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, × 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.	$\tan x° = \frac{3}{8} = 0.375$		3	M1 A1	for tan 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 M1	for $7x - 7$ seen 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	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"
				M1 for $\frac{1582}{28250}$ or $\frac{1582}{29832}$ or 0.056 or 0.053...		
		5.6		A1 cao (Do *NOT* 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 *clear* evidence the candidate thinks the *interior* angle is 60° or the *exterior* 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 $3pq(\ldots)$ or $\ldots(3p + 4q)$ 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, $57.49\dot{}$, 57.499, 57.4999 etc but *NOT* 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 $62.49\dot{}$, 62.499, 62.4999 etc instead of 62.5
		6		A1	for 6, $5.9\dot{}$, 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 $\frac{1}{81}$	*SC* M1 for $\frac{1}{9}\times\frac{1}{8}$ or $\frac{1}{72}$	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	M1 for $\frac{1}{9}\times\frac{1}{8}\times 4$ 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 = 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 *any* 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)	$\sqrt{h} = \frac{61.2}{"3.6"}$		2	M1	for $\sqrt{h} = \frac{61.2}{"3.6"}$ except for k = 1	
		289		A1	cao	
						Total 6 marks

18.	$\frac{a}{\sin 35°} = \frac{6.8}{\sin 64°}$		3	M1	for correct statement of Sine rule
	$a = \frac{6.8 \sin 35°}{\sin 64°}$			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.	eg $\frac{12}{\sqrt{8}} = \frac{12}{2\sqrt{2}} = \frac{12}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{12\sqrt{2}}{4}$ $\frac{12}{\sqrt{8}} = \frac{12}{2\sqrt{2}} = \frac{6}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{6\sqrt{2}}{2}$ $\frac{12}{\sqrt{8}} = \frac{12}{\sqrt{8}} \times \frac{\sqrt{8}}{\sqrt{8}} = \frac{12\sqrt{8}}{8} = \frac{3 \times 2\sqrt{2}}{2}$ $\frac{12}{\sqrt{8}} = \frac{12}{\sqrt{8}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{12\sqrt{2}}{\sqrt{16}}$		2	B1 B1	for use of $\sqrt{8} = 2\sqrt{2}$ or $\sqrt{8} \times \sqrt{2} = \sqrt{16}$ for multiplication of numerator and denominator by $\sqrt{2}$ or $\sqrt{8}$ (in either order)
					SC B1 for $12 = 3\sqrt{16}$ or for both $\left(\frac{12}{\sqrt{8}}\right)^2 = \frac{144}{8} = 18$ and $(3\sqrt{2})^2 = 9 \times 2 = 18$ NB only total of 1 mark for either of these approaches
					Total 2 marks

20. (a)(i)		59	2	B1	cao
(ii)	angle at the centre = twice angle at the circumference or angle at the circumference = half the angle at the centre			B1	Three key points must be mentioned 1. angle at centre/middle/*O*/origin 2. twice/double/2× or half/ $\frac{1}{2}$ as appropriate 3. angle at circumference/edge/perimeter (*NOT* e.g. angle *R*, angle *PRQ*, 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 ΔBCD and/or length of *BD*

22.	Area of $\Delta BCD = 2$		6	B1	for area of triangle *BCD*
	$(BD^2 =)2^2 + 2^2$ or $\left(\frac{BD}{2}\right)^2 + \left(\frac{BD}{2}\right)^2 = 2^2$ or $\frac{BD/2}{2} = \cos 45°$ or $\sin 45°$ or $\frac{BD}{2} = 2\cos 45°$ or $2\sin 45°$			M1	for correct start to Pythagoras or trig for finding *BD* or $\left(\frac{BD}{2}\right)$
	$(BD =)\sqrt{8}$ 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

	$\cos A = \frac{10^2 + 10^2 - BD^2}{2 \times 10 \times 10}$ or $\frac{192}{200}$ or 0.96 or $\sin\frac{A}{2} = \frac{BD/2}{10}$ or $\frac{\sqrt{8}}{20}$ or 0.141 or better (0.14142...)			M1	
	(*A* =) 16.3 or better (16.2602...)			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

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