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Mark Scheme (Results)

January 2016

Pearson Edexcel International GCSE
Mathematics A (4MA0)
Paper 4H

Pearson Edexcel Certificate
Mathematics A (KMA0)
Paper 4H

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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
  - awrt –answer which rounds to

- 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, 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: 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.

Apart from Questions 9c, 11, 13, 22 and 23 (where the mark scheme states otherwise), 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)	2.14... ÷ 4.4	0.4874(456952)	2	M1 for 2.14.... or 4.4 or $\frac{\sqrt{115}}{22}$ A1 Accept if first four sig figs correct
(b)		0.487	1	B1 ft if (a) > 3 sig figs
				Total 3 marks

2	$3 \times (-5)^2 + 4 \times -5$ or $3\times (-5)^2 -$ 20 or 75	55	2	M1 for correct substitution, brackets essential A1
				Total 2 marks

3	8×4 (= 32) or 1 + 9 or 10 − 1 "32" – (3 + 1 + 5 + 5 + 2 +3)(=13) or (3 + 1 + 5 + 5 + 2 +3) + "10"(=29)	3 and 10	3	M1 M1 A correct method to find the total of the 2 missing numbers A1 If M0 scored then SCB1 for an answer of **two numbers** with a sum of 13 or **two numbers** that give a range of 9 for the 8 cards
				Total 3 marks

4	$\frac{2}{5} \times 30$ or 0.4×30	12	2	M1 A1 (an answer of $\frac{12}{30}$ gains M1 only)
				Total 2 marks

5	180 – (40 + 30)	110° angles in a triangle total 180° or corresponding angles	3	M1 Completely correct method seen (no isw) A1 SCB1 if M0 scored, B1 for AED stated or labelled as 110° B1 At least one correct reason used
				Total 3 marks

6	0.5 × (1 + 6) or 0.5 × (4 + 9)	(3.5 , 6.5)	2	M1 for a correct method to find one coordinate or for 1 coordinate given correctly or for (6.5, 3.5) A1
				Total 2 marks

7	(a)	$\frac{12}{100} \times 30$ or 0.12×30 or 3.6 $30 - "3.6"$	26.4(0)	3	M1 M1dep A1	M2 for $\frac{88}{100} \times 30$ or 0.88×30
	(b)	$\frac{9}{0.12}$ or $\frac{9}{12} \times 100$ oe	75	3	M2 M1 for $\frac{9}{12}$ or $9 = 12\%$ or $9 = \frac{12}{100}$ oe A1 (NB: if 75 ± 9 calculated, M2 only)	
					Total 6 marks	

8	(a)	$1 - (0.2 + 0.05 + 0.15)$ or $1 - 0.4$	0.6	2	M1 A1
	(b)	$6 + 6 \times 4 + 6 \times 3 + 6 \times 12$ (= 6 + 24 + 18 + 72) or 6×20 or $\frac{6}{0.05}$ oe	120	2	M1ft $6 + 6{\times}4 + 6{\times}3 + \frac{'0.6'}{0.05} \times 6$ (allow M1 for 3 correct products out of 4) A1
					Total 4 marks

9	(a)		$x^2 + 2x$	1	B1	$2x + x^2$ or $x2 + x^2$
	(b)	$4x > 3 + 7$ or $4x > 10$	$x > 2.5$	2	M1 A1	for $4x > 3 + 7$ or $4x > 10$ or $4x = 3+7$ or $4x = 10$ or $x = 2.5$ or $x < 2.5$ or an answer of 2.5 following $x > 2.5$ in working allow $x > \frac{10}{4}$ oe must have correct inequality sign
	(c)	$3 - 5m = 8 \times 4$ or $3 - 5m = 32$ or $32 + 5m = 3$ $-5m = '32' - 3$ or $3 - '32' = 5m$ $-5m = 29$ or $-29 = 5m$	-5.8	3	M1 M1 A1	Multiplying both sides by 4 as a correct first step for isolating $5m$ or $-5m$ in a correct equation oe eg $\frac{-29}{5}$ dependent on at least M1
		Alternative for (c)				
	(c)	$\frac{-5m}{4} = 8 - \frac{3}{4}$ or $\frac{5m}{4} = \frac{3}{4} - 8$ $-5m = (8 - \frac{3}{4}) \times 4$ or $5m = \left(\frac{3}{4} - 8\right) \times 4$	-5.8	3	M1 M1 A1	For using quarters (or a multiple of 4) and isolating the term in m in a correct equation For isolating $5m$ or $-5m$ in a correct equation. oe eg $\frac{-29}{5}$ dependent on at least M1
						Total 6 marks

10	$\frac{24.5}{7} \times 2$ (=7) or $\frac{24.5}{7} \times 6$ (=21) or $\frac{24.5}{7} \times 8$(=28)		3	M1
	$\frac{24.5}{7} \times 2 + \frac{24.5}{7} \times 6 + 24.5$ (7 + 21 + 24.5)			M1 fully correct method [M2 for $\frac{24.5}{7} \times (7 + 6 + 2)$]
		52.5		A1
				Total 3 marks

11	Eg. $4x = 14$ or $4y = -2$ or $-4y = 2$ or $5(3 - y) + y = 17$ or $5x + 3 - x = 17$ or $x + 17 - 5x = 3$	$x = 3.5$, $y = -0.5$	3	M1 for correctly eliminating 1 variable A1oe A1oe dep on M1
				Total 3 marks

12	$m = -2$		3	M1	For recognising gradient = −2, eg $y = -2x + c$ where $c \neq 4$	M2 for $7 = -2 \times 3 + c$
	$c = 13$			M1indep	$c = 13$	
		$y = -2x + 13$		A1	oe e.g. $y - 7 = -2(x - 3)$ SCB2 for $-2x + 13$	
						Total 3 marks

13	$180 - \frac{360}{10}$ or $\frac{(10-2)\times 180}{10}$ or 144 oe		4	M1	Unless inconsistently labelled
	$\frac{180-'144'}{2}$ or 18			M1	Or M2 for 144 – (180 – 144)
	'144' – 2 × '18'			M1	
		108		A1	dep on M1
	Alternative				
	Pentagon approach – drawing in a pentagon or a statement recognising that the required angle is one of a regular pentagon		4	M1	May be implied by further work
	$180 - \frac{360}{5}$ or $\frac{(5-2)\times 180}{5}$			M2	(M1 for exterior angle of pentagon as long as not seen as interior angle or given as answer)
		108		A1	dep on M1
					Total 4 marks

14	(a)	$5 \times \frac{10}{4}$ oe	12.5	2	M1 A1
	(b)	$18 \div \frac{10}{4}$ oe	7.2	2	M1 A1
	(c)		$6.25T$	1	B1 Accept $T \times \left(\frac{10}{4}\right)^2$
					Total 5 marks

15	(a)		Points correct Curve or line segments joining points	2	B1 B1	$\pm \frac{1}{2}$ square ft curve/line segments from points if 3 or 4 plotted correctly or if all 5 points are plotted consistently within successive 10 unit intervals at the correct heights.
	(b)	30 (or 30.5) indicated on cf graph or stated, or vertical line corresponding to height = 30 (or 30.5) ($\pm \frac{1}{2}$ sq)	157 - 159	2	M1 A1ft	30 or (30.5) indicated on cf graph or stated. If M1 scored ft from a **cf graph** If M1 not scored, ft only from correct curve.
	(c)	Vertical line or mark drawn at 174 cm or horizontal line corresponding to height = 174 cm ($\pm \frac{1}{2}$ sq)	5 or 6	2	M1 A1 ft	174 indicated on the cf graph If M1 scored ft from a **cf graph** If M1 not scored, ft only from correct curve. Whole number answer only
						Total 6 marks

16	(a)		$6x - 12$	2	M1 A1	for $6x$ or -12 (allow $2\times3x$ for $6x$) fully correct
	(b)	'$6x - 12$' = 18 oe	(5, 23)	3	M1ft M1 A1	ft equation in form $ax + b$ ($a \neq 0$, $b \neq 0$) Full method to solve their equation (5, 23)
						Total 5 marks

17	(a)		$\frac{2e^2}{f^4}$	2	B2	Fully correct. Accept $2e^2f^{-4}$ B1 for 2 out of 3 correct terms in a product or quotient
	(b)		$2(y + 6)(y - 6)$	2	M1 A1	for $2(y^2 - 36)$ or $(2y - 12)(y + 6)$ or $(2y + 12)(y - 6)$
	(c)	$\frac{(p - 3)(2p + 5)}{p(p - 3)}$	$\frac{2p + 5}{p}$	3	M1 M1 A1	$(p - 3)(2p + 5)$ $p(p - 3)$ or $(p + 0)(p - 3)$ oe e.g. $2 + \frac{5}{p}$ (NB: if candidates incorrectly cancel a correct algebraic fraction they lose the A mark)
						Total 7 marks

18	(a)	$y = k\sqrt{x}$ or $cy = \sqrt{x}$	$y = \frac{4}{7}\sqrt{x}$	3	M1	M2 for $k = \frac{4}{7}$
		$4 = k \times \sqrt{49}$ or $4c = \sqrt{49}$			M1	
					A1	Accept $y = 0.571(1428)\sqrt{x}$ Note: Award M2A1 if answer given is $y = k\sqrt{x}$ with k evaluated as $\frac{4}{7}$ in (a) or (b).
	(b)	$12 = "\frac{4}{7}" \times \sqrt{x}$ $(\sqrt{x} = 21)$	441	2	M1	Allow ft if M1 scored in (a) but not if k =1
					A1	ft from $12 = "\frac{4}{7}" \times \sqrt{x}$ but not if $k = 1$
						Total 5 marks

19	$\tan 38 = \frac{QS}{8.4}$ **or** $\tan 52 = \frac{8.4}{QS}$ **or** $\frac{QS}{\sin 38} = \frac{8.4}{\sin 52}$		4	M1	Must be a correct equation
	$(QS =)\ 8.4\tan 38$ **or** $(QS =)\ 8.4/\tan 52$ **or** $(QS =)\frac{8.4\sin 38}{\sin 52}$ (=6.56…)			M1	A correct calculation for *QS* or 6.56…
	$(QR =)\frac{'6.56'}{\cos 44}$ **or** $(QR =)\ \frac{'6.56'}{\sin 46}$			M1	A correct calculation with their *QS* for length *QR*
	QR = 9.12(336459)	9.12		A1	Awrt 9.12
	Alternative				
	$\cos 38 = \frac{8.4}{PQ}$ or $\sin 52 = \frac{8.4}{PQ}$		4	M1	Must be a correct equation
	$(PQ =)\ \frac{8.4}{\cos 38}$ or $(PQ =)\frac{8.4}{\sin 52}$ (=10.65…)			M1	A correct calculation for *PQ* Or 10.6\7…
	$(QR =)\ \frac{'10.65..'}{\sin 46} \times \sin 38$			M1	A correct calculation with their *PQ* for length *QR*
	QR = 9.12(336459)	9.12		A1	Awrt 9.12
					Total 4 marks

20	$BP \times 10 = 15 \times 8$ **or** $(10+AB) \times 10 = 15 \times 8$ oe $(BP =)\ (15 \times 8) \div 10\ (= 12)$ oe **or** $10AB = 120 - 100$ oe **or** $10 + AB = (15 \times 8) \div 10$ oe	2	3	M1 M1 A1	for a correct equation a correct calculation for *BP* or a correct simplified equation for *AB*
					Total 3 marks

21	$(BC^2 =)\ 4.8^2 + 6.4^2 - 2 \times 4.8 \times 6.4 \times \cos 123^\circ$ $(BC^2 =)$ 23.04+40.96+33.46..oe (=97.4(6262231))	9.87	3	M1 M1 A1	Correct use of cosine rule to find BC^2 Correct order of operations & correct values awrt 9.87
					Total 3 marks

22	$\frac{6(x+1)-6(x-2)}{(x-2)(x+1)}$ **or** $\frac{6(x+1)}{(x-2)(x+1)}-\frac{6(x-2)}{(x-2)(x+1)}$ (=1) oe		5	M1	Correct single fraction or 2 fractions with the same correct common denominator If expanded, condone 1 error in numerator
	$6(x+1)-6(x-2)=(x+1)(x-2)$ oe $(18=x^2-x-2)$			M1	Correct removal of denominator (M2 if a candidate goes straight to this stage) if expanded, condone 1 error
	x^2-x-20 (=0)			A1	Correct 3 part quadratic (eg x^2-x-20 (=0) or $x^2-x=20$ or $x^2=x+20$)
	$(x+4)(x-5)$ (= 0)			M1	$(x+4)(x-5)$ (= 0) or a fully correct substitution into the quadratic formula eg $\frac{--1\pm\sqrt{(-1)^2-4\times1\times-20}}{2\times1}$ Condone no brackets around -1 or $\frac{1\pm\sqrt{81}}{2}$
		$x=5, x=-4$		A1	dep on last M1
					Total 5 marks

23	*Allow use of* $\pi = 3.14..$ *consistently throughout, for either scheme, but not a rounded decimal for the radius* $\pi \times (4\sqrt{3})^2$ or $2\pi \times (4\sqrt{3})^2$ or $2\pi \times 4\sqrt{3}h$		5	M1	correct expression for curved surface area or area of 1 or 2 circles (condone missing brackets around $4\sqrt{3}$ forM1M1)
	$2\pi \times (4\sqrt{3})^2 + 2\pi \times 4\sqrt{3}h$ $(=56\pi\sqrt{6})$			M1	correct expression for total surface area (candidate may have already divided by π or do so at any stage if already working in an equation)
	$96\pi + 8\pi \times \sqrt{3}h$ $(=56\pi\sqrt{6})$ $(h=)\dfrac{56\pi\sqrt{6} - 2\pi(4\sqrt{3})^2}{2\pi(4\sqrt{3})}$			M1	A correct simplified expression for total the total surface area or a correct expression for h
	$(h=)\dfrac{56\pi\sqrt{6} - 96\pi}{8\pi\sqrt{3}}$ or $(h=)\dfrac{56\sqrt{6} - 96}{8\sqrt{3}}$ oe			M1	correct rearrangement in terms of h and simplified as a quotient
		$7\sqrt{2} - 4\sqrt{3}$		A1	dep on M2
	Alternative				
	$2\pi rh + 2\pi r^2$ or $2\pi rh + \pi r^2$		5	M1	A correct algebraic expression for the csa + 2 circles or csa + 1 circle
	$2rh + 2r^2 = 56\sqrt{6}$ or $rh + r^2 = 28\sqrt{6}$ or $2\pi r(h + r) = 56\pi\sqrt{6}$ or $2\pi rh = 56\pi\sqrt{6} - 2\pi r^2$			M1	A correct equation and correct division by π or 2π or a correct factorisation or correctly isolating term in h
	$(h=)\dfrac{56\pi\sqrt{6}}{2\pi r} - r$ or $(h=)\dfrac{56\pi\sqrt{6} - 2\pi r^2}{2\pi r}$ oe			M1	A fully correct expression for h
	$(h=)\dfrac{56\pi\sqrt{6}}{2\pi 4\sqrt{3}} - 4\sqrt{3}$ or $(h=)\dfrac{56\pi\sqrt{6} - 96\pi}{8\pi\sqrt{3}}$ oe			M1	Correct substitution of r into a correct equation or expression for h
		$7\sqrt{2} - 4\sqrt{3}$		A1	dep on M2
					Total 5 marks

24	$\frac{50}{360} \times \pi \times r^2 = 20\pi$ oe		5	M1	A correct equation for area of sector
	$r^2 = \frac{360 \times 20}{50}$ or $\frac{360 \times 20\pi}{50\pi}$ oe (=144)			M1	Correct rearrangement in terms of r^2
	$r = 12$			A1	$r = 12$
	(perimeter =) $12 + 12 + \frac{50}{360} \times 2 \times 12 \times \pi$ $(= 24 + \frac{10\pi}{3})$ (=24 + 10.47...)	34.5		M1ft A1	(ft dep on M2) for arc length $\frac{50}{360} \times 2 \times$ '12' $\times \pi$ (=10.47...) Or $l = \frac{20\pi}{12 \times 0.5}$ oe Accept 34.4 - 34.5
					Total 5 marks
	Misread of 20 for 20π				
	$\frac{50}{360} \times \pi \times r^2 = 20$			M1	Equation for area of sector using 20
	$r^2 = \frac{360 \times 20}{50\pi}$ (=45.8…)			M1	Correct rearrangement in terms of r^2
	$r = 6.77$			A0	
	(perimeter =) $6.77+6.77+\frac{50}{360} \times 2 \times$ '6.77' $\times \pi$ (=19.4….)			M1ft A0	(ft dep on M2) for arc length $\frac{50}{360} \times 2 \times$ '6.77' $\times \pi$ (=5.91…)
					(Misread maximum 3 marks)

25	32 or 3.2 or 10^{10k} 32×10^{10k} $3.2 \times 10^{10k+1}$	 $3.2 \times 10^{10k+1}$	3	M1 M1 A1
				Total 3 marks

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