OCR
RECOGNISING ACHIEVEMENT

GCSE

Methods in Mathematics (Pilot)

General Certificate of Secondary Education

Unit **B391/02:** Higher Tier

Mark Scheme for June 2011

Oxford Cambridge and RSA Examinations

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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Subject-Specific Marking Instructions

1.   **M** marks are for <u>using a correct method</u> and are not lost for purely numerical errors.
      A marks are for an <u>accurate</u> answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
      B marks are <u>independent</u> of **M** (method) marks and are awarded for a correct final answer or a correct intermediate stage.
      SC marks are for <u>special cases</u> that are worthy of some credit.

2.   Unless the answer and marks columns of the mark scheme specify **M** and **A** marks etc, or the mark scheme is 'banded', then if the correct answer is clearly given and is <u>not from wrong working</u> **full marks** should be awarded.

      Do <u>not</u> award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen <u>and</u> the correct answer clearly follows from it.

3.   Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct.

      Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, eg FT 180 × (*their* '37' + 16), or FT 300 – √(*their* '5^2 + 7^2'). Answers to part questions which are being followed through are indicated by eg FT 3 × *their* (a).

      For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

4.   Where dependent (**dep**) marks are indicated in the mark scheme, you must check that the candidate has met all the criteria specified for the mark to be awarded.

5.   The following abbreviations are commonly found in GCSE Mathematics mark schemes.

      -    **cao** means **correct answer only**.
      -    **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point eg 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
      -    **isw** means **ignore subsequent working** (after correct answer obtained).
      -    **nfww** means **not from wrong working**.
      -    **oe** means **or equivalent**.
      -    **rot** means **rounded or truncated**.

- **seen** means that you should award the mark if that number/expression is seen anywhere in the answer space, including the answer line, even if it is not in the method leading to the final answer.
- **soi** means **seen or implied**.

6. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.

7. As a general principle, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered, mark the poorer (poorest).

8. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the MR annotation. **M** marks are not deducted for misreads.

9. Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.

10. If the correct answer is seen in the body and the answer given in the answer space is a clear transcription error allow full marks unless the mark scheme says 'mark final answer' or 'cao'. Place the annotation ✓ next to the correct answer.

   If the answer space is blank but the correct answer is seen in the body allow full marks. Place the annotation ✓ next to the correct answer.

   If the correct answer is seen in the working but a completely different answer is seen in the answer space, then accuracy marks for the answer are lost. Method marks would still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation ✗ next to the wrong answer.

11. Ranges of answers given in the mark scheme are always inclusive.

12. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.

13. Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

B391/02   **Mark Scheme**   **June 2011**

Question			Answer	Marks	Part marks and guidance	
1	(a)	(i)	27 753	1		
		(ii)	638	1		
	(b)		$\dfrac{V}{L \times W}$ oe	M1	Numerical, eg (V ÷ L) ÷ W	
			Figs 40 (or 39), 60, 30 (or 25)	M1	Accept for any 2 of these roundings seen	ie one stage in calculation done correctly or 'cancelled' versions of these
			20 to 23 nfww	A2	**A1** for 1800 or 1500 nfww or 600 to 700 nfww or 1300 to 1400 nfww Dep on **M1 M1** If **M0 M0** or **M1 M0** scored then **SC1** for answer in range 20 to 23	
2	(a)		0.55	2	**M1** for 1 – (0.4 + 0.05) oe	
	(b)		76	2	**M1** for 190 × 0.4 oe, soi by figs 76	Accept $\dfrac{2}{5}$ of 190
3	(a)		Translation $\begin{pmatrix} -5 \\ -4 \end{pmatrix}$	1 1	Accept 5 left, 4 down, **SC1** for 2 translations which end up in correct position	Condone fractions, coordinates Condone 'across – 5' but not 'across 5' but condone '5 back' Condone eg left – 5 Any other indication of 2 transformations scores zero

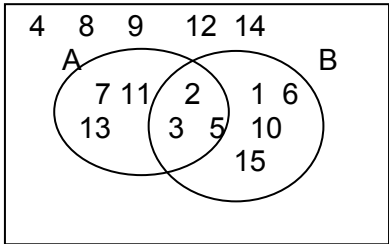| Question			Answer	Marks	Part marks and guidance	
	(b)		Vertices at (3, 1), (3, 2), (6, 3), (6, 1)	3	**B2** for 3 vertices correct **or** **B1** for $y = x$ drawn **or** **SC2** for reflection in $y = -x$ **or** **SC1** for any reflection of A	**MR –1** for reflections of B instead of A
4	(a)		(2, −1)	1		
	(b)		12 cm²	1 1	 Indep	
	(c)		$-\dfrac{1}{3}$ oe	2	**M1** for y step/ x step **soi** by $\dfrac{1}{3}$, 0.33, $\dfrac{1}{3}x$, $-\dfrac{1}{3}x$ etc **or** **SC1** for -3	
5	(a)		Cost of notepads = 4x Cost of pens = 5y Total = £20	1	Must refer to 2 from 4x being notepads and 5y being pens Cost = x and cost = y <u>£20</u>	Cost of notepads = 4x and pens = 5y Counts as first 2

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Mark Scheme

Question			Answer	Marks	Part marks and guidance	
	(b)		Straight line which would go through (0, 4) and (5, 0)	3	**B2** for 'straight' line which would go through (0, 4) or (5, 0) with negative gradient **or** **B1** for 2 correct points plotted **or** **SC1** for ruled line through (4, 0) and (0, 5)	Must be ruled For **3** or **B2** must go across at least 3 large squares horizontally Could be freehand
	(c)		2.60	1 FT	Correct or FT from graph ± ½ small square	
6			$\dfrac{4}{9}$, $\dfrac{5}{9}$ oe	3	**B2** for either **or** **B1** for $\dfrac{3}{9}$ and $\dfrac{6}{9}$ seen or $\dfrac{1\frac{1}{3}}{3}$ and $\dfrac{1\frac{2}{3}}{3}$	oe must be single fractions eg $\frac{8}{18}$ or $\dfrac{3k}{9k}$ and $\dfrac{6k}{9k}$
7	(a)		$2x^4 - 10x^3$	2	Mark final answer unless clear transcription **B1** for 1 term correct in $ax^m - bx^n$	
	(b)		$2xy(x + 2y - 3)$	3	Mark final answer **B2** for $2xy$ extracted and two terms correct or correct partial factorisation with two factors extracted. **or** **B1** for $2xy$ extracted and one term correct or for two factors extracted with one error or correct partial factorisation with one factor extracted.	eg $2x(xy + 2y^2 - 3y)$ eg $2(x^2y + 2xy^2 - 3xy)$ For all marks condone omission of final bracket

Question			Answer	Marks	Part marks and guidance	
8	(a)		$2 \times 2 \times 5 \times 7$	**2**	**M1** two correct steps in factor tree or factor ladder or complete factor tree or ladder with one error or 3 number factorisation of 140 seen or 2, 2, 5, 7	Condone $1 \times 2 \times 2 \times 5 \times 7$ eg $10 \times 2 \times 7$
	(b)		1260	**2**	**SC1** for any multiple of 1260 **or** **M1** for $2 \times 2 \times 3 \times 3 \times 5 \times 7$ oe or sequence of multiples of both seen up to > 1000 or *their* LCM found	eg 7×180 , 9×140 etc Condone 1 error
	(c)		150	**2**	**M1** for $2 \times 3 \times 5 \times 5$ or $(2 \times 3 \times 5)^3$ oe	eg 27 000
9	(a)		7	**2**	**M1** for $x + 2 - 3 = 6$ **soi** or $2^{x + 2 - 3}$ or 2^9	
	(b)		2 nfww	**3**	**M2** for $4y = y + 6$ oe nfww **or** **M1** for 3^{4y} or $3^{y + 6}$ or one error in above **or** **SC1** for 2 from $a^{4y} = a^{y + 6}$	eg $4y = 6y$ not $2y \times 2$
10	(a)			**2**	**B1** for 2, 3, 5 in intersection or all correct except one or two misplaced or omitted or all correct plus extras	

Question			Answer	Marks	Part marks and guidance	
	(b)	**(i)**	$\dfrac{3}{15}$ oe	**1FT**	or FT *their* n(A ∩ B)/ 15	For 3 in 15 etc penalise once only In each part **isw** attempts to 'cancel' or change to decimal or %
		(ii)	$\dfrac{5}{15}$ oe	**1FT**	or FT *their* n(A ∪ B)' / *their* 15	
		(iii)	$\dfrac{3}{15}$ oe	**1FT**	or FT *their* n(A ∩ B')/ *their* 15	
11*			(Angle) BAD = 70° angles in the <u>alternate segment</u> (Angle) BCD = 110 opp. angles in cyclic quad. OR (Angle) BDF = 110 angles on a straight line (Angle) BCD = 110 Angles in the <u>alternate segment</u>	**4**	**3** for either method, if 1 reason omitted/wrong and/or there is extra wrong information **2** for completely correct working with labelled angles but no / wrong reasons or completely correct working and reasons with 1 omitted label OR (Angle) BAD = 70° angles in the <u>alternate segment</u> OR (Angle) BDF = 110 angles on a straight line **1** for answer correct only	Reasons must be closely associated with the relevant statement Angle labels must be correct or refer clearly to their lettered angles on the diagram Any complete alternative method must have correct reasons for every step. may be shown on the diagram

Question			Answer	Marks	Part marks and guidance	
12			$\dfrac{380}{9900}$ oe	3	**M2** for $\dfrac{20}{100} \times \dfrac{19}{99}$ oe **or** **M1** for above with 1 error or $\dfrac{20}{100}$ and $\dfrac{19}{99}$ seen and associated **or** **SC1** for $\dfrac{1}{25}$ oe	eg $\dfrac{19}{495}$ **isw** attempts to 'cancel' or change to decimal or % count a and $a - 1$ instead of 20 and 19 as 1 error
13	**(a)**		$\overrightarrow{AB} = -5\mathbf{a} + 5\mathbf{b}$ oe $\overrightarrow{CD} = -3\mathbf{a} + 3\mathbf{b}$ oe $\overrightarrow{CD} = \dfrac{3}{5}\overrightarrow{AB}$ oe and conclusion	1 1 1	Alternative proof **B1** OC:OA = OD:OB = (3 : 5) oe **B1** Angle O is common oe **B1** Triangles similar, and conclusion including 'corresponding angles' Accept eg $\overrightarrow{CD}$ is a multiple of $\overrightarrow{AB}$ if their CD = kAB , k > 0	Condone the sides are proportional NB Treat $\overrightarrow{CA} = 5\mathbf{a}$ and $\overrightarrow{DB} = 5\mathbf{b}$ as a misread Can score last mark after consistent sign errors in AB and CD
	(b)		3 : 5 oe	1		

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