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Edexcel

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.

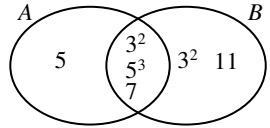
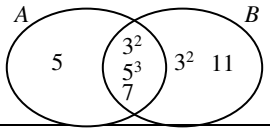
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should 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

- **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.

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 $y \leq 21/3$
						<b>Total 3 marks</b>

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

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
<b>Total 4 marks</b>						
4	(a)	$40 \div 16 \times 12$ 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 $5.25 \times 10^{-2}$
<b>Total 4 marks</b>						
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 $x = -4$ & $9$
	<b>Total 2 marks</b>					
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
	<b>Total 3 marks</b>					
7		$55 \div (6 + 3 + 2) \{= 5\}$ $(6 \times "5") - (2 \times "5")$	20	3	M1 M1 A1	Or $\frac{6}{11} \times 55 (= 30)$ or $\frac{2}{11} \times 55 (= 10)$ Or M2 for Won = 30 and Lost = 10 (can be seen in a ratio 30 : 15: 10)
	<b>Total 3 marks</b>					

Question		Working	Answer	Mark	Notes	
8	(a)		7875	2	M1	$3^2 \times 5^3 \times 7$ oe or correct Venn diagram
	(b)				A1	$3^4 \times 5^4 \times 7 \times 11$ oe or correct Venn diagram
			3 898 125		A1	
<b>Total 4 marks</b>						
9	(a)		$8.4 \times 10^5$	1	B1	
	(b)	$\frac{60000000}{0.08}$ or 750000000 oe (e.g $0.75 \times 10^9$ )	$7.5 \times 10^8$	2	M1 A1	M1 for 60000000 or 0.08
<b>Total 3 marks</b>						
10		$150000 \times 0.82^3$		3	M2  A1	If not M2 then M1 for 1st year e.g $150000 \times 0.82 (= 123000)$ or $150000 \times 0.18 (= 27000)$ SC B1 for $150000 \times 1.18 (= 177000)$ or $150000 \times 1.18^3 (= 246454.8)$ or $150000 \times 0.54 (= 81000)$ or $150000 \times 0.46 (= 69000)$ Accept 82705.2
<b>Total 3 marks</b>						
11		Gradient = $(-4) \div 2$ oe	$y = -2x - 1$ oe	3	M1  A2	Correct method to work out the gradient ( $\pm$ ) accept $4 \div 2$ oe or " $m$ " = 2  If not A2 then A1 for $L = -2x - 1$ or $-2x - 1$ or $y = 2x - 1$ or $y = -2x + c$
<b>Total 3 marks</b>						

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

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 $\pm 1/2$ sq (at least 5 points plotted correctly) Or all points plotted consistently within each interval at the correct heights A1 Accept cf graph which is not joined to (30,0)
	(b)	Use of graph at 50	58 - 59	2	M1 Use of graph at 50 walkers A1 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 Use of their graph at 72 minutes M1 Dep e.g. 12, 13 or 14 walkers A1 0.12 $\rightarrow$ 0.14 inc, oe
				<b>Total 7 marks</b>	

14	(a)	$x^3y^6$	$x^3y^6$	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 for a correct first step e.g. $3^{2y}$ or $3^{-2y}$ A1
				<b>Total 4 marks</b>	



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

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

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 Algebraic representation of one of the two consecutive terms in sequence M1 Adding two consecutive terms M1 Factorisation or multiplying out correctly <u>to get to</u> $n^2 + 2n + 1$ A1 Dep on M3
				<b>Total 4 marks</b>

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 =) $18 \div 3$ 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 1 <sup>st</sup> M1 <b>SC B1 B1 for drawing a tangent at <math>x = +0.5</math> and gradient = -3 <math>\rightarrow</math> -4</b>
				<b>Total 9 marks</b>		

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

20	3.455 or 3.465 or 6.25 or 6.35		3	M1 Accept 3.4649 for 3.465 or 6.349 for 6.35
	$\frac{6 \times 3.465}{6.25 - 3.465}$	7.46		M1 $\frac{6 \times UB_a}{LB_b - UB_a}$ where $3.46 < UB_a \leq 3.465$ and $6.25 \leq LB_b < 6.3$ A1 Dep M2 Accept 7.46499 ...
				<b>Total 3 marks</b>

21	$(LSF) = \sqrt{240 \div 540}$ or $\frac{2}{3}$ or $\frac{3}{2}$ or 1.5 or 3 : 2 or 2 : 3 $(\frac{2}{3})^3 \times 2025$ or accept 0.066 or better for 2/3		3	M1 Full method leading to correct answer
		600		M1 A1
				<b>Total 3 marks</b>

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

Question		Working	Answer	Mark	Notes
23		$360 = (10 \times 10) + 4 \times 0.5 \times 10 \times "h"$ oe $h = 13$			M1 A1 Finding the perpendicular height of a triangular face
		$AC = \sqrt{13^2 + 5^2} = (13.93 \text{ or } \sqrt{194})$ or $AO = \sqrt{13^2 - 5^2} = (12)$ or $OC = (\sqrt{10^2 + 10^2}) \div 2 = (7.07 \text{ or } 5\sqrt{2})$ or $EC \text{ (oe)} = \sqrt{10^2 + 10^2} = (14.14 \text{ or } 10\sqrt{2})$			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 $\cos^{-1}\left(\frac{13.93^2 + 7.07^2 - 12^2}{2 \times 13.93 \times 7.07}\right)$ or $\cos^{-1}\left(\frac{13.93^2 + 14.14^2 - 13.93}{2 \times 13.93 \times 14.14}\right)$			M1 A correct trigonometric expression to find correct angle Accept $\tan \theta = \left(\frac{12}{7.0}\right)$ etc
			59.5°		A1 Accept 59.4° – 59.7°
					<b>Total 6 marks</b>

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

					<b>Total for Paper: 100 marks</b>
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