

Mark Scheme Summer 2008

IGCSE

IGCSE Mathematics (4400)

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Summer 2008

Publications Code UG020267

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Summer 2008 IGCSE Maths Mark Scheme - Paper 3H

Q	Working	Answer	Mark	Notes
1.	$\frac{17.28}{2.4}$		2	M1 for 17.28 or 2.4 or - 0.114... seen
		7.2		A1 for 7.2 oe inc $7\frac{1}{5}$ and $\frac{36}{5}$
				Total 2 marks

2.	$\frac{1-0.6}{2}$		2	M1 for 1 - 0.6 or 0.4 seen or $\frac{x}{2}$ where $0 < x < 1$
		0.2 oe		A1 for 0.2 oe
				Total 2 marks

3. (a)	Enlargement scale factor 2 centre (1, 3)	3	B3 B1 for enlargement, enlarge etc B1 for 2, $\times 2$, two, $\frac{2}{1}$, 1 : 2, 2 : 1 B1 for (1, 3) Condone omission of brackets but do not accept $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$	These marks are independent but award no marks if answer is not a single transformation
(b)	Reflection in the line $y = x$	2	B2 B1 for reflection, reflect etc B1 for $y = x$ oe inc eg 'in line from (2,2) to (5,5)', 'in dotted line shown'	
				Total 5 marks

4.	3 + 1 or 4 seen		2	M1 for 3 + 1 or 4 seen	
		210		A1 for 210 cao	
					Total 2 marks

5.	(a)(i)	1, 9, 17	2	B1 cao	Brackets not necessary
	(ii)	1, 5, 9, 13, 17, 25, 33		B1 cao (B0 if 1, 9 or 17 repeated)	
	(b)	eg No members in common. The intersection is empty. None of the members of A & C are the same. They don't have the same numbers. No numbers are in both A and C .	1	B1	
					Total 3 marks

6.	$\tan x^\circ = \frac{3}{8} = 0.375$		3	M1 for tan A1 for $\frac{3}{8}$ or 0.375	or M1 for sin and $\frac{3}{\sqrt{73}}$ following correct Pythagoras and A1 for 0.3511... or M1 for cos and $\frac{8}{\sqrt{73}}$ following correct Pythagoras and A1 for 0.9363...
		20.6		A1 for 20.6 or better (Accept 20.55604... rounded or truncated to 4 sig figs or more)	
					Total 3 marks

7.	$\pi \times 7.8$ or $2\pi \times 3.9$		2	M1 for $\pi \times 7.8$ or $2\pi \times 3.9$	
		24.5		A1 for 24.5 or for answer which rounds to 24.49, 24.50 or 24.51 ($\pi \rightarrow 24.5044...$ $3.14 \rightarrow 24.492$ $3.142 \rightarrow 24.5076$)	
					Total 2 marks

8. (a)		$n = 2p + 1$ oe	3	B3 for $n = 2p + 1$ oe eg $n = p2 + 1, 1 + p \times 2 = n,$ $n = p + p + 1$ B2 for $2p + 1$ oe B1 for $n =$ linear function of p eg $n = p + 1$
(b)	$2p = n - 1$ or $\frac{n}{2} = p + \frac{1}{2}$		2	M1 for $2p = n - 1$ or $\frac{n}{2} = p + \frac{1}{2}$
		$\frac{n-1}{2}$ oe		A1 for $\frac{n-1}{2}$ oe inc $\frac{n}{2} - \frac{1}{2}$
				Total 5 marks

9. (a)	$7x - 7 = 5 - 2x$ $7x + 2x = 5 + 7$ or $9x = 12$		3	M1 for $7x - 7$ seen M1 for $7x + 2x = 5 + 7$ or $9x = 12$ or for $7x + 2x = 5 + 1$ or $9x = 6$ following $7x - 1 = 5 - 2x$
		$1\frac{1}{3}$ oe		A1 for $1\frac{1}{3}$ oe inc $\frac{4}{3}, \frac{12}{9}, 1.\dot{3}, 1.33$
(b)(i)	$4x \leq 16$		4	M1 for $4x \leq 16$
		$x \leq 4$		A1 for $x \leq 4$
(ii)		1 2 3 4		B2 B1 for 3 correct and none wrong or for 4 correct and 1 wrong
				Total 7 marks

10. (a)	29 832 – 28 250 or 1582 seen		3	M1 M1 for $\frac{1582}{28250}$ or $\frac{1582}{29832}$ or 0.056 or 0.053...	or M1 for $\frac{29832}{28250}$ or 1.056 or 105.6 M1 for "1.056" – 1 or "105.6" – 100	or M1 for $\frac{28250}{29832}$ or 0.9469... or 94.69... M1 for 1 – "0.9469" or 100 – "94.69"
		5.6		A1 cao (Do <i>NOT</i> award for 5.3)		
(b)	$\frac{28141}{1.052}$ or $28141 \times \frac{100}{105.2}$		3	M2 for $\frac{28141}{1.052}$ or $28141 \times \frac{100}{105.2}$ M1 for $\frac{28141}{105.2}$, 105.2%=28141 or 267.5(0) seen		
		26 750		A1 cao		
						Total 6 marks

11. (a)		$60 < p \leq 70$	1	B1 Accept 60-70
(b)	$55 \times 7 + 65 \times 21 + 75 \times 15 + 85 \times 14 + 95 \times 3$ or $385 + 1365 + 1125 + 1190 + 285$ or 4350		4	M1 for finding at least four products $f \times x$ consistently within intervals (inc end points) and summing them
M1 (dep) for use of halfway values (55, 65, ...) or (55.5, 65.5, ...)				
	$\frac{"4350"}{60}$			M1 $\frac{"4350"}{60}$ (dep on 1st M1) for division by 60 or for $\frac{"4380"}{60}$ if 55.5, 65.5, ... used
		72.5		A1 for 72.5 Award 4 marks for 73 if first two M marks awarded
(c)	30 (or 30½) indicated on graph or stated		2	M1 for 30 (or 30½) indicated on graph or stated
		124 or 125		A1 Accept any value in range 124-125 inc eg 124, 124.5, 125
(d)	Use of $p = 131$ on graph		2	M1 for use of $p = 131$ shown on graph or implied by 47, 48 or 49 stated
		≈ 12		A1 Accept any value in range 11-13 inc
				Total 9 marks

12.	3^2 or 9 or value which rounds to 3.39 seen		2	M1 for 3^2 or 9 or value which rounds to 3.39 seen
		36		A1 for 36 cao
				Total 2 marks

13.	finds int angle of hexagon $\frac{(6-2) \times 180}{6}$	finds ext angle of hexagon $\frac{360}{6}$		5	M1 for $\frac{(6-2) \times 180}{6}$ or $\frac{360}{6}$	Award M1 A1 for int angle of hexagon shown as 120° or ext angle shown as 60° on printed diagram or on candidate's own diagram	If there is <i>clear</i> evidence the candidate thinks the <i>interior</i> angle is 60° or the <i>exterior</i> angle is 120° , do not award these two marks.
	120	60		A1 for 120 or 60			
	int angle of polygon = 150 or ext angle of polygon = 30				B1 int angle of polygon = 150 or ext angle of polygon = 30	Award B1 for int angle of polygon shown as 150° or ext angle shown as 30° on printed diagram or on candidate's own diagram	
	$\frac{360}{30}$ or $\frac{180(n-2)}{n} = 150$ oe				M1 for $\frac{360}{30}$ or $\frac{180(n-2)}{n} = 150$ oe		
			12		A1 for 12 cao Award no marks for an answer of 12 with no working. Award 5 marks for an answer of 12 if at least 2 of the previous 4 marks scored.		
						Total 5 marks	

14.	(a)		$5(2y - 3)$	1	B1	cao
	(b)		$3pq(3p + 4q)$	2	B2	B1 for $3pq(\dots)$ or $\dots(3p + 4q)$ or $3p(3pq + 4q^2)$ or $3q(3p^2 + 4pq)$ or $pq(9p + 12q)$ or $3(3p^2q + 4pq^2)$ ie for two factors, one of which is $3pq$ or $(3p + 4q)$, or for correct, but incomplete, factorisation
	(c)(i)		$(x - 2)(x + 8)$	3	B2	B1 for one correct factor or $(x + 2)(x - 8)$
	(ii)		2, -8		B1	ft from (i) if two linear factors
						Total 6 marks

15.	(a)(i)		57.5	2	B1	for 57.5, 57.4 $\dot{9}$, 57.499, 57.4999 etc but <i>NOT</i> for 57.49
	(ii)		56.5		B1	for 56.5 Also accept 56.50
	(b)	62.5 - "56.5"		2	M1	for 62.5 - "56.5" Accept 62.4 $\dot{9}$, 62.499, 62.4999 etc instead of 62.5
			6		A1	for 6, 5.9, 5.999 etc ft from "56.5"
						Total 4 marks

16. (a)	$\frac{5}{9} \times \frac{5}{9}$		2	M1 for $\frac{5}{9} \times \frac{5}{9}$	Sample space method - award 2 marks for a correct answer, otherwise no marks
		$\frac{25}{81}$		A1 for $\frac{25}{81}$ or 0.31 or better	
(b)	$\frac{1}{9} \times \frac{1}{9}$ or $\frac{1}{81}$		3	M1 for $\frac{1}{9} \times \frac{1}{9}$ or $\frac{1}{81}$	Sample space method - award 3 marks for a correct answer, otherwise no marks
	$\frac{1}{9} \times \frac{1}{9} \times 4$ oe			M1 for $\frac{1}{9} \times \frac{1}{9} \times 4$ oe	
		$\frac{4}{81}$		A1 for $\frac{4}{81}$ or 0.05 or better	
Total 5 marks					

17. (a)	$d = k\sqrt{h}$		3	M1 for $d = k\sqrt{h}$ but not for $d = \sqrt{h}$ Also award for $d = \text{some numerical value} \times \sqrt{h}$	
	$54 = 15k$			M1 for $54 = 15k$ Also award for $54 = k\sqrt{225}$	
		$3.6\sqrt{h}$ oe		A1 for $3.6\sqrt{h}$ oe Award 3 marks if answer is $d = k\sqrt{h}$ but k is evaluated as 3.6 oe in <i>any</i> part	
(b)		28.8	1	B1 ft from "3.6" $\times 8$ except for $k = 1$, if at least M1 scored in (a) (1 d.p. accuracy or better in follow through)	
(c)	$\sqrt{h} = \frac{61.2}{\text{"3.6"}}$		2	M1 for $\sqrt{h} = \frac{61.2}{\text{"3.6"}}$ except for $k = 1$	
		289		A1 cao	
Total 6 marks					

18.	$\frac{a}{\sin 35^\circ} = \frac{6.8}{\sin 64^\circ}$		3	M1 for correct statement of Sine rule
	$a = \frac{6.8 \sin 35^\circ}{\sin 64^\circ}$			M1 for correct rearrangement
		4.34		A1 for 4.34 or 4.3395... rounded or truncated to 4 figures or more
				Total 3 marks

19.	<p>eg $\frac{12}{\sqrt{8}} = \frac{12}{2\sqrt{2}} = \frac{12}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{12\sqrt{2}}{4}$</p> <p>$\frac{12}{\sqrt{8}} = \frac{12}{2\sqrt{2}} = \frac{6}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{6\sqrt{2}}{2}$</p> <p>$\frac{12}{\sqrt{8}} = \frac{12}{\sqrt{8}} \times \frac{\sqrt{8}}{\sqrt{8}} = \frac{12\sqrt{8}}{8} = \frac{3 \times 2\sqrt{2}}{2}$</p> <p>$\frac{12}{\sqrt{8}} = \frac{12}{\sqrt{8}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{12\sqrt{2}}{\sqrt{16}}$</p>		2	<p>B1 for use of $\sqrt{8} = 2\sqrt{2}$ or $\sqrt{8} \times \sqrt{2} = \sqrt{16}$</p> <p>B1 for multiplication of numerator and denominator by $\sqrt{2}$ or $\sqrt{8}$ (in either order)</p> <p>SC B1 for $12 = 3\sqrt{16}$</p> <p>or for both $\left(\frac{12}{\sqrt{8}}\right)^2 = \frac{144}{8} = 18$</p> <p>and $(3\sqrt{2})^2 = 9 \times 2 = 18$</p> <p>NB only total of 1 mark for either of these approaches</p>
				Total 2 marks

20.	(a)(i)	59	2	B1	cao
	(ii)	<p>angle at the centre = twice angle at the circumference or angle at the circumference = half the angle at the centre</p>		B1	<p>Three key points must be mentioned</p> <ol style="list-style-type: none"> 1. angle at centre/middle/<i>O</i>/origin 2. twice/double/2× or half/$\frac{1}{2}$ as appropriate 3. angle at circumference/edge/perimeter (<i>NOT</i> e.g. angle <i>R</i>, angle <i>PRQ</i>, angle at top, angle at outside)

20. (b)	180 - (x + 36) oe seen (possibly marked on diagram as size of $\angle ACB$)		5	B1 for 180 - (x + 36) oe seen, either on its own or as part of an equation (This mark may still be scored, even if brackets are later removed incorrectly.)	
				SC (Max of 2 M marks) for omission of brackets in -(x + 36) or their incorrect removal	
	$x = 2(180 - (x + 36))$ or $x = 2(180 - x - 36)$ or $180 - (x + 36) = \frac{x}{2}$ or $180 - x - 36 = \frac{1}{2}x$			M1 $x = 2(180 - (x + 36))$ or $x = 2(180 - x + 36)$ or $180 - x + 36 = \frac{1}{2}x$ or $180 - 36 + x = \frac{1}{2}x$	M1
	$x = 360 - 2x - 72$ or $x + \frac{1}{2}x = 180 - 36$			M1 $x = 360 - 2x + 72$ or $x + \frac{1}{2}x = 180 + 36$ (Note - incorrect simplification results in an answer of $x = 144$)	M1
	$3x = 360 - 72$ or $3x = 288$ or $\frac{3}{2}x = 180 - 36$ or $\frac{3}{2}x = 144$			M1	
		96		A1 cao	

Please note that there is an alternative method on the next page.

20. (b)	OR			
	$\frac{x}{2}$ oe seen (possibly marked on diagram as size of $\angle ACB$)		5	B1
	$x + 36 + \frac{x}{2} = 180$			M1
		96		A1 cao
				Total 7 marks

21. (a)	tan drawn at (3, 6.5)		3	M1	tan or tan produced passes between points (2, $0 \leq y \leq 4$) and (4, $9 \leq y \leq 12$)
	$\frac{\text{vertical difference}}{\text{horizontal difference}}$			M1	finds their $\frac{\text{vertical difference}}{\text{horizontal difference}}$ for two points on tan or finds their $\frac{\text{vertical difference}}{\text{horizontal difference}}$ for two points on curve, where one of the points has an x -coordinate between 2.5 and 3 inc and the other point has an x -coordinate between 3 and 3.5 inc
		2.5-6.5 inc		A1	dep on both M marks
(b)		-1.7	1	B1	Accept answer in range -1.7 - -1.65
(c)(i)	line joining (-1,11) & (1,13)		4	M1	
		12		A1	cao
(ii)	produces line to cut curve again			M1	
		4		A1	ft from line
					Total 8 marks

first part - finds area of $\triangle BCD$ and/or length of BD

22.	Area of $\triangle BCD = 2$		6	B1 for area of triangle BCD
	$(BD^2 \Rightarrow) 2^2 + 2^2$ or $\left(\frac{BD}{2}\right)^2 + \left(\frac{BD}{2}\right)^2 = 2^2$ or $\frac{BD/2}{2} = \cos 45^\circ$ or $\sin 45^\circ$ or $\frac{BD}{2} = 2 \cos 45^\circ$ or $2 \sin 45^\circ$			M1 for correct start to Pythagoras or trig for finding BD or $\left(\frac{BD}{2}\right)$
	$(BD \Rightarrow) \sqrt{8}$ or $2\sqrt{2}$ or 2.83 or better (2.8284...) or $\left(\frac{BD}{2}\right) = \sqrt{2}$ or $\frac{\sqrt{8}}{2}$ or 1.41 or better (1.4142...)			A1 for lengths BD or $\left(\frac{BD}{2}\right)$ correct

second part method 1 - uses Pythagoras to find AM , where M is midpoint of BD

	$AM^2 = 10^2 - \left(\frac{BD}{2}\right)^2$			M1
	$AM = \sqrt{98}$ or $7\sqrt{2}$ or 9.90 or better (9.8994...)			A1 for $\sqrt{98}$ or $7\sqrt{2}$ 9.90 or better
		16		A1 for 16 or answer rounding to 16.0
				Total 6 marks

second part method 2 - finds angle A either using Cosine Rule or by first finding $\frac{A}{2}$ using trig

	$\cos A = \frac{10^2 + 10^2 - BD^2}{2 \times 10 \times 10} \text{ or } \frac{192}{200} \text{ or } 0.96$ $\text{or } \sin \frac{A}{2} = \frac{BD/2}{10} \text{ or } \frac{\sqrt{8}}{20} \text{ or } 0.141 \text{ or better}$ <p style="text-align: center;">(0.14142...)</p>			M1
	$(A \Rightarrow) 16.3 \text{ or better } (16.2602\dots)$			A1 for angle A correct
		16		A1 for 16 or answer rounding to 16.0
				Total 6 marks

second part method 3 - finds angle ABD (or angle ADB) using trig or Cosine Rule

	$(\cos \angle ABD \Rightarrow) \frac{BD/2}{10} \text{ or } (\cos \angle ABD \Rightarrow) \frac{10^2 + BD^2 - 10^2}{2 \times 10 \times BD}$ $\text{or } \cos \angle ABD = \frac{\sqrt{8}}{20} \text{ or } 0.141 \text{ or better } (0.14142\dots)$			M1
	$(\angle ABD \Rightarrow) 81.9^\circ \text{ or better } (81.8698\dots)$			A1
		16		A1 for 16 or answer rounding to 16.0
				Total 6 marks

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