GradeMax

Pearson Edexcel

Mark Scheme (Results)

January 2022

Pearson Edexcel International GCSE 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)
  - 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.

International GCSE Maths					
Apart from questions 7, 8, 17, 22, 25 and 26 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)		one triangle fully shaded	1	B1	or one quarter of the square shaded (ignoring diagonal lines).
(b)		$\frac{3}{4}$	1	B1	oe
(c)		$\frac{9}{10}$	1	B1	oe
					Total 3 marks

2	(i)		8	1	B1	
	(ii)		14	1	B1	
	(iii)		30	1	B1	
	(iv)		3 or 23	1	B1	or both 3 and 23
	(b)	108 – 3 (= 105) or $x \div 5$ where x is found value from first stage $(108-3)\div 5$ oe		2	M1	Allow 108 – 3 ÷ 5 or – 3 ÷ 5 with the correct order indicated eg with arrows
			21		A1	cao If no marks scored SCB1 for 107.4 or 543
						Total 6 marks

3	(a)(i)		unlikely	1	B1
	(ii)		evens	1	B1
	(b)		cross shown at 0	1	B1
					Total 3 marks

4	(a)		Qatar	1	B1	
	(b)		9	1	B1	allow −9
	(c)		−4	1	B1	
						Total 3 marks

5	(a)		Correct line	1	B1	line drawn at $y = -2$
	(b)		(−1, 2)	2	B2	for both coordinates correct If not B2, then B1 for one correct coordinate or (2, –1)
	(c)		(d =) 1	1	B1	accept (5, 1)
						Total 4 marks

6	(a)		Trapezium	1	B1	
	(b)		F	1	B1	
	(c)		4	1	B1	or “four”
	(d)		2	1	B1	or “two”
						Total 4 marks

7	$\frac{3}{8}\times\frac{5}{6}$ oe eg 0.375 ÷ 6 × 5 Allow 0.375 × 0.83…. oe	eg $\frac{3}{8}\times 48 = 18$ **and** eg $\frac{5}{6}\times 18 = 15$		3	M1	for showing intention to multiply the two given fractions **or** using a number of members that is a multiple of 48 to work out the number of right-handed children.
	eg $\frac{3}{8}\times\frac{5}{6}=\frac{15}{48}$ **or** $\frac{\cancel{3}^{1}}{8}\times\frac{5}{\cancel{6}^{2}}$ 0.375 × 0.83…. = 0.31…..	$\frac{\text{"15"}}{\text{"48"}}$			M1	For an attempt to multiply fractions **or** Dividing their 15 by their 48
			$\frac{5}{16}$		A1	dep on M1
						Total 3 marks

8	for at least two of: 8, 200, 0.5		3	M1
	$\frac{1600}{0.5}$ or 8×400 or 16×200			M1
		3200		A1 dep M1 (allow 3000)
				Total 3 marks

9	(a)(i)		58	1	B1
	(ii)	Vertically <u>opposite angle(s)</u> are equal or <u>Vertically opposite</u>		1	B1 reason given dep on a correct angle in (i)
	(b)	*DBA* = 180 − 132 (= 48) or for 132 − 58		2	M1 48 could be shown clearly on diagram
			74		A1
					Total 4 marks

10		BB, BH, BA RB, RH, RA SB, SH, SA	2	B2 for all 9 combinations with no extras or repeats. (B1 for at least 5 correct combinations (ignoring extras and repeats))
				Total 2 marks

11	(a)			1	B1	correct diagram drawn
	(b)		12, 15	1	B1	
	(c)		30	1	B1	
	(d)	eg Pattern number 25 needs 75 counters (or $3 \times 25 = 75$) **or** 70 counters can make only up to Pattern number 23 $\frac{70}{25} = 2.8$ **or** $\frac{70}{3} = 23.(3\ldots)$ 70 is 5 short **or** sight of e.g. $3n$ **or** …69, 72, … 70 is not a multiple of 3	No and reason	1	B1	'No' with reason given (reason can be in words or shown as a calculation)
						Total 4 marks

12	two of: 60 ÷ 8 (= 7.5) or 7 20 ÷ 8 (= 2.5) or 2 24 ÷ 8 (= 3)		5	M1	at least two divisions to find number of cartons for *l* or *w* or *h*. Could be written on sides of box
	"7" × "2" × "3" (= 42) **or** "7" × 8 (=56) and "2" × 8 (= 16) and "3" × 8(= 24)			M1	correct method to find the number of cartons that fit **or** finding the dimensions of the occupied space
	60 × 24 × 20 (= 28 800) **or** 8 × 8 × 8 (= 512) or (7 × 8) ×(2 × 8) × (3 × 8) (= 21 504) oe eg 56 × 16 × 24 (= 21 504)			M1	method to work out volume of either **B** or **C**
	"28 800 – "42" × "512" **or** "28 800" – "21504"			M1	complete method to find volume of packing material.
		7296		A1	allow 7300 from correct working
					If no marks scored SC B3 for 60 × 24 × 20 – "56" × 8 × 8 × 8 (= 128)
12 **Alt** **Finding space left**	two of 7 × 8 (= 56), 3 × 8 (= 24), 2 × 8 (= 16) **or** two of 60 – 56 (= 4), 20 – 16 (= 4), 24 – 24 (= 0)		5	M1	two lengths of filled space found **or** two lengths of empty space found.
	"4" × 24 × 20 (= 1920) **or** "4" × 24 × 60 (= 5760) **or** "4" × "4" × 24 (= 384) **or** **or** "4" × 24 × "16"(= 1536) **or** "4" × 24 × "56"(= 5376)			M1	at least one correct product seen
				M1	at least two correct products seen
	eg "1920 + "5760" – "384" **or** "1536" + "384" + "5376" **or** "5760" + "1536" **or** "1920" + "5376" oe			M1	complete method to find volume of packing material.
		7296		A1	
					Total 5 marks

13	(a)(i)		25	1	B1	allow 24.5 to 25.5
	(ii)		18	1	B1	allow 17.5 to 18.5
	(b)	528 ÷ 1.2 (=£440)		3	M1	
		allow leeway on reading graph eg (£440 =) (“440” ÷ 20) × 37 (= 814) (£440 =) (“440” ÷ 11) × 20 (= 800) (£440 =) (“440” ÷ 10) × “18” (= 792) (£440 =) (“440” ÷ 1) × 2 (= 880) (£440 =) (“440” ÷ “25”) × 46 (= 809.6) There are several acceptable calculations			M1	value read from graph and used to scale to £440 (ft their 18 from (ii) or their 25 from (i))
			800		A1	accept in the range 770 – 880 unless working incorrect
						Total 5 marks

14	3 hours 15 mins = 3.25 (hours) or $3\frac{1}{4}$ (hours) or $3\frac{15}{60}$ (hours) or 195 (mins)		3	B1	For converting 3 hrs 15 minutes into hours or minutes
	18.2 ÷ “$3\frac{1}{4}$” oe **or** 18.2 ÷ “195” × 60			M1	For use of D ÷ T allow 18.2 ÷ 3.15 or their incorrect time conversion (must be clear that this is their time conversion) If B mark awarded then the value that gained that mark must be used here to gain this method mark.
		5.6		A1	oe
					Total 3 marks

15	one of: Flour - $\frac{150\times10}{1500}\times1.30(=1.30)$ Choc spread - $\frac{10\times250}{500}\times2.60(=13)$ Eggs - $\frac{3\times10}{6}\times1.10(=5.50)$	one of Flour - $\frac{150}{1500}\times1.30(=0.13)$ Choc spread $\frac{250}{500}\times2.60(=1.30)$ Eggs $\frac{3}{6}\times1.10(=0.55)$		5	M1	No need for labels
	at least two of: Flour - $\frac{150\times10}{1500}\times1.30(=1.30)$ Choc spread - $\frac{10\times250}{500}\times2.60(=13)$ Eggs - $\frac{3\times10}{6}\times1.10(=5.50)$	at least two of Flour - $\frac{150}{1500}\times1.30(=0.13)$ Choc spread $\frac{250}{500}\times2.60(=1.30)$ Eggs $\frac{3}{6}\times1.10(=0.55)$			M1	No need for labels
	120 × 0.4 (= 48) oe	12 × 0.4 (= 4.80)			M1	indep
	(profit =) "48" – "1.30" – "13" – "5.50" **or "**48" – "19.80"	(profit =) 10("4.80"–"0.13"–"1.30 –"0.55") or 10("4.80" – 1.98)			M1	complete method to calculate profit by subtracting 3 amounts, all of which must be correct or from correct working
			28.2(0)		A1	
						Total 5 marks

16 (a)	$2x^2-3x+14x+7 \quad (-5)$		3	M1	for at least 3 correct terms for the multiplying of the 2 brackets
				M1	2 of the 3 correct terms in an expression in the form ax^2+bx+c where *a*, *b* and *c* are integers
		$2x^2+11x+2$		A1	can be any order
(b)	$2y-4y+8-y^2$		2	M1	for 3 correct terms **or** for 4 correct terms ignoring signs **or** $\ldots-2y-y^2$ **or** $8-2y-\ldots$
		$8-2y-y^2$		A1	Any order but simplified.
(c)		$5b^3c(3b^2-7c^8)$	2	B2	fully correct **or** B1 for a correct partial factorisation with at least two terms outside the bracket eg $5b^3(3b^2c-7c^9)$ or $5c\ (3b^5-7b^3c^8)$ etc **or** the fully correct factor outside the bracket with a two term expression in terms of *b* and *c* inside the bracket eg $5b^3c(15b^2-c^8)$
					Total 7 marks

17	eg $\frac{27}{4}$ **and** $\frac{18}{7}$		3	M1	Both fractions expressed as improper fractions.
	$\frac{27}{4}\times\frac{7}{18}$ oe **or** eg $\frac{189}{28}\div\frac{72}{28}$			M1	for both fractions expressed as equivalent fractions with denominators that are a common multiple of 4 and 7 (seeing this stage gains M2)
	eg $\frac{27}{4}\times\frac{7}{18} = \frac{189}{72} = \frac{21}{8} = 2\frac{5}{8}$ **or** $\frac{27}{4}\times\frac{7}{18} = \frac{189}{72} = 2\frac{45}{72} = 2\frac{5}{8}$ **or** $\frac{27^{3}}{4}\times\frac{7}{18^{2}} = \frac{21}{8} = 2\frac{5}{8}$ **or** $\frac{189}{28}\div\frac{72}{28} = \frac{189}{72} = 2\frac{45}{72} = 2\frac{5}{8}$ oe if the student clearly shows $2\frac{5}{8} = \frac{21}{8}$ then they only need to complete the LHS to $\frac{21}{8}$ (often done in 1st line of working)	shown		A1	dep M2 conclusion to $2\frac{5}{8}$ from correct working – either sight of the result of the multiplication e.g. $\frac{189}{72}$ must be seen then cancelled or correct cancelling prior to the multiplication with $\frac{21}{8}$ seen. NB entire solution using decimals scores no marks.
					Total 3 marks

18	(a)	$\frac{12}{4}(=3)$ or $\frac{4}{12}(=0.\dot{3})$ or $\frac{BC}{4}=\frac{16.5}{12}$ **or** $BC \div 16.5 = 4 \div 12$ **or** $(BC =)16.5 \div \frac{12}{4}$		2	M1	correct scale factor (given as 3 or a fraction or a ratio) **or** correct equation using *BC* **or** a correct expression for *BC*
			5.5		A1	
	(b)		$3x$	1	B1	allow $3 \times x$ or $x \times 3$ ft their "3" in (a)
						Total 3 marks

19	(a)		17.75	1	B1	oe
	(b)		18.25	1	B1	oe $18.24\dot{9}$ (allow 18.2499…)
						SC B1 for 17.5 in (a) **and** 18.5 (or $18.4\dot{9}$)in (b)
						Total 2 marks

20	(a)	700 ÷ 200 (= 3.5)		3	M1	or 3.5 shown on diagram – within bounds of overlay
					M1	for line drawn at correct angle ± 2° within bounds of overlay
			C indicated in correct position		A1	for *C* drawn within bounds of overlay, inclusive of lines
	(b)		(1 :) 20 000	1	B1	
						Total 4 marks

21	28 ÷ 0.35 (= 80) oe eg (28 ÷ 7) × 20 (= 80)		5	M1 indep for calculating total number of sweets
	$1-(0.2+0.35)$ (= 0.45) oe **or** (0.2 + 0.35) × "80" (= 44) or 28 + "16" (= 44)			M1 or for a correct equation for missing values eg $x + 2x + 0.2 + 0.35 = 1$ oe (can be implied by 2 probabilities that total 0.45 in table if not contradicted in working space)
	"0.45" ÷ 3 (= 0.15) oe **or** "0.45" × "80" (= 36) **or** "80" – "44" (= 36)			M1 (or 0.15 or 0.3 seen in table – either order)
	"80" × "0.15" **or** "80" × "0.3" (= 24) **or** "36" ÷ 3 or "36" ÷ $\frac{3}{2}$ (= 24)			M1 A correct calculation for the number of white sweets or the number of pink sweets
		12		A1
21 alt	$1-(0.2+0.35)$ (= 0.45) or 100(%) – 20(%) – 35(%) = 45(%)		5	M1 or for a correct equation for missing values eg $x + 2x + 0.2 + 0.35 = 1$ oe
	"0.45" ÷ 3 (= 0.15) 45(%) ÷ 3 (= 15(%))			M1 (or 0.15 or 0.3 seen in table – either order)
	$\frac{n}{28}=\frac{0.15}{0.35}$ **or** $\left(\frac{n}{0.15}=\right)\frac{28}{0.35}$ oe or $\frac{n}{28}=\frac{0.3}{0.35}$ **or** $\left(\frac{n}{0.3}=\right)\frac{28}{0.35}$ **or** 35% = 28 so 5% = 4			M1 for using proportion with an expression for n white sweets or finding 5% oe to enable calculation to 15%
	$(n=)\ 28\times\frac{0.15}{0.35}$ **or** $(n=)\ 0.15\times\frac{28}{0.35}$ or 15% = 3 × 4 or $28\times\frac{0.3}{0.35}$ **or** $0.3\times\frac{28}{0.35}$ **or** 30% = 6 × 4 (= 24)			M1 a calculation using proportion that would lead to finding their n or $2n$
		12		A1
				Total 5 marks

<table>
<tr><td>22</td><td>$2^2 \times 7$ or $2 \times 3 \times 7$ or $3^2 \times 7$ oe

or showing at least 5 correct multiples across at least 2 lists (excluding 28, 42, 63)
(28) 56, 84, 112, 140, 168, 196, 224, 252
(42) 84, 126, 168, 210, 252
(63) 126, 189, 252</td><td></td><td>3</td><td>M1</td><td>accept prime factors seen in factor tree or correct position in Venn diagram for at least one of the numbers given with no other numbers for that number incorrectly placed</td></tr>
<tr><td></td><td>$2^2 \times 7$ and $2 \times 3 \times 7$ and $3^2 \times 7$
or showing at least 9 correct multiples across all 3 lists (excluding 28, 42, 63)
(28) 56, 84, 112, 140, 168, 196, 224, 252
(42) 84, 126, 168, 210, 252
(63) 126, 189, 252</td><td></td><td></td><td>M1</td><td>accept prime factors seen in factor tree or correct position in Venn diagram for all 3 of the numbers given with no other numbers incorrectly placed</td></tr>
<tr><td></td><td></td><td>252</td><td></td><td>A1</td><td>or $2^2 \times 3^2 \times 7$ Dep on M1</td></tr>
<tr><td>22 alt</td><td>
<table>
<tr><td>7</td><td>28</td><td>42</td><td>63</td></tr>
<tr><td>2</td><td>4</td><td>6</td><td>9</td></tr>
<tr><td>3</td><td>2</td><td>3</td><td>9</td></tr>
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<tr><td>(1)</td><td>1</td><td>1</td><td>1</td></tr>
</table>
</td><td></td><td>3</td><td>M1

M1</td><td>For one correct row in table
eg division by 7 gives 4, 6, 9

Fully correct table – need only go as far as top table – we want to see prime factors along the side or prime factors along the sides and bottom (condone 1’s)</td></tr>
<tr><td></td><td></td><td>252</td><td></td><td>A1</td><td>or $2^2 \times 3^2 \times 7$ Dep on M1</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>Total 3 marks</td></tr>
</table>

23	(a)	(231 776 – 228 314) ÷ 228 314 **or** 3462 ÷ 228 314 (= 0.01516…) **or** 231 776 ÷ 228 314 (= 1.01516…)		2	M1	
			1.5		A1	for 1.5 or better (1.516…) (be careful: 3462 ÷ 231 776 × 100 = 1.49….)
	(b)	231 776 ÷ 1.077 oe		3	M2	If not M2 then M1 for 1.077 or 107.7 or 1 + 0.077(=1.077) seen but not 1 + 7.7%
			215 000		A1	for 215 000 or better (215 205.19…) (if no marks awarded SCB1 for 212000 or better (211990.71…))
						Total 5 marks

24	$0\times13+1\times17+2\times8+3x+4\times11$ or (0 +) 17 + 16 + 3x + 44 (= 77 + 3x)		4	M1	at least **3** correct products with intention to add. eg award for 77 seen as this is sum of 3 products
	$(13+17+8+x+11)$ oe eg 49 + x **or** $98+2x$			M1	Sum for total frequency or (frequency × 2)
	$\frac{"77+3x"}{"49+x"}=2$ oe e.g. $"77+3x"=2("49+x")$			M1	for use of mean in valid equation (ft their values for sum of products and their total frequency if M2 awarded previously)
		21		A1	
					Total 4 marks

25	eg $6x + 10y = 6.2$ _ $\underline{6x + 3y = 3.75}$ $7y = 2.45$ eg $30x + 15y = 18.75$_ $\underline{9x + 15y = 9.3}$ $21x = 9.45$ **or** eg $6\left(\frac{3.1-5y}{3}\right)+3y=3.75$		3	M1	for correct method to eliminate one variable – multiplying one or both equations so the coefficient of x or y is the same in both (condone one arithmetic error), with the intention to subtract all 3 terms to eliminate one variable (intention to subtract is clearly showing a minus sign or subtracting 2 or 3 out of 3 terms) **or** isolating x or y in one equation and substituting into the other
	eg. $6 \times$ "0.45" $+ 3y = 3.75$ or $3 \times$ "0.45" $+ 5y = 3.1$ **or** $3x + 5 \times$ "0.35" $= 3.1$ or $6x + 3 \times$ "0.35" $= 3.75$			M1	dep. Substitute found value into one equation **or** correct method to eliminate second unknown.
		$x = 0.45$ oe $y = 0.35$ oe		A1	dep M1
					Total 3 marks

26	$\frac{360}{10}$ (= 36) ext angle **or** $\frac{(10 - 2)\times 180}{10}$ **(=** 144)		4	M1	method to find interior or exterior angle. (angles may be seen on diagram)
	$x =$ "144" – 90 (= 54) or $x = \frac{"540" - 3\times "144"}{2}$ (=54) or $x = 90 - "36"(=54)$ 54 on the diagram is insufficient – must see working			M1	method to find x (must show it is intended to be x) eg use of int angle – 90º use of ext angle + x = 90º use of pentagon *GHIJA* All figures in " " must come from correct working
	$BAD = CDA = GDE = DGF = \frac{360 - 2\times "144"}{2} (= 36)$			M1	A correct method to find an angle of 36º within the shape (not exterior angle) or 36º shown in correct place in diagram
	There are other correct methods. Please check for correct working.	x = 54 y = 54		A1	dep on M3 to find each of x and y and the correct value of 54 for both from correct working
					Total 4 marks
ALT	*ADG* = "144" – 2 × "36" (= 72)			M1	
	JA is parallel to *GD*			M1	
	DGA = *DAG* (*y*) [isosceles triangle]			M1	
	$x = DGA = y$	shown		A1	
	There are other correct methods. Please check for correct working.				**Total 4 marks**

GradeMax

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