UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

0607 CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/04 Paper 4 (Extended), maximum raw mark 120

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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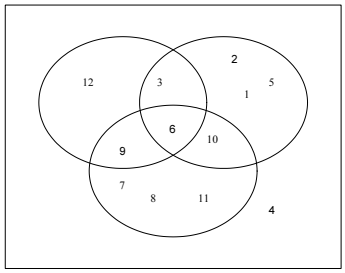
- **M** marks are given for a correct method.
- **A** marks are given for an accurate answer following a correct method.
- **B** marks are given for a correct statement or step.
- **D** marks are given for a clear and appropriately accurate drawing.
- **P** marks are given for accurate plotting of points.
- **E** marks are given for correctly explaining or establishing a given result.

- ft follow through
- oe or equivalent
- soi seen or implied
- www without wrong working

1	**(a)**	7.60	B2	[2]	If B0, SC1 for 12.4
	(b)	3.3 (33….)	B2	[2]	If B0, SC1 for 3.2 (3.22 – 3.23) or M1 for $\frac{0.05}{1.5}\times 100$ oe
	(c)	0.75	B2	[2]	If B0, M1 for 0.84 ÷ 1.12 oe
	(d)	5 www 3		[3]	B2 for 4.937 – 4.938 or $\frac{\log(4/3)}{\log 1.06}$ **or** M1 for using 0.75×1.06^n or $1 \div 1.06^n$ oe, n integer >1
2	**(a)**	$x^3 - x^2 + x + x^2 - x + 1$ $= x^3 + 1$	M1	[2]	Must see 6 correct terms, condoning one sign error Correct conclusion with no errors or omissions
	(b)	Use of $b^2 - 4ac$ (may be in formula) or sketch of U – shaped parabola or $(x - 0.5)^2 = k$	M1	[3]	
		For $\sqrt{-3}$ or for not touching x – in sketch or $k = -0.75$	A1		
		Correct conclusion (e.g. not real or square root of a negative number or graph does not touch x-axis)	R1		Dependent on M1 A1
	(c) (i)	9	B1	[1]	
	(ii)	0	B1	[1]	
	(iii)	$\sqrt[3]{x-1}$ final answer	B3	[3]	If B0, M1 for $y - 1 = x^3$ (correct re-arrangement) M1 for $\sqrt[3]{y-1} = x$ (correct cube root) M1 for interchanging x and y (this may be done first and other 2 M's follow)
	(iv)	28 cao	B1	[1]	

3 (a)	{3, 6, 9, 12} {1, 2, 3, 5, 6, 10} {6, 7, 8, 9, 10, 11}	B1 B1 B1 [3]	
(b)		B2ft [2]	**12 elements must be seen, each only once.** Correct or ft their **(a)** If B0, B1 for 6 or 7 regions correct or ft their **(a)**
(c) (i)	3, 6	B1ft [1]	Correct or ft their Venn diagram
(ii)	3, 6, 7, 8, 9, 10, 11, 12	B1ft [1]	Correct or ft their Venn diagram
(iii)	3, 6, 10	B1ft [1]	Correct or ft their Venn diagram
(iv)	4, 7, 8, 9, 11, 12	B1ft [1]	Correct or ft their Venn diagram
(v)	11 cao	B1 [1]	
4 (a)	1005 www 3	M1 M1 A1 [3]	M1 for at least 3 correct mid-interval values seen then (985, 995, 1002.5, 1007.5, 1015, 1030) M1 for evidence of using $\Sigma fx \div 100$ with values of m in the intervals (3940 + 9950 + 50125 + 20150 + 8120 + 8240 = 100525) or SC2 for 1005.25 or 1005.2 or 1005.3
(b) (i)	0.4, 1, 10, 4, 0.8, 0.4	B3 [3]	If B0, B2 for 4 or 5 correct, B1 for 2 or 3 correct
(ii)	Accurate histogram	M1 A1 A2ft [4]	6 histogram rectangles with at least 4 correct widths 6 correct widths 6 correct heights, A1ft for 4 or 5 correct heights

5	**(a)**	Three reasonable branches	B1 B1 B1 [3]	Must be above x–axis and alway increasing roughly towards $x = -1$ Inverted U shape below x-axis and roughly between $x = -1$ and $x = 3$ Must be above x–axis and always decreasing roughly from $x = 3$
	(b)	$x = -1, x = 3, y = 0$	B1B1B1 [3]	
	(c)	$(1, -0.25)$	B1B1[2]	If B0, allow SC1 for **both** inexact values of correct answer e.g. (1.0000011, – 0.24999…)
	(d)	$(x \in R), x \neq -1, x \neq 3$ oe	B1B1ft [2]	B1 for $x \neq -1$ B1 for $x \neq 3$ oe ft **(b)** or correct. isw limits from grid
		$y \leq -0.25, y > 0$	B1B1ft [2]	B1 for $y \leq -0.25$ B1 for $y > 0$ (f(x) OK for y and condone x for y ft **(c)** for their – 0.25 and **(b)** for their 0, or correct.
	(e) (i)	2	B1 [1]	
	(ii)	4	B1 [1]	
6	**(a)**	250	B2 [2]	If B0, M1 for 100 ÷ 5.6 × 14
	(b) (i)	20	B2 [2]	If B0, M1 for 72 ÷ 3.6 oe
	(ii)	0.225 ft	B2ft [2]	ft 4.5 ÷ their **(b)(i)**. If B0, M1 for 4.5 ÷ their **(b)(i)**
7	**(a)**	$\frac{x}{5}$	B1 [1]	
	(b) (i)	$\frac{x+13}{4}$	B1 [1]	
	(ii)	$\frac{x}{5} + \frac{x+13}{4} = 46$	B1ft [1]	ft their **(a)** and **(b)(i)** if fractions of the form $\frac{x}{l}, \frac{x+p}{q}$, $q \neq l$ neither = 1
	(iii)	95	B3ft dep [3]	ft dependent on B1 in **(ii)** but if $p = 0$, SC2 for 102.(22…) If B0, M1for "4x"+"5x"+"65" o.e. (or better) then M1 (dependent) for "4x"+"5x"+"65"="920" o.e. (or better) these two M's may still be over common denominator
	(c)	4.41 ft	B2ft [2]	ft (2 × their **(b)(iii)** + 13) ÷ 46 If B0, M1 for (2 × their **(b)(iii)** + 13) ÷ 46 oe, 4.4, 4.413... imply M1

8	**(a)**	Positive	B1 [1]	
	(b) (i)	9.6	B1 [1]	
	(ii)	11	B1 [1]	
	(iii)	1.2(0)r + 1.5(0)	B1B1 [2]	B1 for 1.2(0)r (1.198…) + c, or B1 for mr + 1.5(0) (1.497…) with c, m not zero. Allow x for r. SC1 for 1.2(0) and 1.5(0) seen
9	**(a)**	1190 (1193. …..) cao www 3	M2 A1 [3]	M2 for correct explicit expression $\frac{180}{\sin 8.6} \times \sin 82.5$ or M1 for implicit sine rule $\frac{AK}{\sin 82.5} = \frac{180}{\sin 8.6}$ SC2 for correct answer by other method if working seen
	(b)	1199 – 1200 cao www 3	M1 A2 [3]	M1 for $1410^2 + 770^2 - 2 \times 1410 \times 770 \cos 58.3$ A1 for 1 439 990.8…. SC2 for correct answer by other method or use of other triangle if working seen
	(c)	568500 – 569400 cao www 3	M2 A1 [3]	M2 for 0.5 × 180 × their **(a)** × sin(180 – 82.5 – 8.6) + 0.5 × 1410 × 770 × sin58.3 o.e. or M1 for area of one triangle
	(d)	1490 – 1500. …. cao www 5	B2 M1 A2 [5]	B2 for angle TDK = 32.96 – 33.09 or for angle DKT = 88.36 – 88.61 If this B0, then M1 for correct full method for finding one of these angles M1 for correct explicit expression for AT or AT^2 e.g. $180^2 + 1410^2 - 2 \times 180 \times 1410 \times$ cos (82.5 + their angle TDK) A1 for 2 235 000 to 2 240 000
	(e)	28.2 cm	B2 [2]	If B0, SC1 for figures 282

10 (a)	Prism	B1 [1]	
(b) (i)	5.25	B2 [2]	If B0, M1 for 0.5 (3 + 4) × 1.5 oe
(ii)	810.6 (or 811)	B3ft [3]	ft their **(b)(i)** × 154.4. If B0 then M2 for their **(b)(i)** × 8 × 19.3 or M1 for their **(b)(i)** × 8.
(iii)	91.78 – 91.8 cao www 4	M3 A1 [4]	M1 for $(BC^2) = 1.5^2 + 0.5^2$ (implied by 1.58 or 2.5) may be on diagram or near to diagram M1 for 2 × their **(b)(ii)** M1 for (3 + 4 + 2 × their *BC*) × 8 (*BC* **must** be from Pythagoras or trigonometry)
(c)	24 ft	M1 A2ft[3ft]	ft 20 000 ÷ their **(b)(ii)** M1 for mass of box ÷ mass of one bar (implied figs 2466 to 2467..) A1 for 24.66 – 24.67…. or 24.6 or 24.7 (i.e. 1 dp) ft Answers less than 1 can only have M1
11 (a)	$\frac{1}{6}$ oe	B1 [1]	**Penalty of –1 for 2 sf decimals or percentages. Do not accept ratio or worded forms.**
(b) (i)	2 then 4 branch tree diagram 3 pairs of correct probabilities $\frac{5}{6},\frac{1}{6}$ and $\frac{7}{8},\frac{1}{8}$ and $\frac{1}{4},\frac{3}{4}$ on a 2 then 4 branch tree diagram	B1 B1 B1 B1 [4]	B1 each correct pair with correct orientation If incorrect orientation check labelling for the three pairs
(ii)	$\frac{37}{48}$ (0.7708…) cao	B3 [3]	If B0, M2 for $\frac{5}{6}\times\frac{7}{8}+\frac{1}{6}\times\frac{1}{4}$ or M1 for one of the above products.
(iii)	0.00063 cao	B2 [2]	If B0, M1 for (1 – their **(b)(ii)**)^5 or $\left(\frac{5}{6}\times\frac{1}{8}+\frac{1}{6}\times\frac{3}{4}\right)^5$ ft their tree oe 0.000632… implies M1
(iv)	148	B1ft [1]	ft their **(b)(ii)** × 192 Allow decimals or integers (rounded or truncated)

12 (a)	192 3×2^n oe	B1 [1] B2 [2]	 e.g. $6 \times 2^{n-1}$ If B0, B1 for 2^k , $k \in Z$ in final answer
(b)	24 $n^2 - 2n$ or $(n-1)^2 - 1$ oe	B1 [1] B3 [3]	If B0, M2 for recognising form $an^2 + bn + c$, $a \neq 0$, b and c not both zero Allow other variables If B0 M0, M1 for reaching second differences of 2