mark	Notes
19	eg $5x - 1 = 3x + 7.4$ oe **or** eg $10x - 2 + 48$ **or** $6x + 14.8 + 48$ **or** $24 + 24 + 5x - 1 + 3x + 7.4$ oe		4	M1 a correct equation to find x **or** a correct expression for the perimeter in terms of x
	$x = 4.2$			A1 the correct value of x (implies previous mark)
	$2 \times 24 + 2(5 \times \text{"4.2"} - 1)$ oe **or** $2 \times 24 + 2(3 \times \text{"4.2"} + 7.4)$ oe **or** $2 \times 24 + (5 \times 4.2 - 1) + (3 \times 4.2 + 7.4)$ oe eg $24 + 24 + 20 + 20$ oe			M1dep on a correct method to find the perimeter – use of positive x from correct working (1st M1 awarded for an equation) **and** only if used the same measurement for AD and BC
	working required	88		A1 cao dep on either M1 or $x = 4.2$
				Total 4 marks

Question		Working	Answer	Mark	Notes
20	(a)		2.745	1	B1
	(b)		2.755	1	B1
	(c)	$(80 \times 60) \div 2^2$		2	M1 For two of 80, 60, 2 or 4 rather than 2^2 oe
		eg $(80 \times 60) \div 2^2 = 1200$ *working with rounded values seen required*	1200		A1 dep on M1 for answer coming from the use of the 3 rounded numbers – if 1200 seen then ignore any other working and comments
					Total 4 marks

Question	Working	Answer	Mark	Notes
21	$[k =] \dfrac{6+17}{2}$ **or** $[k =] 6+\dfrac{17-6}{2}$ **or** $[j =] \; 4+2(15-4)$ **or** $[j =] \; 15 + (15 - 4)$ **or** $\dfrac{4+j}{2}=15$		3	M1
	Correct answers score full marks (unless from obvious incorrect working) 1 correct answer will score M1A1 and both will score M1A1A1	26		A1
		11.5		A1 oe eg $\dfrac{23}{2}$ both answers the wrong way round scores M1A1 unless the correct answers are clearly labelled in working space
				Total 3 marks

Question	Working		Answer	Mark		Notes
22	eg $\quad 5x + 4y = -2$ $+\ 8x - 4y = 17.6$ $\quad\quad (13x = 15.6)$ eg $[\ x = \dfrac{4.4 + y}{2}\ ]$ oe $5\left(\dfrac{4.4 + y}{2}\right) + 4y = -2$ oe	eg $\quad 10x + 8y = -4$ $-\ 10x - 5y = 22$ $\quad\quad (13y = -26)$ eg $[\ y = 2x - 4.4\ ]$ oe $5x + 4(2x - 4.4) = -2$ oe		3	M1	multiplication of one or both equation(s) with correct operation selected (allow one arithmetic error) (if $+$ or $-$ is not shown then assume it is the operation that at least 2 of the 3 terms have been calculated for) **or** correct rearrangement of one equation with substitution into second
	eg $5 \times$ "1.2" $+ 4y = -2$ **or** $2 \times$ "1.2" $- y = 4.4$	eg $5x + 4 \times$ "-2" $= 4.4$ **or** $2x -$ "-2" $= 4.4$			M1	(dep on previous M1 but not on a correct first value) correct method to find second unknown – this could be a correct substitution into one of the equations given or calculated or starting again with the same style of working as for the first method mark
	Working required		$x = 1.2$ $y = -2$		A1	oe eg $x = \dfrac{6}{5}$ for both solutions dependent on first M1
						Total 3 marks

Question	Working		Answer	Mark	Notes
23	$\dfrac{2.9}{100} \times 5000 (=145)$ oe **or** 1.029×5000 (=5145) oe **or** $1.029^2 \times 5000$ (= 5294….) oe **or** 0.058×5000 (= 290) oe **or** 1.058×5000 (= 5290)			4	M1 **Bank H**
	5000×0.016 oe (= 80) oe **or** 5000×1.016 oe (= 5080) oe **or** 5000×0.032 (= 160) oe **or** 5000×1.032 (= 5160) oe	M2 for 5000×1.016^2 (= 5161.28)			M1 **Bank G**
	$(80 + 5000) \times 0.016$ (= 81.28) oe **or** 5080×1.016 (= 5161.28) oe				M1 **Bank G**
	Correct answer scores full marks (unless from obvious incorrect working)		16.28		A1
					Total 4 marks

Question		Working	Answer	Mark	Notes
24	(a)		1	1	B1
	(b)		$27a^6b^{12}$	2	B2 (B1 for 2 of 3 parts in a product)
	(c)		$7x^2y^2(2y^2+3x)$	2	B2 B1 for a correct factorisation with at least 2 factors outside (eg $7x$, x^2, xy, etc) eg $7x(2xy^4+3x^2y^2)$ eg $x^2y^2(14y^2+21x)$ or for the correct common factor with just one mistake inside the bracket eg $7x^2y^2(2y+3x)$ which is missing the squared on the y term
	(d)	$y = mx + 4$ where $m \neq 0$ oe (eg $y = 2x + 4$) **or** $y = -2x + c$ or $y + 2x = c$ oe **or** $-2x + 4$ or $f(x) = -2x + 4$ oe		2	M1
		Correct answer scores full marks (unless from obvious incorrect working)	$y = -2x + 4$		A1 oe eg $y + 2x = 4$
					Total 7 marks

Question	Working	Answer	Mark	Notes
25	$(54 - 24) \div 2 \ (=15)$ [may be marked on diagram]		5	M1
	$"15"^2 - (24 \div 2)^2 \ (= 81)$			M1 ft their "15" (if > 12)
	$[\text{height} =] \sqrt{"15"^2 - (24 \div 2)^2} \ (= 9)$			M1 ft their "15" (if > 12)
	$(24 \times "9") \div 2$ oe			M1 figures must be from correct working
	Correct answer scores full marks (unless from obvious incorrect working)	108		A1 allow 107.9 – 108.1
	ALTERNATIVES BELOW			**Total 5 marks**
25	$(54 - 24) \div 2 \ (=15)$ [may be marked on diagram]		5	M1
	or $x = \cos^{-1}\left(\dfrac{"12"}{"15"}\right) (= 36.86...)$ **or** $y = \sin^{-1}\left(\dfrac{24 \div 2}{"15"}\right) (= 53.13...)$ **or** $A = \cos^{-1}\left(\dfrac{15^2 + 15^2 - 24^2}{2 \times 15 \times 15}\right) (= 106.2...)$ **or** $B = \cos^{-1}\left(\dfrac{15^2 + 24^2 - 15^2}{2 \times 15 \times 24}\right) (= 36.8....)$			M1 ft their "15" (if > 12) [using Hero's formula S = 0.5 × 54 (= 27) and] $27 \times (27 - 24) \times (27 - "15") \times (27 - "15")$
	or "12"tan"36.86…" (= 9) (allow 8.9… for these) "12" ÷ tan"53.13…" (= 9) **or** "15" × sin "36.86…" (= 9) **or** "15" × cos "53.13…" (= 9)			M1 ft their "15" (if > 12) M2 for $0.5 \times 24 \times "15" \times \sin"36.86…"$ or $0.5 \times "15" \times "15" \times \sin(2 \times "53.13…")$ or $0.5 \times "15" \times "15" \times \sin("106.2...")$ **or** $\sqrt{"27"("27"-24)("27"-"15")("27"-"15")}$
	$(24 \times "9") \div 2$ oe			M1
	Correct answer scores full marks (unless from obvious incorrect working)	108		A1 allow 107.9 – 108.1
				Total 5 marks