Pearson
Edexcel

Mark Scheme (Results)

November 2021

Pearson Edexcel International GCSE
Mathematics A (4MA1)
Paper 1F

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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.

Apart from Questions 18 & 19 (where the mark scheme states otherwise), the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.

Question	Working	Answer	Mark	Notes
1 (a)		$\frac{5}{25}$ $\frac{8}{40}$	2	B1 B1 B2 for 2 correct only. B1 for 1 correct only − 1 mark for each incorrect tick if more than 2 ticks
(b)		Octagon	1	B1 Accept misspellings
(c)		6 'sectors' shaded oe	1	B1 Shading equivalent to 6 sectors
(d)	$\frac{56 \times 3}{4} (= \frac{168}{4})$ or $\frac{56}{4} \times 3 (= 14 \times 3)$		2	M1
		42		A1
				Total 6 marks

2 (a)		Sevilla	1	B1 Accept misspellings
(b)		66 000	1	B1
(c)		600	1	B1 Accept in words ie 6 hundred(s), six hundred(s)
(d)		2 : 3	1	B1 Allow 1:1.5
(e)	$\frac{72}{100}$		2	M1 or $\frac{36}{50}$
		$\frac{18}{25}$		A1
				Total 6 marks

Question		Working	Answer	Mark	Notes	
3	(a)		Wednesday	1	B1	Accept Wed
	(b)		55	1	B1	
	(c)		Correct Bars	1	B1	Susan 1.5 cm, Philip 4 cm (and having the correct key)
	(d)	$\dfrac{25}{100}\times180$ or 0.25×180 or $180\div4$ oe		2	M1	
			45		A1	
						Total 5 marks

4	(a)		Chicago	1	B1	Accept misspellings
	(b)		16	1	B1	accept –16
	(c)	$-1+2\times3$		2	M1	for clearly adding 3 lots of 2 or the sequence – 1, 1, 3, 5
			5		A1	
						Total 4 marks

5	(a)	800 × 1.75				2	M1	
				1400			A1	
	(b)	60 – (98 ÷1.75) oe	$60\times1.75-98$ (= 7) **and** "7"÷1.75		2	M1	accept (98 ÷ 1.75) – 60
				4		A1	accept – 4
								Total 4 marks

6	(a)		(1, 4)	1	B1	
	(b)	180 + "68" or 360 – "112"		2	M1	accept 66° to 70° or 110° to 114° seen or used.
			248		A1	accept 246° to 250°
	(c)		5.4	1	B1	accept 5.2 cm to 5.6 cm ignore answer line if 1dp answer given on diagram or in space.
	(d)		27	1	B1ft	ft "*their* c" × 5 if B1 awarded in part (c)
	(e)		2 hr 20 min	2	B1 B1	for 2 hours for 20 minutes if no marks awarded, SC B1 for eg 1hr 80min or 140min
						Total 7 marks

7	(a)		4	1	B1	
	(b)		24*ab*	1	B1	accept *ab*24 etc. but no × signs
	(c)	8*w* + *w* or – 4*y* (+) – 3*y*		2	M1	M1 for 9*w* or – 7*y*
			9*w* – 7*y*		A1	
	(d)		4(4 + 3*t*) oe	2	B2	if not B2 then B1 for 2(8 + 6*t*)
						Total 6 marks

8	(a)	2 + 4 + 6 + 5			2	M1	
			17			A1	
	(b)	8 + 5 + 6			2	M1	
			19			A1	
	(c)	3 + 4 + 2 + 5			2	M1	
			14			A1	If no marks awarded, SC B1 for 6 + 4 + 2 + 2 + 1 (=15)
							Total 6 marks

9		$(0.5 \times 4 \times 6) - (0.5 \times 2 \times 3)$ or $2 \times 3 + 0.5 \times 2 \times 3$ or $(0.5 \times 4 \times 6) - (0.25 \times$ "$0.5 \times 4 \times 6$") oe			3	M2	if not M2 then M1 for either $0.5 \times 4 \times 6$ (= 12) or $0.5 \times 2 \times 3$ (= 3) if not M2 then M1 for either area of 1 large parallelogram (2×3) or 1 triangle ($0.5 \times 3 \times 2$) Allow M1 for consistent use of incorrect side lengths, eg $0.5 \times 5 \times 7$
			9			A1	
							Total 3 marks

10	(a)	eg $\dfrac{3}{10} \times \dfrac{4}{1} \left(= \dfrac{12}{10}\right)$ or $\dfrac{6}{20} \div \dfrac{5}{20}$ or $\dfrac{12}{40} \div \dfrac{10}{40}$		2	M1	Inverting $\frac{1}{4}$ and changing to multiply or writing both fractions with the same denominator.
		eg $\dfrac{3}{10} \times \dfrac{4}{1} = \dfrac{12}{10} = \dfrac{6}{5}$ or $\dfrac{6}{20} \div \dfrac{5}{20} = \dfrac{6}{5}$ or eg $\dfrac{3}{\cancel{10}^{5}} \times \dfrac{\cancel{4}^{2}}{1} = \dfrac{6}{5}$	shown		A1	Conclusion to $\dfrac{6}{5}$ from correct working – either sight of the result of the multiplication eg $\dfrac{12}{10}$ must be seen or correct cancelling prior to multiplication. NB use of decimals scores no marks.
	(b)	eg $\dfrac{10}{12} - \dfrac{9}{12}$ or $\dfrac{20}{24} - \dfrac{18}{24}$ oe **or** eg $\dfrac{10-9}{12}$		2	M1	for correct fractions with a common denominator of 12 or a multiple of 12.
		eg $\dfrac{10}{12} - \dfrac{9}{12} = \dfrac{1}{12}$ or $\dfrac{20}{24} - \dfrac{18}{24} = \dfrac{2}{24} = \dfrac{1}{12}$ oe	clearly shown		A1	dep on M1 for a correct answer from fully correct working.
						Total 4 marks

11	(a)	$\dfrac{6.04(0344...)}{1.11(3552873...)}$		2	M1	Either numerator or denominator correct (at least 3 digits needed) or for an answer of 5.42 to 5.4243 rounded or truncated.
			5.4243(89042…)		A1	accept 5.4243 or 5.4244 or better.
	(b)		5.4	1	B1ft	ft their answer to (a), must have at least 3 sig figs in part (a)
						Total 3 marks

12	(a)		Enlargement	3	B1	for enlargement, enlarge, etc so long as no mention of rotation, reflection or translation, flip, move etc.
			scale factor 3		B1	SF 3, triple, three times etc. with no mention of a vector, line, angle of rotation.
			centre (0, 0)		B1	Accept centre O or the origin
	(b)	line $x = 5$ drawn **or** shape in correct orientation, not necessarily in correct position.		2	M1	Can be implied by correct answer.
			Shape with vertices at (7, 2), (7, 4), (8, 3), (9, 3), (9, 2)		A1	
						Total 5 marks

Q		Working	Answer	Mark	Notes
13	(a)		e^6	1	B1 cao
	(b)	$x^2 - 3x + x - 3$		2	M1 for any 3 correct terms **or** for 4 out of 4 correct terms ignoring signs **or** for $x^2 - 2x \dots$ **or** for $\dots -2x - 3$
		Correct answer scores full marks (unless from obvious incorrect working)	$x^2 - 2x - 3$		A1
					Total 3 marks

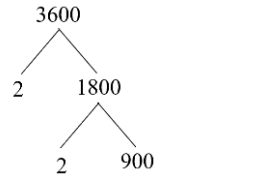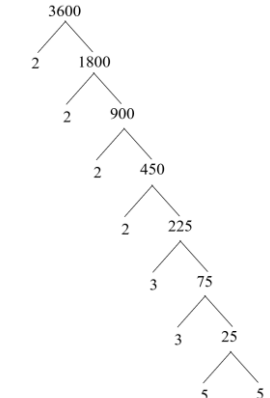| **14**		$30^2 + h^2 = 52^2$ oe or $900 + h^2 = 2704$ $(h^2 =) 52^2 - 30^2 (= 1804)$ or $(h^2 =) 2704 - 900 (= 1804)$		3	M1 for applying Pythagoras theorem correctly
		$(h =) \sqrt{52^2 - 30^2} (= \sqrt{1804}) (= 42.47352..)$ or $(h =) \sqrt{2704 - 900} (= \sqrt{1804}) (= 42.47352..)$			M1 for square rooting
		Correct answer scores full marks (unless from obvious incorrect working)	42.5		A1 awrt 42.5 or allow $2\sqrt{451}$
					Total 3 marks

15	(a)	$54 \div 9 \times 4$ oe or $\frac{4}{9} \times 54$ oe		2	M1 Allow $0.44(44\ldots) \times 54$ or $\frac{24}{54}$
		Correct answer scores full marks (unless from obvious incorrect working	24		A1
	(b)	$\frac{"24"+n}{54+n} = \frac{1}{2}$ or $\frac{30}{60}$ or $54 - "24"\ (=30)$ and $"30" - "24"$ or $2 \times "30" - 54$		2	M1 ft if "24" < 27 or $\frac{6}{60}$
		Correct answer scores full marks (unless from obvious incorrect working)	6		A1
					Total 4 marks

16		$2 \times 0.75\ (= 1.5)$ oe or $2 \times 0.75 \times 2\ (= 3)$ oe		5	M1 for area of rectangle
		$\pi \times (0.5 \div 2)^2\ (= 0.1963)$ or $\frac{1}{2} \times \pi \times (0.5 \div 2)^2\ (= 0.09817)$			M1 for area of circle **or** area of semicircle
		"1.5" – "0.09817" $(= 1.4018\ldots)$ or "3" – "0.1963" $(= 2.8036\ldots)$			M1
		"1.4018" $\times 2 \times 250 \div 4\ (= 175.228\ldots)$ or "2.8036" $\times 250 \div 4\ (= 175.228\ldots)$ or "1.4018" $\times 250 \div 4\ (= 87.6\ldots)$			M1or for 87 – 88
		Correct answer scores full marks (unless from obvious incorrect working)	175		A1 Allow 175 – 176
					Total 5 marks

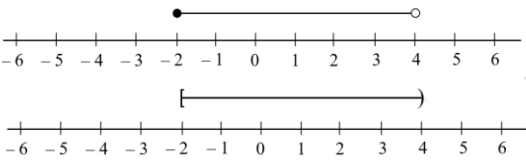| 17	$LW = 180$ oe $(9LW = 1620)$ or $4L \times (L + W) = 1620$ oe or $5W \times (L + W) = 1620$ oe or $4L = 5W$ oe $(L = \frac{5}{4}W$ oe or $W = \frac{4}{5}L$ oe$)$		5	M2 for any two correct equations from (i) $LW = 180$ oe $(9LW = 1620)$ (ii) $4L \times (L + W) = 1620$ oe (iii) $5W \times (L + W) = 1620$ oe (iv) $4L = 5W$ oe $(L = \frac{5}{4}W$ oe or $W = \frac{4}{5}L$ oe$)$ (M1 for one correct equation **or** $1620 \div 9 \ (= 180)$)
	$L \times "\frac{4}{5}L" = "180"$ oe or $W \times "\frac{5}{4}W" = "180"$ oe or $4L \times \left(L + \frac{4}{5}L\right) = 1620$ oe or $5W \times \left(\frac{5}{4}W + W\right) = 1620$ oe or $9L\left("\frac{4}{5}L"\right) = 1620$ oe or $9\left("\frac{5}{4}W"\right)W = 1620$ oe or $4\left("\frac{180}{W}"\right)^2 + 4("180") = 1620$ oe or $5("180") + 5\left("\frac{180}{L}"\right)^2 = 1620$ oe			M1 for a correct equation in terms of one variable only
	Correct answer scores full marks (unless from obvious incorrect working)	$L = 15$ and $W = 12$		A2 for both correct (A1 for one correct) Award 4 marks for $L = 12$ and $W = 15$ dep on M3
				Total 5 marks

Elimination

18	$5a+3p=1.96$ and $3a+2p=1.22$ oe **or** $5a+3p=196$ and $3a+2p=122$ oe		M2 for an arithmetical method (must see the calculation to find 0.22 or 0.26 or 0.74 and 0.48 oe) E.g. 6.1(0) – 5.88 (= 0.22) oe **or** 3.92 – 3.66 (= 0.26) oe **or** 1.96 – 1.22 (= 0.74) oe and 1.22 – "0.74" (= 0.48)		5	M1 for setting up both equations oe Allow the use of apples and pears oe throughout, e.g. 5 apples + 3 pears = 1.96 and 3 apples + 2 pears = 1.22
	E.g. $15a+9p=5.88$ $15a+10p=6.1\ 0$ Subtracting $(-p=-0.22)$ E.g. $5a+3p=1.96$ and $6a+4p=2.44$ oe Subtracting	E.g. $10a+6p=3.92$ $9a+6p=3.66$ Subtracting $(a=0.26)$				M1 for a correct method to eliminate a or p: coefficients of a or p the same **and** correct operation to eliminate selected variable (condone any one arithmetic error) **or** to find the cost of 1 apple and 1 pear
	E.g. $5a+3("0.22")=1.96$ or $3a+2("0.22")=1.22$ E.g $a+p=0.48$ oe	E.g. $5("0.26")+3p=196$ or $3("0.26")+2p=1.22$	E.g. 3×0.22 (= 0.66) 1.96 – "0.66" (= 1.3(0)) "1.3(0)" ÷ 5 (= 0.26) **or** 5×0.26 (= 1.3(0)) 1.96 – "1.3(0)" (= 0.66) "0.66" ÷ 3 (= 0.22) **or** Apple and pear is 0.48 oe			M1 (dep on M2) for substituting their value found (must be > 0) of one variable into one of the equations **or** for repeating above method to find second variable **or** for third working column allow $k(a + p) = k(0.48)$ **or** for a complete arithmetical method to find the other value
	$10\times"0.26"+10\times"0.22"$ or $(a+p=)\,0.48\times10$ oe or $k(a+p)=k(0.48)\times\dfrac{10}{k}$					M1 (dep on M3) can be implied by $10(a + p)$ provided a and p must be > 0
	Working required			4.8(0)		A1 dep M2
						Total 5 marks

Substitution				
18	$5a+3p=1.96$ and $3a+2p=1.22$ oe **or** $5a+3p=196$ and $3a+2p=122$ oe		5	M1 for setting up both equations oe Allow the use of apples and pears oe throughout, e.g. 5 apples + 3 pears = 1.96 and 3 apples + 2 pears = 1.22
	E.g. $3\left(\dfrac{1.96-3p}{5}\right)+2p=1.22$ or $5\left(\dfrac{1.22-2p}{3}\right)+3p=1.96$ or $3a+2\left(\dfrac{1.96-5a}{3}\right)=1.22$ or $5a+3\left(\dfrac{1.22-3a}{2}\right)=1.96$ or $p=0.22$ or $a=0.26$			M1 for correctly writing a or p in terms of the other variable **and** correctly substituting (condone any one arithmetic error)
	E.g. $(a=)\dfrac{1.96-3(0.22)}{5}$ or $(a=)\dfrac{1.22-2(0.22)}{3}$ or $(p=)\dfrac{1.96-5(0.26)}{3}$ or $(p=)\dfrac{1.22-3(0.26)}{2}$			M1 (dep on M2) for substituting their value found (must be > 0) of one variable into one of the equations **or** for repeating above method to find second variable
	$10\times"0.26"+10\times"0.22"$			M1 (dep on M3) can be implied by $10(a+p)$ provided a and p must be > 0
	Working required	4.8(0)		A1 dep M2
				Total 5 marks

19	E.g. $2 \times 2 \times 900$ or $2^2 \times 900$ or $2 \times 3 \times 600$ or $2 \times 5 \times 360$ or $3 \times 3 \times 400$ or $3^2 \times 400$ or $3 \times 5 \times 240$ or $5 \times 5 \times 144$ or $5^2 \times 144$ E.g. <table><tr><td>2</td><td>3600</td></tr><tr><td>2</td><td>1800</td></tr><tr><td></td><td>900</td></tr></table> E.g. 		3	M1 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, 900 (see LHS for examples of the amount of work needed for the award of this mark, allow no more than one mistake ft in factor tree or table (eg one mistake with 2 prime factors ft: $3600 = 1800 \times 20 = 2 \times 900 \times 4 \times 5$ or $360 = 2 \times 2 \times 90$)
	E.g. $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$ E.g. <table><tr><td>2</td><td>3600</td></tr><tr><td>2</td><td>1800</td></tr><tr><td>2</td><td>900</td></tr><tr><td>2</td><td>450</td></tr><tr><td>3</td><td>225</td></tr><tr><td>3</td><td>75</td></tr><tr><td>5</td><td>25</td></tr><tr><td>5</td><td>5</td></tr><tr><td></td><td>(1)</td></tr></table> E.g. 			M1 for 2, 2, 2, 2, 3, 3, 5, 5 or 2^4, 3^2, 5^2 or $2^4 + 3^2 + 5^2$ (ignore 1s) (may be a fully correct factor tree or ladder)
	Working required	$2^4 \times 3^2 \times 5^2$		A1 dep on M2 can be any order (allow $2^4 . 3^2 . 5^2$) (SCB1 for $3.6 \times 2^3 \times 5^3$)
				Total 3 marks

20	$0.22x = 5.48$ oe or $(1\% =) 5.48 \div 22 (= 0.24909…)$ or $100 \div 22 (= 4.54…)$			M1
	$(x =) 5.48 \div 0.22$ oe or $(100\% =) 5.48 \div 22 \times 100$ or "0.24909…" $\times 100$ or $5.48 \times$ "4.54…"			M1
	Correct answer scores full marks (unless from obvious incorrect working)	24.9		A1 awrt 24.9
				Total 3 marks

20 **ALT** **1**	$0.22x = 5\ 480\ 000$ oe or $(1\% =) 5\ 480\ 000 \div 22 (= 249\ 090.9091…)$ or $100 \div 22 (= 4.54…)$			M1
	$5\ 480\ 000 \div$ "0.22" oe or $(100\% =) 5\ 480\ 000 \div 22 \times 100$ or "249 090.9091…"$\times 100$ or $5\ 480\ 000 \times$ "4.54…"			M1
	Correct answer scores full marks (unless from obvious incorrect working)	24 900 000		A1 awrt 24 900 000
				Total 3 marks

21	(i)	$-7+3 \leq 2x < 5+3$ oe or $\dfrac{-7}{2} \leq x - \dfrac{3}{2} < \dfrac{5}{2}$ oe or $-7+3 \leq 2x$ oe **and** $2x < 5+3$ oe or $(x =) -2$ or $(x =) 4$		3	M1 or one side of the inequality correct, i.e.. $x \geq -2$ oe or $x < 4$ Condone = rather than $\leq$ or $<$ or any other sign for the M marks.
		$\dfrac{-7+3}{2} \leq x < \dfrac{5+3}{2}$ or $\dfrac{-7}{2} + \dfrac{3}{2} \leq x < \dfrac{5}{2} + \dfrac{3}{2}$ or $\dfrac{-7+3}{2} \leq x$ oe **and** $x < \dfrac{5+3}{2}$ or $(x =) -2$ and $(x =) 4$			M1
		Correct answer scores full marks (unless from obvious incorrect working)	$-2 \leq x < 4$		A1 allow $x \geq -2$ and $x < 4$ Allow $[-2, 4)$
	(ii)			2	M1 ft for drawing a line from -2 to 4 or (indep) for a closed circle or [at -2 or (indep) for an open circle or) or [at 4 Only allow a follow through for a double ended inequality
			Correct diagram		A1 ft for correct diagram Only allow a follow through for a double ended inequality
					Total 4 marks

22	$0.0027 = \dfrac{5.4}{(V)}$ oe		5	M1 for correctly using $density = \dfrac{mass}{volume}$
	$(V =)\dfrac{5.4}{0.0027} = 2000$			M1 for correctly rearranging for V
	$\pi \times 10^2 \times h = 2000$ oe			M1ft their 2000 for $\pi \times 10^2 \times h = $ their V
	$(h =)\dfrac{2000}{\pi \times 10^2}$ oe $(= 6.3661\ldots)$			M1ft their 2000 dep on previous M1 for correctly rearranging for h
	Correct answer scores full marks (unless from obvious incorrect working)	6.4		A1 awrt 6.4
				Total 5 marks
				TOTAL FOR PAPER 100 marks