



GCSE

Methods in Mathematics (Pilot)

General Certificate of Secondary Education

Unit B392/02: Higher Tier

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.

© OCR 2011

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 awarded for a correct final 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 $FT 180 \times (\text{their } '37' + 16)$, or $FT 300 - \sqrt{(\text{their } '5^2 + 7^2)}$. Answers to part questions which are being followed through are indicated by eg $FT 3 \times \text{their}(a)$.

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).
- **nfw** 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.

B392/02

Mark Scheme

June 2011

MARK SCHEME

Question		Answer	Marks	Part marks and guidance
1	(a)	6.71	2	M1 for 6.70[8203 932....] or for $\sqrt{45}$ seen SC1 for wrong answer rounded correctly to 3sf (but must come from answer with >3sf)
	(b)	0.7143	2	M1 for 0.714[285 714 ...] or for 60 or 84 seen
2		7	2	M1 for $x - 4 = 3$ or for $2x - 8 = 6$ Allow embedded in answer if not contradicted
3	(a)	36 cm ³	4	B3 for 36 B1 for cm ³ M2 for $(2 \times 2 \times 5) + (4 \times 2 \times 2) soior (2 \times 2 \times 6) + (2 \times 2 \times 3) soior (6 \times 5 \times 2) - (3 \times 4 \times 2) soiorM1 for splitting shape into 2 cuboids with either horizontal division with 4 marked on vertical edge or vertical division with 3 marked on horizontal edge20 + 1624 + 1260 - 244 may be evidenced by 2 \times 2 \times 4 (2 \times 2 \times 4 alone scores M0)3 may be evidenced by 2 \times 2 \times 3 (2 \times 2 \times 3 alone scores M0)$
	(b)	179.5[9...] [cm ³] (179.5 or 179.6 or 180)	2	M1 for $\frac{4}{3}\pi \times 3.5^3$ Do not penalise missing or incorrect units

Question		Answer	Marks	Part marks and guidance	
4		$\frac{3}{20}$, 0.15 $\frac{3}{8}$, 37.5% $0.1\dot{6}$, 16.6%	4	B4 for all correct or B3 for 4 or 5 correct or B2 for 3 correct or B1 for 1 or 2 correct Accept: 0.166, 16.6% 0.167, 16.7%	Allow 0.1666... for recurring
5	(a)	(i) 108	2	M1 for [ext angle =] $360/5$ or 72 soi or [sum of interior angles =] 3×180 or 540	Allow: 6×90 from $(2n - 4)$ right angles for M1
		(ii) Explanation: eg $3 \times 108^\circ < 360^\circ$ or $4 \times 108^\circ > 360^\circ$ or 108 does not go into 360 oe or a correct labelled diagram showing 108, 108, 108 and 36	2	B1 for 3 angles at a point < 360 or for 4 angles round a point > 360 or for <i>their (i)</i> does not go into 360 or M1 for unlabelled diagram showing an attempt at 3 pentagons plus a "gap"	Max B1 if angle not 108° (Any explanation without numbers will score a maximum of 1 mark)
	(b)	(i) Explanation: eg six of angle D fit round a point so each must be $360 \div 6$ [= 60°]	1	Allow clear annotation on diagram as explanation	Condone use of "circle" for point Do not allow explanation stating equilateral triangle unless with a correct explanation
		(ii) 120°	1	Condone omission of degree symbol	

B392/02

Mark Scheme

June 2011

Question		Answer	Marks	Part marks and guidance
	(iii)*	Clear identification and explanation of which sides are equal: ED = DC because pentagon is symmetrical AE = BC because pentagon is symmetrical AE = AB because they meet in the tessellation BC = AB because they meet in the tessellation	3	<p>2 All correct statements with some reasons missing or two correct statements with reasons or 1 One correct statement with reason or at least two statements with no reason</p> <p>NB AE = AB and BC = AB and AE = BC may be combined (eg AE = AB = BC) (ignore additional incorrect work or incorrect reason)</p>
6		8.48 to 8.49 or 8.5	3	<p>M2 for $\sqrt{72}$ OR $\sqrt{9^2 - 3^2}$ or 8.4(....) or M1 for a Pythagoras statement</p> <p>SC1 for $\sqrt{9^2 + 3^2}$ soi by eg $\sqrt{90}$ or 9.4 to 9.5</p> <p>eg $3^2 + AC^2 = 9^2$ Allow M2 for 8.4(....) from scale drawing</p>
7		£42	2	M1 for finding one part (£14) or 28×1.5 oe seen
8		101	3	M2 for $2n + 1$ or add on 2×47 or $50 + 51$ or M1 for tabulation of term and number of sticks or "goes up by 2" or n^{th} term = $2n + c$
9	(a)	2, 0, 2, 6	2	B2 all values correct or B1 2 values correct

Question		Answer	Marks	Part marks and guidance
	(b)		2	<p>B1 for at least four of <i>their</i> points correctly plotted B1 smooth curve through correct points, below x- axis at vertex</p>
	(c)	-2.8, 1.8 (both ± 0.1)	2	<p>B1, B1 (or FT <i>their</i> curve) If 0 scored, M1 evidence of reading from $y = 5$</p>
10	(a)	Explanation eg there should be 4 dp in the answer or the answer should be smaller than 0.41 (or 0.21) or because $0.4 \times 0.2 = 0.08$	1	<p>Clear sensible reason (not just giving the actual answer with no working or explanation)</p>
	(b)	<p>Explanation eg The answer should be bigger than 1 because $\frac{2}{3}$ is bigger than $\frac{1}{2}$ or the answer should be bigger than $\frac{2}{3}$ but $\frac{3}{5}$ is smaller than $\frac{2}{3}$</p>	1	<p>Exemplars for 1 mark</p> <ul style="list-style-type: none"> “you don’t add fractions by adding tops and bottoms” “you don’t add the denominators” “you have to find a common denominator first” $\frac{2}{3}$ is larger than $\frac{3}{5}$ $\frac{2}{3} + \frac{1}{2}$ is obviously > 1

B392/02

Mark Scheme

June 2011

Question		Answer	Marks	Part marks and guidance				
11	(a)	7	2	M1 for correct pairs of numbers from any “window” multiplied eg $11 \times 17 - 10 \times 18$				
	(b)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td></td><td style="text-align: center;">$e + 1$</td></tr> <tr> <td style="text-align: center;">$e + 7$</td><td style="text-align: center;">$e + 8$</td></tr> </table>		$e + 1$	$e + 7$	$e + 8$	2	B2 for all correct or B1 for 1 or 2 correct
	$e + 1$							
$e + 7$	$e + 8$							
	(c)	<p><i>Their</i> $(e+7)(e+1)$ and <i>their</i> $e(e+8)$ Correctly expands their double brackets Correctly expands their other bracket(s) with 2 terms in at least one bracket $e^2 + 8e + 7 - (e^2 + 8e) = 7$ oe</p>	1 1 1 1	eg $e^2 + 7e + 1e + 7$ eg $e^2 + 8e$ $e^2 + 8e + 7 - e^2 - 8e = 7$ seen nfw gets B4				
12	(a)	$[y =]x^3 - 3x + 5$	1	If answers not seen in answer spaces, look for (a) (b) (c) written next to correct equations in equation box – allow any clear indication of matching graph to correct equation				
	(b)	$[y =]4 - x^2$	1					
	(c)	$[y =]\sin x$	1					
13	(a)	125	2	M1 for $100/0.8$ or $100 = 80\%$ or $0.8x = 100$ oe eg 100×1.25				

Question		Answer	Marks	Part marks and guidance
	(b)	66.7% or 66 $\frac{2}{3}$ % or 67%	3	M2 for eg choosing a price, finding special offer price and attempt to find % increase from offer price to normal price or $[y=]$ 1.667 or 1/0.6 or 1.666666.. seen or M1 for “multiply by 0.6” oe seen or choosing a price and finding special offer price or for figs 166 seen
14	(a)	1280	4	M3 for $y = 2.5x^3$ or 2.5×8^3 or M2 for $k = 2.5$ or M1 for $y = kx^3$ Alternative method: M3 for 512×2.5 or M2 for [multiplier] 2.5 or M1 for $2 \Rightarrow 8$ and $8 \Rightarrow 512$
	(b)	7.36(8....) or 7.4 or 7.37	2	M1 for $1000 = 2.5x^3$ oe eg $x^3 = 400$ Allow <i>their k</i> for M1
15	(a)	$\frac{\pi}{2}$	3	M2 area of circle $\pi \times 1 \times 1$ or area semicircle in decimal form or M1 for finding AC 2cm or radius of semicircle 1cm or area of circle in decimal form

Question	Answer	Marks	Part marks and guidance
(b)*	<p>Fully correct and clear working showing that shaded area is $\frac{1}{4}$ of the circle</p> <p>e.g.</p> <p>Whole circle has area $16\pi \text{ cm}^2$</p> <p>$BC = 6 \text{ cm}$</p> <p>Radius of semicircle with diameter $BC = 3 \text{ cm}$</p> <p>Semicircle with diameter BC has area $\frac{9\pi}{2} \text{ cm}^2$</p> <p>Lower shaded area is $\left(8\pi - \frac{9\pi}{2}\right)$</p> <p>Total shaded area is $\frac{\pi}{2}$</p> $+ \left(8\pi - \frac{9\pi}{2}\right) = 4\pi$ <p>So shaded area is $\frac{1}{4}$ of the circle.</p>	5	<p>4 Areas worked out clearly but may be as decimals rather than in terms of π and/or final step showing that the shaded area is $\frac{1}{4}$ of the circle omitted</p> <p>or</p> <p>3 The lower shaded area worked out with a clear and unambiguous method (to reach 3.5π or 10.99 to 11) or a complete method for the whole shaded area with errors</p> <p>or</p> <p>2 The area of semicircle, with diameter BC, worked out with a clear and unambiguous method (to reach 4.5π or $14.1(\dots)$ or lower shaded area found without sufficient supporting evidence</p> <p>or</p> <p>1 Working out area of whole circle or length BC or radius of relevant semicircle (with diameter BC). or area of semi-circle, with diameter BC, found without sufficient supporting evidence or complete strategy stated eg “shaded semi-circle (diam AC) + big semi-circle (diam AB) – unshaded semi-circle (diam BC)”</p>
(c)	1 : 3	1	Accept 4 : 12 or $4\pi : 12\pi$

Question		Answer	Marks	Part marks and guidance
16		10.6 (or better)	5	<p>B1 one angle of triangle B1 second angle of triangle then M2 for $BC = \frac{6.8\sin47}{\sin28}$ oe or M1 for $\frac{6.8}{\sin28} = \frac{BC}{\sin47}$ oe</p>
17	(a)	$[b =] \frac{2T}{h} - a$ oe	3	<p>M2 for $\frac{2T}{h} = a + b$ or $hb = 2T - \left(\frac{ha}{2}\right)$ or M1 for $2T = h(a + b)$ or $\frac{hb}{2} = T - \frac{ha}{2}$</p> <p>SC2 for formula correctly rearranged to make a the subject</p>
	(b) (i)	$(x+2)(x-1)$	2	M1 Factors using integers, excluding 0, giving two terms correct when expanded or $(x \pm 2)(x \pm 1)$
	(ii)	$\frac{x-1}{x-2}$	2	M1 Factors for denominator using integers, excluding 0, giving two terms correct when expanded or $(x \pm 2)(x \pm 2)$
18		$\frac{13}{99}$	2	M1 for $[100x =] 13.13[131313\dots]$
				Note: it is possible to get full marks by doing this on the calculator.

B392/02

Mark Scheme

June 2011

Question		Answer	Marks	Part marks and guidance
19		$\frac{1}{2}$ oe	4	<p>M1 for $4x^2 - 3x + 1 = x$</p> <p>M1 for $4x^2 - 4x + 1 = 0$</p> <p>M1 for $(2x - 1)^2 = 0$ or $\frac{4 \pm \sqrt{(16-16)}}{8}$</p> <p>correct equation in x getting all terms to 1 side factorise (or use formula)</p> <p>Use of diagram/graph leading to correct answer scores 4 marks</p> <p>Condone $\frac{1}{2}$ as part of a co-ordinate eg $(\frac{1}{2}, \frac{1}{2})$</p>

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

