



Mark Scheme (Results)

Summer 2017

Pearson Edexcel International GCSE In Mathematics A (4MA0) Paper 3HR



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General Marking Guidance

- WWW. MYMathscloud.com 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
- o indep − independent
- eeoo each error or omission

No working

WWW. MYMathscloud.com 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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

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: eq. 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.

Apart from questions 2, 7 and 18 (where the mark scheme states otherwise) the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method

Ques	Working	Answer	Mark	x Notes
1	6-2.84 6-2.84			M1 or for 0.63
	$\frac{1}{(\sqrt{5})^2}$ or $\frac{1}{5}$ be			NB: Accept 2.23(6) in place of $\sqrt{5}$
		0.632	2	A1 for 0.632 or $\frac{79}{125}$
				SC : B1 for an answer of $1.41(31)$
				Total 2 marks

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2	5x - x = 8 - 10			M1	for correct rearrangement with x terms on one side and numbers on the other in a correct equation or the correct simplification of either x terms or numbers on one side in a correct equation eg. $4x - 8 = -10$; $5x = x - 2$
	4x = -2			M1	or $-4x = 2$ or $4x + 2 = 0$ or $-4x - 2 = 0$ NB: This mark implies the previous M1
		-0.5	3	A1	oe e.g. $-\frac{2}{4}$ dep on M1
					Total 3 marks

3	Angle $BCD = 142^{\circ}$ or			M1	for angle $BCD = 142^{\circ}$ or	
	Angle $BCF = 180 - 62$ (=118°) or				angle $BCF = (180 - 62)^{\circ}$	
	Angle $ABC = 180 - 142$ (=38)					
	360 – 142 – "118" or "38" + 62			M1	for a complete method to find x	
		100	3	A1		
						Total 3 marks

							m			
							n.m.			
4 a	3500 ÷ 119			M1						
		29.41	2	A1	for 29	9.41 – 29.412				
							-			
b	8500 ÷ 52 or 163(.461)			M1		M1 for $8500 \times 119 = 1011500$	M1 for $119 \div 52 (=2.28)$			
	"162 461 " × 110			M1	dan	M1 for "1011500" \div 52	M1 for 9500×220			
	105.401^ 119			1/11	dep	WII 101 1011300 ÷ 32	WIT IOI 0300 ^ 2.20			
		19452	3	A1	for 19	2380 - 19520				
с	$24 \div 60 (-0.4)$ or 2.4 or 2^{24} or or			M1						
	$24 \div 60 (-0.4)$ or 2.4 or $2\frac{-0.6}{60}$ or 60									
	$2 \times 60 + 24$ (=144)									
	1524 - 2.4			3.61	(11	1524 - 2.24				
	$1534 \div 2.4$ oe or (1524 ÷ 144) × 60 oc			MI	A1 (allow $1534 \div 2.24$ or answer of $684(.82)$ or 685)					
	(1334 ÷ 144) × 60 6e	639	3	Δ1	for 630 630 17					
		057	5		101 05		Total 8 marks			
			1							

5a	$\pi \times 2.5$ oe or $2 \times \pi \times \left(\frac{2.5}{2}\right)$			M1		
		7.85	2	A1	7.85 – 7.86	
b	$10 \times \frac{4.7}{2.5}$ oe or $10 \times \frac{470}{250}$ oe			M1	or for digits 188	
		18.8	2	A1	accept 19 if 18.8 seen	
						Total 4 marks

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6a	$\frac{a+b+c}{3} = 21$ or $\frac{a+b}{2} = 19$ or			M1		SCIOL
	$\frac{3 \times 21(=63) \text{ or } 2 \times 19(=38)}{3 \times 21 - 2 \times 19}$	25	3	M1	for a complete method	
b	$2 \times 19 - 20 (=18) \text{ or} \\21 \times 3 - 20 - \text{``25''} (=18)$		5	M1	ft from (a) for a complete method to find age of 3 rd person	
	"25" – "18"			M1	dep or for 18 25	
		7	3	A1	ft from answer in (a)	
					Total 6 marks	

7	e.g. $2 \times 2 \times 7 \times 12$ or			M1	for the start of a correct method
	at least 3 divisions in a factor tree				e.g. may be a factor tree or consecutive divisions
					condone 1 error
	All 6 correct prime factors, no extras			M1	e.g. from a factor tree, ignore 1s
	(2,2,2,2,3,7,(1))				
		2×2×2×2×3×7	3	A1	oe dep on M1, M1
					Total 3 marks

8a	Correct triangle	2	B2
	(-1, -2) (-1, 0) (2, -2)		(B1 for a rotation of 90° clockwise about a different centre i.e. a triangle in the same orientation as the correct triangle or rotation by 90° anticlockwise about $(0, 2)$)
			Totation by 50° anticioekwise about (0, 2))
b	Correct trapezium	1	B1
	(1, -1) (1, -2) (3, 1) (3, -2)		
			Total 3 marks

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9a	$10e^{5}f^{2}$	2	B2	If not B2 then award B1 for	SUD.C
				$ke^{5}f^{2}, k \neq 10$ or $10e^{5}f^{a}$ or $10e^{b}f^{2}$ $a, b \neq 0$	-OM
b	(x-6)(x+1)	2	B2	If not B2 then award B1 for	
				(x-1)(x+6) or	
				(x-3)(x-2) or $(x+3)(x-2)$ or $(x-3)(x+2)$	
				Total 4 marks	

10a	100 - 9.4 (= 90.6)	$\frac{9.4}{100} \times 607$ oe (= 57.058)			M1	
	$\frac{"90.6"}{100} \times 607$ oe	607 – "57.058"			M1	(dep)
			550	3	A1	for 549.942 or 549.94 or 549.9
b	$\frac{100}{20} \times 1320 \text{ oe}$				M2	for a complete method
						If not M2 then award M1 for a correct first step
						$1320 \div 20 (=66)$ or $0.2x = 1320$ or $1320 \div 2 (=660)$
			6600	3	A1	
						Total 6 marks

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11a	Complete correct binary structure for selection of two			M1			SCIOUD.CC
	counters OR At least one additional red						
	branch labelled $\frac{2}{20}$ and at least two blue branches labelled $\frac{11}{20}$						
	20	Correct probability tree diagram	2	A1			
b	$\frac{9}{20} \times \frac{11}{20}$			M1	for $\frac{9}{20} \times \frac{11}{20}$		
		$\frac{99}{400}$	2	A1	(ft diagram) for $\frac{99}{400}$ or 0.2475	5 or 24.75%	
С	$\frac{9}{20} \times \frac{9}{20}$ or $\frac{11}{20} \times \frac{11}{20}$			M1	for one correct product ft from diagram	M1 for $2 \times \frac{9}{20} \times \frac{11}{20}$ oe (ft from (a))	
	$\frac{9}{20} \times \frac{9}{20} + \frac{11}{20} \times \frac{11}{20}$			M1	for the complete method ft from diagram	M1 for $1 - 2 \times \frac{9}{20} \times \frac{11}{20}$	
		$\frac{202}{400}$	3	A1	$\frac{202}{400}$ oe or 0.505 or 50.5%		
						Total 7 marks	

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12a	2, 9, 18, 28, 39, 51, 63, 75, 86, 100	Correct table	1	B 1	
b				M1	(ft from sensible table i.e. clear attempt at addition)
					for at least 8 points plotted correctly at end of interval or for all 10 points plotted consistently within each interval in the freq table at the correct height
		Correct cf graph	2	A1	accept curve or line segments accept graph that is not joined to (0,15)
с	E.g. for a mark drawn at 25 on their cumulative frequency diagram			M1	for intention to use 25 on cf axis ft from a cumulative frequency graph provided method is shown
		33 - 35	2	A1	33 - 35 ft from a cumulative frequency graph provided method is shown
d	E.g. reading of $66 - 68$ (%) or reading from graph at $A = 52$ or mark on cf axis from using $A = 52$			M1	for a reading taken from 52 on age axis ft from a cumulative frequency graph provided method is shown
	$\frac{68''}{100} \times 1200(000)$			M1	(dep)
		792000 - 816000	3	A1	for answer in the range 792000 – 816000
					Total 8marks

13			M1	for either $y = 2x + 1$ or $x + y = 10$ drawn correctly
			M1	for all lines drawn correctly
	Correct region	3	A1	for all 3 lines correct and the region identified
				Lines may be full lines or broken lines
				Total 3 marks

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4 Scheme 1 (interior angle and angle <i>ADC</i> and an angle in triangle <i>A</i>	ADC)	Le	t <i>X</i> be	e midpoint of <i>DC</i>
(Angle <i>DEA</i> =) $\frac{(5-2) \times 180}{5} = 108$			M1	or for 108 seen as an interior angle
Angle <i>EDA</i> or <i>EAD</i> = $(180 - 108) \div 2 = 36$			M1	
Angle ADC or ACD = 108 - 36 = 72 or Angle DAC = 108 - 2 × 36 (=36) or Angle DAC = $\cos^{-1}\left(\frac{"16.18"^2 + "16.18"^2 - 10^2}{2 \times "16.18" \times "16.18"}\right)$ Angle DAX or CAX = (108 - 2 × 36) ÷ 2 (=18)			M1	Angles may be seen on diagram
E.g. $AX = 5 \times \tan 72 \ (=15.38)$ or $AX = 5 \div \tan 18 \ (=15.38)$ or $AX = 5 \times \tan ADC$ or $AX = 5 \div \tan DAX$ or $AD^2 = 10^2 + 10^2 - 2 \times 10 \times 10\cos 108 \ (=261.8)$ or $AD = \sqrt{10^2 + 10^2 - 2 \times 10 \times 10 \times \cos 108} \ (=16.18)$ or			M1	or for $AD = \frac{10}{\sin 36} \times \sin 108$ (=16.18) or $AD = \frac{10}{\sin 36} \times \sin 72$
$AD = \frac{10 \times \sin 72}{\sin 36} \ (=16.18)$				Allow 16 or 16.2 for <i>AD</i> throughout NB: Allow the value on the diagram for angle <i>ADC</i> or <i>DAX</i> if used in an otherwise correct trig statement
E.g. Area = $\frac{1}{2} \times 10 \times 15.38$ oe or			M1	dep on previous M1
$\begin{array}{c} 2 \\ 0.5 \times 10 \times \text{``16.18''} \times \sin 72 \text{ or } 0.5 \times \text{``16.18''} \times \text{``16.18''} \times \sin 36 \text{ or} \\ 0.5 \times 10 \times \text{``16.18''} \times \sin ADC \text{ or } 0.5 \times \text{``16.18''} \times \text{``16.18''} \times \sin DAX \end{array}$				NB: Allow the value on the diagram for angle <i>ADC</i> or <i>DAX</i> if used in an otherwise correct area statement
	76.9	6	A1	for answer in the range $76.5 - 77$
				SC: B4 for an answer in the range 53 – 53.5
				Total 6 marks

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14 Scheme 2 (only interior angle needed)				Let <i>X</i> be midpoint of <i>DC</i>]
(Angle <i>DEA</i> =) $\frac{(5-2) \times 180}{100} = 108$			M1	or for 108 seen as an interior angle	
5					
$AD^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \cos 108$ (=261.8) or			M1	Allow 16 or 16.2 for <i>AD</i> throughout	
$AD = \sqrt{10^2 + 10^2 - 2 \times 10 \times 10 \times \cos 108} (=16.18)$				-	
$AX^2 = "261.8" - 5^2 (= 236.8)$ or			M1		
$AX^2 = 16.18^{-2} - 5^2 (= 236.8)$					
$\sqrt{2368}$ (-1538)			M1		
V 230.0 (-15.50)					
$0.5 \times 10 \times$ "15.38"			M1]
	76.9	6	A1	for answer in the range $76.5 - 77$	
				SC: B4 for an answer in the range $53 - 535$	
				Total 6 marks	1

15a	$3 \times 2 \times x^2 - 3 \times 2x - 12$			M1	for one of $3 \times 2 \times x^2$ (=6 x^2) or $-3 \times 2x$ (=6 x) or -12
		$6x^2 - 6x - 12$	2	A1	
b	$6 \times 2^2 - 6 \times 2 - 12$			M1	substitute $x = 2$ in (a)
					ft from answer to (a) (must be a quadratic expression)
		0	2	A1	
с	$6x^2 - 6x - 12 = -12$			M1	ft from answer to (a) (must be a quadratic expression)
	x = 1, 0			A1	for both correct solutions
		1, 0	3	A1	for $k = 1$ and $m = 0$
					Total 7 marks

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16	cxy + dy = ax + b			MII	both terms in original denominator multiplied by y	
	e.g. $cxy - ax = b - dy$ or			M1	for isolating terms in x and non x terms correctly	-
	dy - b = ax - cxy				ft from $cxy + d = ax + b$ or $cx + dy = ax + b$	
	x(cv-a) = b - dv			M1	for taking out a factor of x correctly provided there are	-
					two terms in x	
		$x = \frac{b - dy}{dy}$	4	A1	for $x = \frac{b - dy}{dy}$ or e.g. $x = \frac{dy - b}{dy}$	
		cy-a			cy - a $a - cy$	
					Total 4 marks	

17	$12 \times (12+6) = 9 \times (9+BC)$ oe or			M1
	$12 \times (12+6) = 9 \times AC$ oe or AC = 24			
	$(BC =) \frac{12 \times (12 + 6)}{9} - 9$ oe or 24 - 9			M1 for a complete method
		15	3	A1
				Total 3 marks

				nnn
$y^{2} + 4x = 12$ 4x + 6y = 20 with subtraction or $\left(\frac{10 - 2x}{3}\right)^{2} + 4x = 12 \text{ or}$ $2x \left(\frac{12 - y^{2}}{3}\right) + 2x = 10 \text{ cm}$			M1	for eliminating one variable multiplication of equation(s) to get same multiple of y with subtraction (condone one arithmetic error) or either rearrangement of one equation and then correct substitution into second equation (condone algebraic
E.g. $y^2 - 6y = -8$ or $4x^2 - 4x - 8 = 0$			A1	reduction to a correct 3 term quadratic; terms may not all be 'on the same side'
E.g. $(y-2)(y-4) (= 0)$ or 4(x-2)(x+1) (=0)			M1	ft if first M1 awarded and equation is quadratic for correct factorisation or correct substitution into formula
			A1	for $y = 2$, $y = 4$ or $x = 2$, $x = -1$ correct x or y values implies previous M1
$(x =) \frac{10 - 3 \times 2}{2} \text{ or } \frac{10 - 3 \times 4}{2}$ $(y =) \frac{10 - 2 \times 2}{3} \text{ or } \frac{10 - 2 \times (-1)}{3}$			M1	(dep on the previous M1) for correct substitution to find both values
	x = 2, y = 2 or x = -1, y = 4	6	A1	values for x and y must be correctly paired dep on M1 awarded
				Total 6 marks

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19	$(V_c =) \frac{\pi}{3} \times 36^2 \times 53 \ (=22896\pi = 71930)$			M1	for volume of cone	Sud Com
	$(V_H =) \frac{2\pi}{3} \times 36^3 (=31104\pi = 97716)$			M1	for volume of hemi-sphere	
					NB : 54000π or 169646 implies first two method marks	
	$\pi \times r^2 \times 2r = "\frac{2\pi}{3} \times 36^3" + "\frac{\pi}{3} \times 36^2 \times 53"$ oe			M1	(dep on at least M1) for forming an equation with correct volume expression for cylinder	
	$r = \sqrt[3]{\frac{54000\pi''}{2\pi}} = 30$			M1		
	2 × "30"			M1	(dep previous M1)	
		60	6	Al		
					Total 6 marks	

20	$(2^p)^2 - 2^p - 2^p + 1$ or			M2	for correct expansion
	$2^{2p} - 2^p - 2^p + 1$ or $4^p - 2^p - 2^p + 1$				If not M2 then award M1 for 3 terms correct from $(2^p)^2 - 2^p - 2^p + 1$
	$N = 2^{p+1} (2^{p-1} - 1)$	Shown		A1	for correct factorised expression from correct working (dep on M2)
					Total 3 marks
	Alternative method N = (k-1)(k+1)			M1	for correct factorisation
	$N = (2^p - 1 - 1)(2^p - 1 + 1)$			M1	for correct factorisation and substitution (implies B1)
	$N = 2^{p+1} (2^{p-1} - 1)$	Shown	3	A1	for correct factorised expression (dep on M2)

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21	$((BD)^{2} =) (x-2)^{2} + (x-3)^{2} - 2(x-2)(x-3)\cos(120)$			M1	2
	$(x-2)^{2} = x^{2} - 2x - 2x + 4 \text{ oe}$ $(x-3)^{2} = x^{2} - 3x - 3x + 9 \text{ oe}$			M1	(independent) correct expansion of $(x-2)^2$ or $(x-3)^2$
	$x^{2}-4x+4 + x^{2}-6x+9 + x^{2}-5x+6 (=3x^{2}-15x+19)$			A1	correct quadratic for BD^2 with all terms expanded may not be simplified
	Area = $2BD^2$ oe or			M1	(independent)
	Area = $2 \times ("3x^2 - 15x + 19")$				
		$6x^2 - 30x + 38$	5	A1	
					Total 5 marks





8b

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S

5

x

4





Cumulative percentage







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