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Pearson Edexcel

Mr. Demerdash

Mark Scheme (Results)

Summer 2019

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

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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
  - eeoo – each error or omission

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- **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.
  Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.
  If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
  If there is a choice of methods shown, the method that gains the least marks should be marked.
  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 in another.

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International GCSE Maths

Apart from Q2, 17, 18d, 20, & 24 (where the mark scheme states otherwise) the correct answer, unless obtained from an incorrect method, should be taken to imply a correct method

Question		Working	Answer	Mark	Notes	
1	(a)		$x > -3$	1	B1	Accept $-3 < x$
	(b)	$4y - y \leq 8 + 13$		2	M1	Arranging y's on one side and the numbers on the other side. (allow $4y - y = 8 + 13$ oe or $4y - y < 8 + 13$ oe or $4y - y > 8 + 13$ oe or $4y - y \geq 8 + 13$ oe)
			$y \leq 7$ oe		A1	Allow $y \leq 21/3$
						Total 3 marks

2		$\frac{17}{3}(-)\frac{11}{4}$ or $5\frac{8}{12}(-)2\frac{9}{12}$ $\frac{68}{12} - \frac{33}{12}$ or $4\frac{20}{12} - 2\frac{9}{12}$ $\frac{35}{12} = 2\frac{11}{12}$ Alt: $3\ (+)(\frac{2}{3} - \frac{3}{4})$ $3\ (+)(\frac{8}{12} - \frac{9}{12})$ $3 - \frac{1}{12} = 2\frac{11}{12}$ Alt: $4\frac{5}{3}(-)\ 2\frac{3}{4}$ $2\ (+)(\frac{5}{3} - \frac{3}{4})$ $2\ (+)(\frac{20}{12} - \frac{9}{12})$ $= 2\frac{11}{12}$		3	M1 M1 A1 M1 M1 A1 M1 M1 A1	Sight of $\frac{17}{3}$ and $\frac{11}{4}$ or $5\frac{8}{12}$ and $2\frac{9}{12}$ or $\frac{68n}{12n} - \frac{33n}{12n}$ Dep on M2 Dep on M2 Dep on M2
						Total 3 marks

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Question		Working	Answer	Mark	Notes	
3	(a)		–5, 5, 5, –5	2	B2	All 4 correct values If not B2 then B1 for 2 or 3 correct values
	(b)		Fully correct curve	2	M1 A1	Plotting at least 6 points correctly from their table dep on B1 in part(a) Do not accept horizontal line at top of curve or straight line segments
						Total 4 marks

4	(a)	40 ÷ 16 × 12 oe	30	2	M1 A1	$40 \times \frac{12}{16}$ oe
	(b)	$525 \div 100^2$	0.0525 oe	2	M1 A1	$\frac{525}{100^2}$ Accept 5.25×10^{-2}
						Total 4 marks

5			$(x + 4)(x - 9)$	2	M1 A1	For $(x + a)(x + b)$ where $ab = -36$ and a and b are integers Ignore extension to roots $x = -4$ & 9
						Total 2 marks

6		P(mint =) 1 – (0.35 + 0.32 + 0.12) {= 0.21} P(strawberry or mint =) 0.32 + "0.21"	0.53 oe	3	M1 M1 A1	Or a correct equation summing to 1 Dep Allow 0.53/1
						Total 3 marks

7		55 ÷ (6 + 3 + 2) {= 5} (6 x "5") – (2 x "5")	20	3	M1 M1 A1	Or $\frac{6}{11}$ x 55 (= 30) or $\frac{2}{11}$ x 55 (= 10) Or M2 for Won = 30 and Lost = 10 (can be seen in a ratio 30 : 15: 10)
						Total 3 marks

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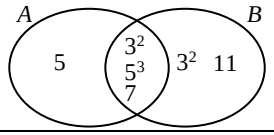
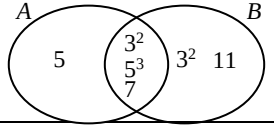
Question		Working	Answer	Mark	Notes	
8	(a)		7875	2	M1 A1	$3^2 \times 5^3 \times 7$ oe or correct Venn diagram
	(b)		3 898 125	2	M1 A1	$3^4 \times 5^4 \times 7 \times 11$ oe or correct Venn diagram
						Total 4 marks

9	(a)		8.4×10^5	1	B1	
	(b)	$\frac{60000000}{0.08}$ or 750000000 oe (e.g $0.75 \times 10^{9)}$	7.5×10^8	2	M1 A1	M1 for 60000000 or 0.08
						Total 3 marks

10		150000×0.82^3	82705	3	M2 A1	If not M2 then M1 for 1st year e.g 150000 x 0.82 (= 123000) or 150000 x 0.18 (= 27000) SC B1 for 150000 x 1.18 (= 177000) or 150000×1.18^3 (= 246454.8)or 150000 x 0.54 (=81000) or 150000 x 0.46 (= 69000) Accept 82705.2
						Total 3 marks

11		Gradient = (−)4 ÷ 2 oe	$y = -2x - 1$ oe	3	M1 A2	Correct method to work out the gradient (±) accept 4 ÷ 2 oe or "m" = 2 If not A2 then A1 for $L = -2x - 1$ or $-2x - 1$ or $y = 2x - 1$ or $y = -2x + c$
						Total 3 marks

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Question		Working	Answer	Mark	Notes	
12		$\sin 32 = \frac{BD}{3.1}$ oe $(BD =) 3.1 \times \sin 32$ (= 1.6427...) $\cos 42 = \frac{"3.1\sin 32"}{AB}$ oe or $\frac{AB}{\sin 90} = \frac{"3.1 \sin 32"}{\sin 48}$ oe $AB = \frac{"3.1\sin 32"}{\cos 42}$ or $AB = \frac{"3.1 \sin 32"}{\sin 48}$	2.21	5	M1 M1 M1 M1 A1	A correct calculation involving *BD* Accept 1.6 or better Dep or (*AD* =) "1.6.. x tan 42 {= 1.479} Or (*AB* =) $\sqrt{"1.479"^2 + "1.6427"^2}$ 2.21053... (Accept 2.2 → 2.22)
						Total 5 marks

13	(a)	Plotting points from table at ends of interval (40, 6), (50, 20), (60, 56), (70, 84), (80,95), (90, 100) Points joined with curve or line segments	Correct cf diagram	2	M1 A1	$\pm^1/_2$ sq (at least 5 points plotted correctly) Or <u>all</u> points plotted consistently within each interval at the correct heights Accept cf graph which is not joined to (30,0)
	(b)	Use of graph at 50	58 – 59	2	M1 A1	Use of graph at 50 walkers No working shown and answer is within 58 – 59 award M1A1
	(c)	86 or 87 or 88 indicated on graph or stated 100 – "86" or 100 – "87" or 100 – "88"	$\frac{12}{100}$ oe $\frac{13}{100}$ oe $\frac{14}{100}$	3	M1 M1 A1	Use of their graph at 72 minutes Dep e.g. 12, 13 or 14 walkers 0.12 → 0.14 inc, oe
						Total 7 marks

14	(a)	x^9y^6	x^9y^6	2	B1B1	Allow B1 if $(x^3y^2)^3$ or $(x^{36}y^{24})^{0.25}$ seen on answer line
	(b)	$3^n = \frac{3^x}{3^{2y}}$	$n = x - 2y$	2	M1 A1	for a correct first step e.g. 3^{2y} or 3^{-2y}
						Total 4 marks

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Question		Working	Answer	Mark	Notes	
15		*ABD* = 98° ÷ 2 (= 49°) or *ABC* = 90°		4	M1	Correct angle stated or seen on diagram
		Angle at centre / middle is twice angle at circumference			B1	Dep M1
		Angle in a semicircle / from a diameter is 90° / right angle			B1	Dep M1
		DBC = (90 – 49) = 41	41°		A1	Correct answer + no reasons = M1A1
		Alt:				
		180 – 98 (= 82°)				
		OAD = 82 ÷ 2 (= 41°)			M1	Correct angle stated or seen on diagram
		Base / bottom angles in an isosceles triangle are equal			B1	Dep M1
		DBC = 41°				
		Angles in the same segment / from the same chord (*DC*) are equal			B1	Dep M1
			41°		A1	Correct answer + no reasons = M1A1
		Alt:				
		DOC = 180 – 98 (= 82°)			M1	Correct angle stated or seen on diagram
		Angles on a straight line = 180°			B1	Dep M1
		DBC = 41°				
		Angle at centre / middle is twice angle at circumference			B1	Dep M1
			41°		A1	Correct answer + no reasons = M1A1
						Total 4 marks

16	(a)	$y = \frac{k}{x^2}$ condone proportion symbol in place of =		3	M1	Setting up a correct equation "*k*" ≠ 1
		$16 = \frac{k}{1.5^2}$ or $9 = \frac{k}{2^2}$ or $4 = \frac{k}{3^2}$ or $2.25 = \frac{k}{4^2}$			M1	Using the values from the table to find the value of the constant or "*k*" = 36
			$y = \frac{36}{x^2}$		A1	$\frac{36}{x^2}$ = M2 A0
	(b)	$x^2 = \frac{36}{144}$ or $x = \sqrt{(\frac{36}{144})}$			M1	Substituting *y* = 144 into the correct equation and making x^2 or *x* the subject.
			0.5 oe	2	A1	cao
						Total 5 marks

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Question		Working	Answer	Mark	Notes	
17		(Term n =) $\frac{1}{2}n(n+1)$ or (Term n +1 =) $\frac{1}{2}(n+1)(n+2)$ $\frac{1}{2}n(n+1)+\frac{1}{2}(n+1)(n+2)$ $\frac{1}{2}(n+1)(n+n+2)=\frac{1}{2}(n+1)(2n+2)$ or $\frac{1}{2}n^2+\frac{1}{2}n+\frac{1}{2}n^2+\frac{1}{2}n+n+1 \rightarrow$ $n^2 + 2n + 1$	$(n+1)^2$ shown	4	M1 M1 M1 A1	Algebraic representation of one of the two consecutive terms in sequence Adding two consecutive terms Factorisation or multiplying out correctly to get to $n^2 + 2n + 1$ Dep on M3
						Total 4 marks

18	(a)		$\frac{3}{4}$ oe	1	B1	
	(b)	$\frac{x-5}{4(x-5)-3}$	$\frac{x-5}{4x-23}$	2	M1 A1	 cao
	(c)	$y=\frac{x}{4x-3}$ or $x=\frac{y}{4y-3}$ $y(4x-3)=x$ or $x(4y-3)=y$ $4xy-3y=x$ or $4xy-3x=y$ $4xy-x=3y$ or $4xy-y=3x$ $x(4y-1)=3y$ or $y(4x-1)=3x$	$\frac{3x}{4x-1}$ oe	3	M1 M1 A1	Moving the denominator to the other side of the equation Factorising the variable on one side in a correct expression
	(d)	Tangent drawn at $x = -0.5$ (G =) 18 ÷ 3 oe	$5 \rightarrow 7$	3	M1 M1 A1	Drawing a tangent at $x = -0.5$ Correct method to work out the gradient of the tangent at $x = -0.5$ or $x = +0.5$ Dep on 1st M1 **SC B1 B1 for drawing a tangent at x =+0.5 and gradient = − 3 → −4**
						Total 9 marks

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Question		Working	Answer	Mark	Notes	
19		$\frac{25}{2}\pi = \pi r^2 \times \frac{80}{360}$ $r = 7.5$		6	M1 A1	Equation of sector equal to $\frac{25\pi}{2}$ or a calculation that leads to r or r^2
		(APB =) $2 \times \pi \times$ "7.5" $\times \frac{80}{360}$ (= 10.471).... *(APB =)* 10.471.... (=10 π /3) $(AB^2) =$ "7.5"^{2} + "7.5"^{2} − (2 × "7.5" × "7.5" × cos80) or $\frac{AB}{\sin 80} = \frac{\text{"7.5"}}{\sin 50}$ or (*AB* =) 2 x "7.5" x sin 40 (*AB* =) 9.6418 "9.6418" + "10.4719"			M1 ft M1ft M1ft	Dep on 1st M1 Accept 10.5 or better Dep on 1st M1 Correct equation to find *AB* (= 9.6) or AB^2 (= 93 or better) must use a clearly identified radius value Dep on 2nd and 3rd method marks
			20.1		A1	awrt 20.1
						Total 6 marks

20		3.455 or 3.465 or 6.25 or 6.35 $\frac{6\times 3.465}{6.25-3.465}$		3	M1 M1	Accept $3.464\dot{9}$ for 3.465 or $6.34\dot{9}$ for 6.35 $\frac{6\times \text{UB}_a}{\text{LB}_b - \text{UB}_a}$ where 3.46 < $\text{UB}_a \leq$ 3.465 and 6.25 $\leq \text{LB}_b <$ 6.3
			7.46		A1	Dep M2 Accept 7.46499 ...
						Total 3 marks

21		(LSF =)$\sqrt{240 \div 540}$ or $\frac{2}{3}$ or $\frac{3}{2}$ or 1.5 or 3 : 2 or 2 : 3 $\left(\frac{2}{3}\right)^3$ x 2025 oe accept 0.0.66 or better for 2/3		3	M1 M1	Full method leading to correct answer
			600		A1	
						Total 3 marks

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Question		Working	Answer	Mark	Notes	
22		$-2(x^2-6x)+5$ or $-2(x^2-6x-2.5)$		4	M1	Factorising by extracting – 2 in a correct expression
		$-2[(x-3)^2-9-2.5]$ or $-2[(x-3)^2-9]+5$			M1	Correct expression equivalent to $5 + 12x – 2x^2$
		$-2[(x-3)^2-11.5]$ or $-2(x-3)^2+18+5$			M1	Correct expression equivalent to $5 + 12x – 2x^2$
			$23-2(x-3)^2$		A1	**Award full marks if a, b, and c are correctly stated and $23-2(x-3)^2$ is not stated anywhere.** SC B3 for $23-2(3-x)^2$ SC B2 for $-2(x-3)^2$ + constant or $23 – 2(x + \text{constant})^2$ SC B1 for $– 2 (x + 3)^2$ +constant
		Alt: $a + b(x^2 + 2cx + c^2)$			M1	Multiplying out expression correctly
		$2bc = 12$ or $a + bc^2 = 5$ or $b = – 2$			M1	Equating coefficients or stating value of b
		$2 \times -2 \times c = 12$ or $c = -3$			M1	Method to calculate c
		$a + -2 \times (-3)^2 = 5$ or $a = 23$ seen			M1	Method to calculate a
			$23-2(x-3)^2$			SC B3 for $23-2(3-x)^2$
						Total 4 marks

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Question		Working	Answer	Mark	Notes	
23		360 = (10 x 10) + 4 x 0.5 x 10 x "*h*" oe *h* = 13			M1 A1	Finding the perpendicular height of a triangular face
		AC = $\sqrt{13^2 + 5^2}$ = (13.93 or √194) or AO = $\sqrt{13^2 - 5^2}$ = (12) or OC = ($\sqrt{10^2 + 10^2}$) ÷ 2 = (7.07 or 5√2) or EC (oe) = $\sqrt{10^2 + 10^2}$ = (14.14 or 10√2)			M2	Finding the accurate length of two sides relevant to finding correct angle. M2 for two sides found or M1 for one side. 1dp rounded or truncated.
		$tan^{-1}\left(\frac{12}{7.07}\right)$ or $cos^{-1}\left(\frac{7.07}{13.93}\right)$ or $sin^{-1}\left(\frac{12}{13.93}\right)$ or cos^{-1} $\left(\frac{13.93^2 + 7.07^2 - 12^2}{2 \text{ x } 13.93 \text{ x } 7.07}\right)$ or cos^{-1} $\left(\frac{13.93^2 + 14.14^2 - 13.93}{2 \text{ x } 13.93 \text{ x } 14.14}\right)$	59.5°		M1 A1	A correct trigonometric expression to find correct angle Accept $\tan\theta = \left(\frac{12}{7.0}\right)$ etc Accept 59.4° – 59.7°
						Total 6 marks

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Question		Working	Answer	Mark	Notes	
24		$\frac{x-4}{x} \times \frac{x-5}{x-1} = 0.7$ $3x^2 - 83x + 200 (= 0)$ oe $\frac{83 \pm \sqrt{83^2-(4\times3\times200)}}{2\times3}$ or $(3x - 8)(x - 25) (=0)$ or $(x - 83/6)^2 + 200/3 - 83^2/36 (=0)$ Alt: y = yellow marbles	25	5	M2 A1 M1 A1	If not M2 then M1 for either $\frac{x-4}{x}$ or $\frac{x-5}{x-1}$ Rearrangement of their quadratic to the form $ax^2 + bx + c (= 0)$ 1st step in solving the correct 3 term quadratic Accept 25 only (dep on M3 if using algebra) If not M2 then M1 for either $\frac{y}{y+4}$ or $\frac{y-1}{y+3}$
		$\frac{y}{y+4} \times \frac{y-1}{y+3} = 0.7$ $3y^2 - 59y - 84 (= 0)$ oe $\frac{59 \pm \sqrt{59^2-(4\times3\times-84)}}{2\times3}$ or $(3y + 4)(y - 21)$ or $(y - 59/6)^2 - 84/3 - 59^2/36 (=0)$ $y = 21$ 21+4	25		M2 A1 M1 A1	Rearrangement of their quadratic to the form $ay^2 + by + c (= 0)$ 1st step in solving the correct 3 term quadratic Accept 25 only (dep on M3 if using algebra) Give full marks if $\frac{21}{25} \times \frac{20}{24} = 0.7$ seen and 1st M2 scored **NB: SC B1 for completing 1st step in solving incorrect 3 term quadratic**
						Total 5 marks

						Total for Paper: 100 marks

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