

# **Mathematics Syllabus A**

General Certificate of Secondary J512/03

Paper 3

## **Mark Scheme for June 2010**

---

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 2010

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](mailto:publications@ocr.org.uk)

**Marking Instructions & Abbreviations****Marking instructions**

- 1 Mark strictly to the mark scheme.
- 2 Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
- 3 Work crossed out but not replaced should be marked.
- 4 **M** (method) marks are not lost for purely numerical errors.  
**A** (accuracy) marks 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.
- 5 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).
- 6 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.
- 7 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. If the answer is missing, but the correct answer is seen in the body allow full marks. If the correct answer is seen in working but a completely different answer is seen in the answer space, then accuracy marks for the answer are lost. Method marks would normally be given.
- 8 For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work.
- 9 For answers scoring no marks, you must either award NR (no response) or 0, as follows:  
Award NR (no response) if:
  - Nothing is written at all in the answer space
  - There is any comment which does not in any way relate to the question being asked ("can't do", "don't know", etc.)
  - There is any sort of mark that is not an attempt at the question (a dash, a question mark, etc.)Award 0 if:
  - There is any attempt that earns no credit. This could, for example, include the candidate copying all or some of the question, or any working that does not earn any marks, whether crossed out or not.
- 10 Where a follow through mark is indicated on the mark scheme for a particular part question, you must ensure that you refer back to the answer of the previous part question.

- 11 Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen. E.g. answer on 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.
- 12 Anything in the mark scheme which is in brackets (... ) is not required for the mark to be earned, but if present it must be correct.
- 13 Ranges of answers given in the mark scheme are always inclusive.
- 14 Annotating scripts. The following annotations are available:

✓ and ✗

**BOD** - Benefit of doubt

**FT** - Follow through

**ISW** - Ignore subsequent working

**M0, M1, M2** - Method mark awarded 0, 1, 2

**A1** - Accuracy mark awarded

**B1, B2** - Workless mark awarded 1, 2

**MR** - Misread

**SC** - Special case

^ - Omission sign

These should be used whenever appropriate during your marking.

### Abbreviations

- Where you see **oe** in the mark scheme it means **or equivalent**.
- Where you see **isw** in the mark scheme it means **ignore subsequent working** (after correct answer obtained), provided the method has been completed.
- Where you see **cao** in the mark scheme it means **correct answer only**.
- Where you see **soi** in the mark scheme it means **seen or implied**.
- Where you see **www** in the mark scheme it means **without wrong working**.
- Where you see **seen** in the mark scheme it 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.
- Figs: for example **figs 237** means any answer with just these digits with leading or trailing zeros disregarding any decimal point. E.g. 237000, 2.37, 2.370, 0.00237 but not 23070 or 2374.

1	(a)	<u>In (a) mark the best part of the answer</u> (i) E.g. Answer should be negative	1	Soi e.g. -16.65 NOT after wrong operation e.g. $3.7 + -4.5 = -0.8$
		(ii) E.g. Answer > 8 or $\sqrt{64} = 8$	1	Soi e.g. $7^2 = 49$ or answer is too small
		(iii) E.g. Answer should be 7(.0) or $6 \div 1 = 6$	1	Soi e.g. $70 \times 0.9 = 63$ or $63 \div 9 = 7$ <b>BUT</b> withhold mark if their answer to $6.3 \div 0.9$ is incorrect
	(b)	(i) 7	1	
		(ii) 22	1	
	(c)	$44 - 26 - (3 + 8) = 7$ cao	1	
2	(a)	(0, 0, 5) cao	1	
	(b)	(3, 2, 5) cao	1	
	(c)	(1.5, 2, 0) oe cao	1	
3		-2	3	Allow embedded answer if not contradicted <b>M2</b> for $x + 7 = 5$ <b>Or M1</b> for $2x + 14 = 10$ <b>And M1</b> for $2x = 10 - \text{their } 14$
4		30	4	<b>M1</b> for $40\% = 12$ soi <b>And M1</b> for $10\% = 3$ or $20\% = 6$ <b>And M1</b> for $3 \times 10$ or $12 + 12 + 6$ <b>OR Alternatively</b> <b>M1</b> for $40\% = 12$ soi <b>And M2</b> for $12 \div 0.4$ oe <b>Or M1</b> for $12 \div 40\%$ <b>OR</b> <b>SC2</b> for answer of 20 or 42 or for 18 seen
5	(a)	(i) -6	2	<b>B1</b> for 4 or -10 seen
		(ii) $2 \frac{3}{4}$ or 2.75 or $11/4$ cao	2	<b>B1</b> for $\frac{1}{4}$ or 0.25 or $2\frac{1}{2}$ or 2.5 or $5/2$ seen
	(b)	5, 8, 11	2	<b>B1</b> for 1 correct, in correct place <b>Or SC1</b> for any two of these values seen
6	(a)	0.35 oe	2	<b>M1</b> for $0.15 + 0.2$ soi by 0.17 or for $0.35/1$
	(b)	0.16 oe	2	<b>M1</b> for $0.4 \times 0.4$ or for $0.16/1$
7		$(\frac{1}{2} \times) 3 \times 4^2$ 24 www feet <sup>2</sup> or ft <sup>2</sup> or f <sup>2</sup> or sq(uare) feet	<b>M1</b> <b>A1</b> 1	

8	(a)	90° cao	1	
	(b)	Translation cao 1 right, 7 up or $\begin{pmatrix} 1 \\ 7 \end{pmatrix}$	1 2	Must be a <u>single</u> transformation type  <b>B1</b> for 1 right or 7 up <b>Or B1</b> for $\begin{pmatrix} n \\ 7 \end{pmatrix}$ or $\begin{pmatrix} 1 \\ n \end{pmatrix}$  <b>Or SC1</b> for 1 left, 7 down; (1,7); $\begin{pmatrix} -1 \\ -7 \end{pmatrix}$ ; $\begin{pmatrix} 7 \\ 1 \end{pmatrix}$  <b>OR Alternatively</b> <b>B1</b> for reflection cao <b>AND B2</b> for $y = -1/7x$ <b>Or B1</b> for line drawn (approx. correct)
	(c)	$y = -\frac{1}{2}$ oe $x = 3\frac{1}{2}$ oe	1 1	After 0, <b>SC1</b> for $x = -\frac{1}{2}$ and $y = 3\frac{1}{2}$
9	(a)	(i) 48	3	<b>If adding areas</b> <b>B1</b> for width = 4 soi <b>And M1</b> for $2 \times (6 \times \text{their } 4)$  <b>OR If subtracting areas</b> <b>B1</b> for top of foot of L = 2 soi <b>And M1</b> for $10 \times 6 - (6 \times \text{their } 2)$
		(ii) 32	3	<b>M1</b> for $10 + 6 +$ four other lengths oe <b>And A1</b> for $10 + 6 + 4 + 2 + 6 + 4$  After 0, <b>SC1</b> for answer of 40 or 36 or 30
	(b)	(i) $y - x$ seen	<b>B1</b>	
		(ii) Width must be positive oe	<b>B1</b> <b>Dep</b>	Dependent on (i) correct <b>Or</b> $r$ must be positive oe or $y = x + r$ oe
		(iii) $2x - y$ or $x - (y - x)$ oe	<b>B1</b>	
		(iv) Width cannot be greater than length oe	<b>B1</b> <b>Dep</b>	Dependent on (iii) correct <b>Or</b> $p$ must be positive oe
		(v) $\frac{2x - y}{y}$ or $\frac{x(2x - y)}{xy}$ oe	2	<b>B1</b> for $px$ or $(x - r)x$ or $p(y - r)$ or $\text{their(iii)}x$ oe <b>AND</b> $yx$ <b>both</b> seen
10	(a)	121 seen 125 or $25 + 100$ seen Not equal (so not a right angle) oe soi	1 1 1	<b>FT</b> final mark after 1 slip only in any part of calculation. <b>Final mark dependent on a fully correct method.</b>
	(b)	Less oe $121 < 125$ soi oe Or 11 is too small oe	1 1	Independent of second mark Dependent on first mark scored

11		Compass arc 6cm $\pm$ 2mm from A Ruled perpendicular bisector drawn  2 points <b>only</b> , clearly identified as their solution, between boundaries and 6cm $\pm$ 2mm from A	<b>M1</b> <b>B2</b>  <b>B2</b>	Any length <b>M1</b> for at least one pair of crossing compass arcs (not just touching) equal radius from B and C  <b>B1</b> for one point <b>only</b> , clearly identified as their solution, between boundaries and 6cm $\pm$ 2mm from A
12		$3\frac{1}{21}$ or equivalent mixed number	<b>3</b>	<b>M1</b> for $\frac{8}{3}$ or $\frac{8}{7}$ oe <b>And M1</b> for $\frac{their(a \times b)}{their(c \times d)}$ soi by $\frac{64}{21}$ oe Dependent on attempt to change at least one to top heavy
13	(a)	$5x(x - 2y)$	<b>2</b>	<b>M1</b> for $5(x^2 - 2xy)$ or $x(5x - 10y)$
	(b)	$h = \frac{A - 2\pi r^2}{2\pi r}$ or $h = \frac{A}{2\pi r} - r$	<b>3</b>	<b>M2</b> for $\frac{A}{2\pi r} = r + h$ <b>OR</b> <b>M1</b> for $A = 2\pi r^2 + 2\pi rh$ <b>And M1</b> for $A - 2\pi r^2 = 2\pi rh$
14	(a)	(i) 17 to 17.5	<b>1</b>	
		(ii) 7.5 to 8	<b>2</b>	<b>B1</b> for a weight of 21 or 13 to 13.5 seen
		(iii) 9(000) or in words	<b>2</b>	<b>B1</b> for CF value of 21(000) or in words seen
	(b)	U – 12.5 or 12.49 L – 11.5(0)	<b>2</b>	<b>SC1</b> for one value correct in any position
15	(a)	2	<b>1</b>	
	(b)	Correct widths Heights: 0.4, 1.2, 1.6, 0.6	<b>1</b> <b>2</b>	<b>B1</b> for two correct bars on grid or two correct values in working -1 for extra bars
	(c)	4	<b>1</b>	
	(d)	Girls quicker oe <b>or</b> Girls have bigger range oe soi	<b>1</b>	Not just 'Mode for girls is 30-35 and mode for boys is 35-40' Allow 'Some girls in 10-20 group (but no boys)'
16	(a)	Systematic	<b>1</b>	
	(b)	B – 34 G – 46	<b>3</b>	<b>B2</b> for 34 or 46 seen <b>Or M1</b> for $\frac{230}{their400} \times 80$ or $\frac{170}{their400} \times 80$

17	(a)	$2^{2x-3}$ final answer	2	<b>B1</b> for $2^{2x \pm n}$ seen, $n \neq 0$ <b>Or SC1</b> for $\frac{2^{2x}}{2^3}$ or $\frac{2^{2x}}{8}$ or $2^{2x} \times 2^{-3}$
	(b)	$x = 4$	3	<b>B1</b> for $2^5$ soi <b>And M1</b> for <i>their</i> $(2x - 3) =$ <i>their</i> 5 soi
18	(a)	$\frac{1}{2}$ or $2^{-1}$ or 0.5	3	<b>B1</b> for 8 from $64^{\frac{1}{2}}$ <b>And B1</b> for 1/16
	(b)	$62 + 23\sqrt{7}$	3	<b>B2</b> for three of 20, $8\sqrt{7}$ , $15\sqrt{7}$ , $6\sqrt{49}$ seen <b>Or B1</b> for two of 20, $8\sqrt{7}$ , $15\sqrt{7}$ , $6\sqrt{49}$ seen
19	(a)	(4, 20)	1	
	(b)	(4, 7)	1	
20		$(x + 5)(x - 7) = 2x - 3$ $x^2 - 4x - 32 = 0$ $(x - 8)(x + 4)$  $x = 8, y = 13$ cao or $x = -4, y = -11$ cao	<b>M1</b> <b>M1</b> <b>M1</b>  <b>B1</b> <b>B1</b>	Equating or <b>attempting</b> to subtract the two equations Collecting to equal zero. Allow 1 term error. Factorising <i>their</i> $x^2 + bx + c$ in the form $(x + p)(x + q)$ where either $pq = c$ or $p + q = b$  After <b>B0</b> , <b>B0</b> allow <b>SC1</b> for either <b>both</b> $x$ or <b>both</b> $y$ correct



**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](mailto:general.qualifications@ocr.org.uk)

**[www.ocr.org.uk](http://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