Mark Scheme (Results)
Summer 2008

IGCSE Mathematics (4400) Paper 3H

Summer 2008 IGCSE Maths Mark Scheme – Paper 3H

Q	Working	Answer	Mark	Notes	
1.	$\dfrac{17.28}{2.4}$		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	

Q	Working	Answer	Mark	Notes	
2.	$\dfrac{1-0.6}{2}$		2	M1 for 1 – 0.6 or 0.4 seen or $\dfrac{x}{2}$ where 0 < x < 1	
		0.2 oe		A1 for 0.2 oe	
				Total 2 marks	

Q		Working	Answer	Mark	Notes	
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.	$\tan x° = \dfrac{3}{8} = 0.375$		3	M1	for tan	or M1 for sin and $\dfrac{3}{\sqrt{"73"}}$ following correct Pythagoras and A1 for 0.3511... or M1 for cos and $\dfrac{8}{\sqrt{"73"}}$ following correct Pythagoras and A1 for 0.9363...
				A1	for $\dfrac{3}{8}$ or 0.375	
		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 ($\pi \to 24.5044...$ $3.14 \to 24.492$ $3.142 \to 24.5076$)	
						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 $\dfrac{n}{2} = p + \dfrac{1}{2}$		2	M1	for $2p = n - 1$ or $\dfrac{n}{2} = p + \dfrac{1}{2}$
			$\dfrac{n-1}{2}$ oe		A1	for $\dfrac{n-1}{2}$ oe inc $\dfrac{n}{2} - \dfrac{1}{2}$
						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 $\dfrac{4}{3}$, $\dfrac{12}{9}$, $1.\dot{3}$, 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	or
					M1	for $\dfrac{1582}{28250}$ or $\dfrac{1582}{29832}$ or 0.056 or 0.053...	M1 for $\dfrac{29832}{28250}$ or 1.056 or 105.6 M1 for "1.056" − 1 or "105.6" − 100	M1 for $\dfrac{28250}{29832}$ or 0.9469... or 94.69... M1 for 1 − "0.9469" or 100 − "94.69"
			5.6		A1	cao (Do *NOT* award for 5.3)		
	(b)	$\dfrac{28141}{1.052}$ or $28141 \times \dfrac{100}{105.2}$		3	M2	for $\dfrac{28141}{1.052}$ or $28141 \times \dfrac{100}{105.2}$ M1 for $\dfrac{28141}{105.2}$, 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, …)
		$\dfrac{"4350"}{60}$			M1	$\dfrac{"4350"}{60}$ (dep on 1st M1) for division by 60 or for $\dfrac{"4380"}{60}$ 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 $\dfrac{(6-2)\times180}{6}$	finds ext angle of hexagon $\dfrac{360}{6}$		5	M1	for $\dfrac{(6-2)\times180}{6}$ or $\dfrac{360}{6}$	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	
	$\dfrac{360}{30}$ or $\dfrac{180(n-2)}{n}=150$ oe				M1	for $\dfrac{360}{30}$ or $\dfrac{180(n-2)}{n}=150$ 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 $3pq(...)$ or $...(3p + 4q)$ 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 *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 $62.4\dot{9}$, 62.499, 62.4999 etc instead of 62.5
			6		A1	for 6, $5.\dot{9}$, 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 $\frac{1}{81}$	*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)	$\sqrt{h} = \dfrac{61.2}{"3.6"}$		2	M1	for $\sqrt{h} = \dfrac{61.2}{"3.6"}$ except for $k = 1$
			289		A1	cao
						Total 6 marks

18.	$\dfrac{a}{\sin 35°} = \dfrac{6.8}{\sin 64°}$		3	M1	for correct statement of Sine rule
	$a = \dfrac{6.8\sin 35°}{\sin 64°}$			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 $\dfrac{12}{\sqrt{8}} = \dfrac{12}{2\sqrt{2}} = \dfrac{12}{2\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{12\sqrt{2}}{4}$ $\dfrac{12}{\sqrt{8}} = \dfrac{12}{2\sqrt{2}} = \dfrac{6}{\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{6\sqrt{2}}{2}$ $\dfrac{12}{\sqrt{8}} = \dfrac{12}{\sqrt{8}} \times \dfrac{\sqrt{8}}{\sqrt{8}} = \dfrac{12\sqrt{8}}{8} = \dfrac{3 \times 2\sqrt{2}}{2}$ $\dfrac{12}{\sqrt{8}} = \dfrac{12}{\sqrt{8}} \times \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{12\sqrt{2}}{\sqrt{16}}$		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 $\left(\dfrac{12}{\sqrt{8}}\right)^2 = \dfrac{144}{8} = 18$ 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 ∠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 $180 - (x + 36) = \dfrac{x}{2}$ or $180 - x - 36 = \dfrac{1}{2}x$			M1	$x = 2(180 - (x + 36))$ or $x = 2(180 - x + 36)$ or $180 - x + 36 = \dfrac{1}{2}x$ or $180 - 36 + x = \dfrac{1}{2}x$	M1
		$x = 360 - 2x - 72$ or $x + \dfrac{1}{2}x = 180 - 36$			M1	$x = 360 - 2x + 72$ or $x + \dfrac{1}{2}x = 180 + 36$ (Note – incorrect simplification results in an answer of $x = 144$)	M1
		$3x = 360 - 72$ or $3x = 288$ or $\dfrac{3}{2}x = 180 - 36$ or $\dfrac{3}{2}x = 144$			M1		
			96		A1	cao	

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

20.	(b)	OR			
		$\dfrac{x}{2}$ oe seen (possibly marked on diagram as size of $\angle ACB$)		5	B1
		$x + 36 + \dfrac{x}{2} = 180$			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, $0 \le y \le 4$) and (4, $9 \le y \le 12$)
		$\dfrac{\text{vertical difference}}{\text{horizontal difference}}$			M1	finds their $\dfrac{\text{vertical difference}}{\text{horizontal difference}}$ for two points on tan or finds their $\dfrac{\text{vertical difference}}{\text{horizontal difference}}$ 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
	$(BD^2 =)2^2 + 2^2$ or $\left(\dfrac{BD}{2}\right)^2 + \left(\dfrac{BD}{2}\right)^2 = 2^2$ or $\dfrac{BD/2}{2} = \cos 45°$ or $\sin 45°$ or $\dfrac{BD}{2} = 2\cos 45°$ or $2\sin 45°$			M1	for correct start to Pythagoras or trig for finding BD or $\left(\dfrac{BD}{2}\right)$
	$(BD =)\sqrt{8}$ or $2\sqrt{2}$ or 2.83 or better (2.8284...) or $\left(\dfrac{BD}{2}\right) = \sqrt{2}$ or $\dfrac{\sqrt{8}}{2}$ or 1.41 or better (1.4142...)			A1	for lengths BD or $\left(\dfrac{BD}{2}\right)$ correct

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

	$AM^2 = 10^2 - \left(\dfrac{BD}{2}\right)^2$			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 $\dfrac{A}{2}$ using trig

	$\cos A = \dfrac{10^2 + 10^2 - BD^2}{2 \times 10 \times 10}$ or $\dfrac{192}{200}$ or 0.96 or $\sin \dfrac{A}{2} = \dfrac{BD/2}{10}$ or $\dfrac{\sqrt{8}}{20}$ 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

	$(\cos \angle ABD =) \dfrac{BD/2}{10}$ or $(\cos \angle ABD =) \dfrac{10^2 + BD^2 - 10^2}{2 \times 10 \times BD}$ or $\cos \angle ABD = \dfrac{\sqrt{8}}{20}$ 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