OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics A (Two Tier)

General Certificate of Secondary Education

Component **J512/04:** Paper 4

Mark Scheme for June 2011

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Subject-Specific Marking Instructions

1 **M** marks are for using a correct method and are not lost for purely numerical errors.
A marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
B marks are independent of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
SC marks are for special cases 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 not from wrong working **full marks** should be awarded.

Do not award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen and 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.

MARK SCHEME

Question			Answer	Marks	Part marks and guidance	
1			568.75 81.25	2	**M1** for 650 ÷ 8 can be implied by either correct answer seen	Accept correct answers in either order
2	(a)	(i)	2.4	2	**B1** for 2.3(6….) or 2.37 Or **SC1** for 12.7	12.7 is from rounding to 1dp following incorrect use of calculator
		(ii)	3.9 oe	2	**M1** for $\sqrt{15.21}$	Condone for M mark 15.21
	(b)		0.75 x 10 = 7.5 96 x 7.5 = 720 960 x 7.5 = 7200	B1		Must start with using 96 x 0.75 = 72 and leading to the calculation The answer to Jasmine's calculation (960) need not be stated 960 on its own or 7200 ÷ 7.5 = 960 scores 0 marks
3	(a)		A	1		
	(b)	(i)	$60 < t \leq 80$	1		Allow any indication of correct class eg 60 – 80 Do not allow '12' or '4th class' or '70'

Question			Answer	Marks	Part marks and guidance	
		(ii)	61.25 oe	4	**M2** for (10 x 1 + 30 x 4 + 50 x 10 + 70 x 12 + 90 x 3 + 110 x 2) ÷ 32 Or **M1** for sum frequency × time where time is within correct class AND **B1** for 5 or 6 midpoints correct If no working **SC3** for an answer 61 minutes 25 seconds	Allow 61 minutes 15 seconds Condone 61 or 61.3 provided method shown For M marks condone lower bound for correct class For M2 condone one error in products (nb: sum may be outside range 1640 – 2280) If products not seen for M2 allow *their* sum ÷ 32 provided *their* sum in range 1640 – 2280 For M1 allow for the sum at least 3 frequency × time (can be implied by 1640 – 2280) For B1 midpoints correct are implied by 1960 seen or by 5 or 6 correct products
	(c)	**(i)**	No effect oe	**1**		
		(ii)	Increase oe	**1**		Ignore any recalculations of the mean

Question			Answer	Marks	Part marks and guidance	
4			74.5% or 74½	4	**M3** for (40 – (2 + 0.85 + 4.2 × 1.75)) ÷ 40 × 100 or 100 - ((2 + 0.85 + 4.2 × 1.75) ÷ 40 × 100) or 0.745 Or **M2** for 40 – (2 + 0.85 + 4.2 × 1.75) or 29.8(0) or 2980 or (2 + 0.85 + 4.2 × 1.75) ÷ 40 × 100 or 25.5% Or **M1** for 2 + 0.85 + 4.2 × 1.75 or 10.2(0) or 1020 If **M0** then **SC2** for *their* profit ÷ 40 × 100 Or **SC1** for ((2 + 0.85 + 4.2) ÷ 40) × 100	Check nfww May be done in stages Accept T & I method if final answer 74.5% Accept T & I method for M2 if 25.5% Ft their arithmetic errors for M marks provided earlier method seen Eg (40 – (2 + 0.85 + 4.2)) ÷ 40 × 100 or 100 – (((2 + 0.85 + 4.2) ÷ 40) × 100) or 82.375 scores SC2 17.625 scores SC1
5	(a)	(i)	45	4	**M3** for 5*x* = 225 or 225 ÷ 5 or (360 – 135) ÷ 5 Or **M2** for 5*x* + 135 = 360 or *x* + *x* + 3*x* = 225 or 5*x* and 225 seen or 5*x* and 360 – 135 seen Or **M1** for *x* + *x* + 135 + 3*x* = 360 or 225 seen or 360 – 135	Check nfww 180 – 135 on its own scores 0 marks 135 ÷ 3 on its own scores 0 marks However an answer of 45 with NO working scores full marks In general any correct working will have 360 soi (can be implied from 225 seen)
		(ii)	Isosceles trapezium or parallelogram	1		Condone rhombus No mark for trapezium only
	(b)		18	2	**M1** for 360 ÷ 20	Allow 180(n – 2) = n(180 – 20) for M mark

Question			Answer	Marks	Part marks and guidance	
6			(Chocolate) 328 and (eggs) 5	3	**M2** for 410 ÷ 250 × 200 or 410 ÷ 250 × 3 or ((160 ÷ 250) x 200) + 200 or ((160 ÷ 250) x 3) + 3 Or **M1** for 410 ÷ 250 or 1.64 or (160 ÷ 250) x 200 or (160 ÷ 250) x 3	Condone 328 and both 4.92 and 5 on answer lines; condone reverse order choc 5 and eggs 328 for all marks If no working award either 2 marks for chocolate 328 and/or eggs 4.92 or 1 mark for eggs 5
7	(a)		424 – 424.3	3	**M2** for $15 \times \pi \times 3^2$ Or **M1** for $\pi \times 3^2$ or 28.27(…) If **M0** then **SC1** for $15 \times \pi \times 6^2$	Condone 423.9
	(b)		[½ litre =] 500 (ml or cm^3) **and** No	1FT	Strict FT *their* (a)	
8			$24x^2 = 150$ or $6x^2 = 37.5$ or $6x^2 = 150 \div 4$ or $x^2 = 150 \div 24$ or $x^2 = 37.5 \div 6$ or $4x \times 6x = 150$	B1	Must see equation	Condone x sign in correct equation eg $4 \times x \times 6x = 150$ Allow shape split in different ways eg $7x^2 + 6x^2 + 6x^2 + 5x^2 = 150$
			150 ÷ 24 or 37.5 ÷ 6 or 6.25	M1		Check nfww
			$\sqrt{(150 \div 24)}$ or 2.5 or $\sqrt{6.25}$	M1	Dep 1st M1	Award both the first two M marks if (x=)2.5 seen and nfww May be done in stages, may be seen embedded
			50 x $\sqrt{(150 \div 24)}$ or 50 × 2.5 or 50 × $\sqrt{6.25}$	M1		Allow 3rd M mark for 50 × *their x* May be added individually If a value for x given and 50x written then check their implied calculation
			125	A1		If correct equation, no working and 125 award 5 marks If no equation, no working and 125 award 4 marks

Question			Answer	Marks	Part marks and guidance	
9			$2^4 \times 3^2$	3	**B2** for 2 × 2 × 2 × 2 × 3 × 3 or better Or **M1** for division of 144 by at least 2 prime factors eg 2 & 2 or 2 & 3 or 3 & 3 If **M0** then **SC1** for answer $2^4 + 3^2$	May be seen in factor tree or other diagram
10	(a)		Fully correct line extending from at least (0, 1) to at least (2, 5) ±½ small square	3	**B2** for 2 correct points ±½ small square plotted or line with gradient of 2 Or **B1** for one correct point ±½ small square plotted or line with positive gradient passing through (0, 1)	If line incorrect must see point plotted for B1
	(b)		$x = 2$, $y = 5$	1FT	Correct answer or FT *their* straight line	FT ± ½ small square
11	(a)	(i)	$2(2x + 7)$	1	Mark final answer	
		(ii)	$x(x – 5)$	1	Mark final answer	Condone $(x \pm 0)(x – 5)$
		(iii)	$(x – 4)(x + 4)$	1	Mark final answer	Condone final bracket missing
		(iv)	$(x + y)(x + y + 8)$	2	Mark final answer **B1** for $(x + y)(x + y + n)$ where $n \neq 0$ or $x + y + 8$	Condone final bracket missing for both marks Correct answer spoilt by further work scores B1 only

Question			Answer	Marks	Part marks and guidance	
	(b)		$t = \frac{v-6}{5}$ or $t = \frac{v}{5} - \frac{6}{5}$ or $t = \frac{6-v}{-5}$	2	**B1** for $v - 6 = 5t$ or $6 - v = -5t$ or $\frac{v}{5} = \frac{6}{5} + t$ If **B0** then **SC1** for $\frac{v-6}{5}$ or $\frac{v}{5} - \frac{6}{5}$ or $\frac{6-v}{-5}$	Correct answer spoilt by further work scores B1 only
	(c)		$21x + 2$	2	**B1** for $6x + 14 + 15x - 12$ or better If **B0** then **SC1** for $21x - 2$	Correct answer spoilt by further work scores B1 only
	(d)		$2(x - 1)$ or $2x - 2$	1		Condone final bracket missing if $2(x - 1)$
12	(a)		3×10^8	1		Condone 3.0×10^8
	(b)		6.5×10^{-7}	1		
13	(a)		C = 68 Angle at centre/middle double angle at circumference/edge [on same arc] D = 146 [Sum of] opposite angles in cyclic quadrilateral = 180	1 1 1 1	All marks independent	Correct reason followed by irrelevant statement scores Correct reason followed by incorrect reason implies choice and does not score For reason accept any correct <u>full</u> alternative <u>reasons</u>
	(b)		1 : 9	1	Mark final answer	Accept ratio 1: 3^2 or 1^2: 3^2

Question			Answer	Marks	Part marks and guidance	
	(c)		21.5(…)	3	**M2** for 280/360 × 2 × π × 4.4 or 80/360 × 2 × π × 4.4 Or **M1** for 2 × π × 4.4 or 27.6 – 27.7 If **M0** then **SC1** for 280/360 x π × 4.4 or 80/360 x π × 4.4	Check nfww If no working answer 6.14(…) scores M2
14			46.3	4	Mark final answer **B3** for 46.30 – 46.35 Or **M2** for 36.2 × tan52 or (36.2 x sin52) ÷ sin38 Or **M1** for tan52 = *h*/36.2 or *h*/sin52 = 36.2/sin38	Check nfww For B3 allow 46 provided trig method seen Full correct alternative trig method scores M2 Allow M2 for answers using grads 38.50 – 38.55 or rads -219 – -219.13
15			16.1 – 16.13	3	**B2** for 260.(1...) Or **B1** for $12.1^2 + 7.3^2 – 2 \times 12.1 \times 7.3$ cos110	Check nfww Allow 16 provided trig method seen Allow B2 for answer using grads 15 – 15.1 or rads 19.3 – 19.4 Allow B1 for using grads 227.3 – 227.4 or rads 376.1 – 376.2
16	(a)	(i)	Fully correct	2	**M1** for box with correct median & one of UQ or LQ	
		(ii)	Sim: median or average scores same Diff: Dev's scores more consistent or Adil's scores more varied	1 1		Allow medians the same or median(s) 40 Allow Dev's IQR or range smaller or Adil's IQR or range bigger For diff: Must be comparison No marks for comparing individual values

Question			Answer	Marks	Part marks and guidance	
		(iii)	'Zero only once' – not Adil 'Over 100' – not Dev 'Mean score was over 75' – Not Shane Answer Freddie	**1** **1** **1** **1**		All marks independent Marks are for interpretation of graphs Ignore irrelevant comments Contradictory comments imply choice & score 0
	(b)		48	**2**	**M1** for 320/500 × 75 If **M0** then **SC1** for final answer 27	May be done in stages
17	**(a)**		1 8	**2**	**B1** for one correct	
	(b)		Both points plotted ±½ small square & correct shape curve drawn	**2**	**M1** for at least one correct point ±½ small square & curve or both points plotted ±½ small square & no curve	Condone only section (1.5,8) to (2,16) ruled Allow both marks for curve passing through all correct points even if plotting at (0,1) and (1.5,8) not seen (ignore *their* other plotted points) Correct or ft their (a) for plotting points
	(c)		1.8	**1FT**	Strict FT *their curve* ±½ small square – curve must be drawn in relevant region	For FT reading of graph condone points joined by straight lines Embedded answer $4^{1.8}$ (= 12) scores 0
18	**(a)**		81	**2**	**B1** for $\sqrt{x}$ = 9 or $4x$ = 324 or $\sqrt{81}$ = 9 or $2\sqrt{81}$ = 18 or 9^2	
	(b)		120 and 240	**2**	**B1** for either 120 or 240 If **B0** then **SC1** for both answers given embedded or rads 357.9 - 358 or grads 226.6 – 227	

Question			Answer	Marks	Part marks and guidance	
19	(a)		$h = d/5$ or $h = 0.2d$ or $5h = d$	3	**B2** for $24 = k \times 120$ or $24k = 120$ Or **M1** for $h = kd$ or $kh = d$ oe If **B0** then **SC2** for final answer with proportionality sign where = sign should be If **B0** then **SC1** for equation with d and h swapped eg $5d = h$	To award B2 MUST see equation and the calculation to find k must follow from position of *their* k in 1st stage of working Condone use of capital H and D Condone use of other letters provided they are defined
	(b)		27	2	**B1** for 135/5 or 135 x 0.2 or (extra) 15/5 or 3	
20	(a)		$a = 2$ $b = 13$	1 2	**B1** for $(x + 2)^2 - 4 + 17$ or $a^2 + b = 17$	
	(b)		13	1FT	FT *their b* from part (a)	Condone both x = -2 and minimum 13 given (±2, 13) scores 0 y = 13 scores 0

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

14 – 19 Qualifications (General)
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553