

# Mark Scheme (Results) Summer 2010

IGCSE

IGCSE Mathematics (4400)  
Paper 3H Higher Tier

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## Summer 2010 IGCSE Mathematics (4400) Mark Scheme - Paper 3H

Apart from Questions 4(c), 16 and 21 (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	$\frac{15}{6}$ oe or $\frac{100}{6}$ oe inc value rounded or truncated to at least 1 dp eg 16.6, 16.7		2	M1
		250		A1 cao
b	$\frac{900}{6}$ or $\frac{5}{6}$ oe inc value rounded or truncated to at least 2 dp eg 0.83		2	M1
		750		A1 cao
				Total 4 marks

2 ai		62	2	B1 cao
ii		alternate		B1 Accept 'opposite and corresponding' (need both) or 'opposite, angle sum of triangle = 180° and sum of angles on a line = 180°' (need all three)
bi		71	2	B1 cao
ii		corresponding		B1 Accept 'opposite and alternate' (need both) or 'opposite, angle sum of triangle = 180° and sum of angles on a line = 180°' (need all three)
				Total 4 marks

3 a		6	1	B1 cao
b		7	1	B1 cao
				Total 2 marks

Q	Working	Answer	Mark	Notes
4 a		$5n + 30$	1	B1
b		$y^6$	1	B1 cao
c	$4x - 8 = 3$		3	M1 for correct expansion of $4(x-2)$ or for either $4x = 3 + 2$ or $4x = 5$ following $4x - 2 = 3$
	$4x = 8 + 3$ or $4x = 11$			M1 for $4x = 8 + 3$ or $4x = 11$
		$2\frac{3}{4}$ oe		A1 dep on 2 method marks
				Total 5 marks

5 a	$\frac{3}{10} \times \frac{5}{6}$		2	M1
		$\frac{15}{60}$ or $\frac{1}{4}$		A1 Accept $\frac{3}{12}, \frac{5}{20}$
b		24	2	B2 B1 for multiple of 24
				Total 4 marks

Q	Working	Answer	Mark	Notes
6 a		$400 < V \leq 500$	1	B1 Accept 400-500
b	$50 \times 2 + 150 \times 4 + 250 \times 6 + 350 \times 18$ $+ 450 \times 44 + 550 \times 6$ $= 100+600+1500+6300+19\ 800+3300$ $= 31\ 600$		4	M1 for finding at least 4 products $m \times f$ consistently within intervals (inc end points)
	$31\ 600 \div 80$			M1 (dep) for use of at least 4 correct halfway values
		395		M1 (dep on 1st M1) for adding and $\div$ by 80
				A1
c		2 6 12 30 74 80	1	B1 cao
d		Points correct	2	B1 $\pm \frac{1}{2}$ sq ft from sensible table
		Curve or line segments		B1 ft from points if 4 or 5 correct or if points are plotted consistently within each interval at the correct heights
e	Use of 40 (or 40.5) on graph or 40 (or 40.5) stated		2	M1 for use of 40 (or 40.5) on cf graph or for 40 (or 40.5) stated
		approx 420		A1 If M1 scored, ft from cf graph If no indication of method, ft only from correct curve & if answer is correct ( $\pm \frac{1}{2}$ sq tolerance) award M1 A1
				Total 10 marks

Q	Working	Answer	Mark	Notes
7	cos and 41 6.8 cos 41°		3	M1 or M1 for 6.8 sin 41° (4.461) and 6.8 <sup>2</sup> - "4.461" <sup>2</sup> (26.337) M1 for $\sqrt{26.337}$ or M1 for correct statement of Sine Rule eg $\frac{6.8}{\sin 90^\circ} = \frac{x}{\sin 49^\circ}$ M1 for correct expression for x eg $x = \frac{6.8 \sin 49^\circ}{\sin 90^\circ}$
		5.13		A1 for ans rounding to 5.13 (5.132025...)
				Total 3 marks

8	$\frac{1786}{0.76}$ or $1786 \times \frac{100}{76}$ oe		3	M2 for $\frac{1786}{0.76}$ or $1786 \times \frac{100}{76}$ oe M1 for $\frac{1786}{76}$ , 76% = 1786, $\frac{1786}{x} = 0.76$ , $1786 = 0.76x$ or 23.5 seen
		2350		A1 cao
				Total 3 marks

Q	Working	Answer	Mark	Notes
9 a		reflection in the line $y = -x$	2	B2 B1 for reflection B1 for $y = -x$ oe [accept eg “in dotted line” or “in line through (-5,5) and (5, -5)”] These marks are independent but award no marks if the answer is not a single transformation
b		R correct Vertices are (2,-1)(3,-1)(3,-3)	2	B2 B1 for 2 vertices correct or for a translation of R or for a 90° clockwise rotation of Q about (-1,1)
c		reflection in the line $y = 1$	2	B2 B1 for reflection B1 for $y = 1$ oe [accept eg “in a horizontal line through (0,1) ft from (b), if B1 scored in (b)"] As in (a)
				Total 6 marks

10 a		$-4 \leq x < 3$	2	B2 Also accept ‘ $x < 3$ and $x \geq -4$ ’ B1 for $-4 \leq x \leq 3$ , $-4 < x < 3$ , $-4 < x \leq 3$ , a double-ended inequality which is correct at one end (ignore the other end) Also award B1 for $x \geq -4$ , $x < 3$ , ‘ $x < 3$ or $x \geq -4$ ’
bi	$2x > -8$		4	M1 for $2x > -8$ or $x + 4.5 > 0.5$
		$x > -4$		A1 for $x > -4$ as final answer
ii		-3 -2 -1	2	B2 B1 for 3 correct and 1 wrong or for 2 correct and none wrong
				Total 6 marks

Q	Working	Answer	Mark	Notes
11 a	$\pi \times 8^2$		2	M1
		201		A1 for ans rounding to 201 ( $\pi \rightarrow 201.061\dots$ 3.14 $\rightarrow$ 200.96)
b	eg 8.5870... $\times$ 587.71		2	M1 for correct evaluation of at least 2 of the terms inside the brackets (126.75, 192, 268.96 accept if rounded or truncated to at least 3sf) or for correct evaluation of brackets (587.71 - accept 587, 588 or 587.7)
		5050		A1 Accept any answer in the range 5040-5050 inclusive. ( $\pi \rightarrow 5046.677\dots$ 3.14 $\rightarrow$ 5044.119...)
				Total 4 marks

12 a		18 13 2 -9 -14	2	B2 for all correct B1 for 3 or 4 correct
b		Points Curve	2	B1 $\pm \frac{1}{2}$ sq ft from (a) if at least B1 in (a)
				B1 ft if B1 awarded for points or if there is not more than one point incorrectly plotted and at least B1 scored in (a) Award for single curve (not line segments) which does not miss. more than one plotted point by more than $\frac{1}{2}$ square
ci		$3x^2 - 12$	4	B2 B2 for $3x^2 - 12$ B1 for two of three terms differentiated correctly
ii	$3 \times 5^2 - 12$			M1 for substn $x = 5$ in their (c)(i) if at least B1 scored in (c)(i)
		63		A1 cao
				Total 8 marks



Q	Working	Answer	Mark	Notes
13	There are 4 independent requirements to consider when marking this question but the order in which they are satisfied will vary. Focus on these 4 key points, ignoring irrelevant or incorrect statements.			
	$\angle PQS = 36^\circ$ or $\angle SPR = 54^\circ$		4	B1 May be stated or marked on diagram
	angles in the same segment			B1 Award if 'same segment', 'same arc', or 'same chord'
	$\angle PQR = 90^\circ$ or $\angle PSR = 90^\circ$ and angle in a semicircle is a right angle			B1 Angle may be stated or marked on diagram. Condone omission of 'is a right angle' oe.
		54		B1 cao
				Total 4 marks

14	ai		15	2	B1 cao
	ii		8.25		B1 cao
	b	$\frac{1}{2} \times 15 \times 8.25$		2	M1
			61.875		A1 Also accept 61.88
	c	$\frac{8.25}{25}$		3	M1 numerator "8.25" M1 denominator 25
			0.33		A1 cao
					Total 7 marks

Q	Working	Answer	Mark	Notes
15 a	$E = \frac{k}{r^2}$		3	M1 for $E = \frac{k}{r^2}$ but not for $E = \frac{1}{r^2}$
	$4 = \frac{k}{50^2}$			M1
		$\frac{10000}{r^2}$		A1 Award 3 marks if answer is $E = \frac{k}{r^2}$ but $k$ is evaluated as 10 000 in <i>any</i> part
b		25	1	B1 ft from $\frac{10000}{400}$ except for $k = 1$ , if at least M1 scored in (a)
c	$r^2 = \frac{10000}{1600}$ oe		2	M1 for substitution and rearrangement into form $r^2 = \frac{k}{1600}$ or $r = \frac{\sqrt{k}}{40}$ with their value of $k$ except for $k = 1$
		2.5 oe		A1 cao
				Total 6 marks

16	eg $9 - 3\sqrt{5} - 3\sqrt{5} + \sqrt{5}^2$ $9 - 2 \times 3\sqrt{5} + \sqrt{5}^2$		2	B2 B1 for $9 + \sqrt{5}^2$ or $9 + \sqrt{5}\sqrt{5}$ or $9 + \sqrt{25}$ or $3^2 + \sqrt{5}^2$ or $3^2 + \sqrt{5}\sqrt{5}$ or $3^2 + \sqrt{25}$ B1 for $-3\sqrt{5} - 3\sqrt{5}$ or for $-2 \times 3\sqrt{5}$
				Total 2 marks

Q	Working	Answer	Mark	Notes
17	$\frac{18}{12}$ or 1.5 oe or 18 : 12 oe		3	M1 for $\frac{18}{12}$ or 1.5 oe or 18 : 12 oe Also award for $\frac{12}{18}$ or $\frac{2}{3}$ or 12 : 18 oe
	$544 \times 1.5^2$			M1 for $1.5^2$ or 2.25 or $\frac{9}{4}$ or 9 : 4 oe Also award for $(\frac{2}{3})^2$ or $\frac{4}{9}$ or 4 : 9 oe
		1224		A1 cao
				Total 3 marks

18	$\frac{x(x+6)}{(x+6)(x-6)}$		3	B1 for $x(x+6)$ Accept $(x+0)(x+6)$ B1 for $(x+6)(x-6)$
		$\frac{x}{x-6}$		B1 cao
				Total 3 marks

Q	Working	Answer	Mark	Notes	
19 a	$\frac{3}{6} \times \frac{3}{6}$		2	M1 for $\frac{3}{6} \times \frac{3}{6}$ oe	
		$\frac{9}{36}$ or $\frac{1}{4}$ oe		A1 Sample space method - award 2 marks for a correct answer, otherwise no marks	
b	$\frac{1}{6} \times \frac{5}{6} + \frac{2}{6} \times \frac{3}{6}$ OR $\frac{1}{6} \times \frac{2}{6} + \frac{1}{6} \times \frac{3}{6} + \frac{2}{6} \times \frac{3}{6}$ OR $\frac{3}{6} \times \frac{3}{6} + \frac{1}{6} \times \frac{2}{6}$		3	M1 for one of $\frac{1}{6} \times \frac{5}{6}, \frac{2}{6} \times \frac{3}{6},$ $\frac{1}{6} \times \frac{2}{6}, \frac{1}{6} \times \frac{3}{6},$ $\frac{3}{6} \times \frac{3}{6}$	SC M1 for one of $\frac{1}{6} \times \frac{2}{5}, \frac{1}{6} \times \frac{3}{5},$ $\frac{2}{6} \times \frac{3}{5}$
				M1 for sum of 2 or 3 products which, evaluated accurately, gives the correct answer	M1 for $\frac{1}{6} + \frac{2}{6} \times \frac{3}{5}$ or $\frac{1}{6} \times \frac{2}{5} + \frac{1}{6} \times \frac{3}{5}$ $+ \frac{2}{6} \times \frac{3}{5}$
		$\frac{11}{36}$		A1 Sample space method - award 3 marks for a correct answer, otherwise no marks. Accept 0.305, 0.30, 0.31, 0.305, 0.306 etc but not 0.3	
				Total 5 marks	

Q	Working	Answer	Mark	Notes
20	13° or 19° angle of elevation identified		6	B1 On diagram or implied by working
				M1 for 40 tan 13° or 9.2347... rounded or truncated to at least 2 sf or any complete, correct method of finding the height of the flagpole
	$\tan 19^\circ = \frac{\text{"9.2347..."}}{BC}$			M1 or for $\tan 71^\circ = \frac{BC}{\text{"9.2347..."}}$
	$(BC =) \frac{\text{"9.2347..."}}{\tan 19^\circ}$ or $\frac{40 \tan 13^\circ}{\tan 19^\circ}$ or 26.819...			M1 for correct expression for BC, which need not be evaluated eg also accept $40 \tan 13^\circ \tan 71^\circ$ If evaluated, accept 26.7 or 26.8 or any value which rounds to 26.7 or 26.8 $(\frac{9.2}{\tan 19^\circ} \rightarrow 26.718...$ $\frac{9.23}{\tan 19^\circ} \rightarrow 26.805...)$
	$40^2 + \text{"26.819..."}^2$			M1 dep on first two M1s for $40^2 + \text{"26.819..."}^2$ or for complete, correct method of finding length of AC
		48.2		A1 for ans rounding to 48.2 (48.1590...) Award 6 marks for an answer which rounds to 48.2, if it has been obtained by a mathematically correct method
				Total 6 marks

Q	Working	Answer	Mark	Notes
21	$2x^2 = 3x + 14$ May be implied by second M1		5	M1 $y = 2\left(\frac{y-14}{3}\right)^2$
	$2x^2 - 3x - 14 (= 0)$			M1 $2y^2 - 65y + 392 = 0$
	$(2x - 7)(x + 2) (= 0)$ or $\frac{3 \pm \sqrt{121}}{4}$ or $\frac{3}{4} \pm \frac{\sqrt{121}}{4}$			M1 $(2y - 49)(y - 8) (= 0)$  or $\frac{65 \pm \sqrt{1089}}{4}$ or $\frac{65}{4} \pm \frac{\sqrt{1089}}{4}$
		$x = \frac{7}{2}, x = -2$		A1 dep on all method marks $y = \frac{49}{2}, y = 8$
		$x = \frac{7}{2}, y = \frac{49}{2}$ $x = -2, y = 8$		A1 dep on all method marks $x = \frac{7}{2}, y = \frac{49}{2}$ $x = -2, y = 8$
				Total 5 marks

Total 100 marks



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