



GCSE

Mathematics A

Session: 2010 June
Type: Mark scheme
Code: J512
Units: 01; 02; 03; 04

Mathematics Syllabus A

General Certificate of Secondary Education **J512/01**

Paper 1

Mark Scheme for June 2010

UCLES

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.

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

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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.
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Award NR (no response) if:
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 - 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.
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- 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)	Circle	1	
	(b)	Hexagon	1	
	(c)	Rhombus	1	
	(d)	Trapezium	1	
	(e)	Cylinder	1	
2	(a)	2389, 12 000, 25 490, 100 000	1	
	(b)	57	1	
	(c)	(i) 218 112	1	Condone £ in answers
		(ii) 173 900	1	Condone £ in answers
		(iii) Four thousand (and) seventy seven	1	
3	(a)	7, 4, 4, 11, 4 in frequency column	2	B1 for 3 or 4 correct frequencies in frequency column Or SC1 for all tallies correct or all correct frequencies in tally column or if poor notation eg $\frac{7}{30}$, 7:30 etc
	(b)	6 cao	1	
	(c)	6 ft	1	Correct or ft <i>their</i> (b)
4	(a)	Any three, of 2, 4, 6, 8 or 10	1	
	(b)	Even, even, odd	3	1 for each correct response
	(c)	(i) 9 cao	1	
		(ii) 25 cao	1	
		(iii) 9 cao	2	B1 for 81 seen
5	(a)	$\frac{1}{2}$ oe	1	
	(b)	0.75 cao	1	
	(c)	25 cao	1	
	(d)	$\frac{3}{25}$ final answer	2	Allow M1 for $\frac{12}{100}$ oe
6		8.50	4	B1 for (adults) = 13 and B1 for (children) = 13.5(0) and M1 for <i>their</i> [13 + 13.50] – 18 <i>Misreads of numbers of adults and/or children in this question would not score the respective B marks.</i>
7	(a)	os, ok, ac, as, ak, fc, fs, fk and no incorrect combinations	2	1 for 6 or more correct (ignore further incorrect)

	(b)	$1/9, 2/18, 0.11(1\dots)$ or $11(.1\dots)\%$	1	Ignore extra words e.g. 'unlikely' No ft from an incorrect (a)								
	(c)	They are not equally likely to be chosen	1									
8	(a)	(i) $8e$	1									
		(ii) $5c + 2d$	2	1 for one term correct seen								
		(iii) g^4	1									
	(b)	(i) 5	1	Condone 9×5 seen								
		(ii) 21	1	Condone $21 \div 7$ or $\frac{21}{7}$ seen								
9	(a)	1 correct line drawn any length	1	If >1 line 0 marks								
	(b)	H drawn with exactly 2 correct lines	2	B1 for H drawn Or SC1 for any letter with two lines of symmetry correctly drawn								
	(c)	S or H	1	Allow I, Z, N, some Xs and some Os								
10	(a)	81	1									
	(b)	4	1									
	(c)	15 or 15/1	2	M1 for 40/8 (= 5)								
	(d)	21	2	M1 for 70/10								
	(e)	1728 with working seen	3	SC2 if correct and no working M1 for $144(0) + 288$ or $168(0) + 48$ (at least 1 term correct and addition attempted) And A1 if all non-zero digits are correct in their part sums Or M1 for $1400 + 40 + 280 + 8$ (i.e. 4 values added at least two terms correct) And A1 for all non-zero digits correct, and 3 terms correct Or if grid ('Chinese' method) used <table border="1" style="display: inline-table; vertical-align: middle;"> <tbody> <tr> <td>1</td> <td>4</td> <td>(0)</td> <td>4</td> </tr> <tr> <td>2</td> <td>8</td> <td>(0)</td> <td>8</td> </tr> </tbody> </table> M1 complete grid, 2 products correct A1 whole grid correct	1	4	(0)	4	2	8	(0)	8
1	4	(0)	4									
2	8	(0)	8									
	(f)	1008	2	Allow 1 for 1000 or 8 seen								

11	(a)	30 minutes oe	1	
	(b)	One or more Xs marked on (or slightly above/below) horizontal section	1	Condone Xs marked at either end of horizontal section
	(c)	(i) 12km	1	
		(ii) 36 or <i>(their 12) × 3</i>	2	M1 for attempt to use $s = d/t$
	(d)	Steeper at start	1	OR More time taken (at end) to cover same distance
12	(a)	16	1	
	(b)	23	1	
	(c)	38	2	M1 for attempt at $(61 \text{ or } 60) - (23 \text{ or } 28)$
	(d)	42	2	M1 for sight of 41 and/or 43
	(e)	35 32	3	SC2 for answers reversed 1 for (old) mode = 35 and 1 for new mode = 32 and 1 for teacher aged 35 left and 1 for teacher aged 32 started to a maximum of 2 marks OR SC1 for any 2 integer values $n, n - 3$
	(f)	0.17 oe	1	
13	(a)	<u><i>In (a) mark the best part of the answer</i></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 $63 \div 9 = 7$ BUT 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	
14	(a)	-6	2	B1 for 4 or -10 seen
	(b)	$2 \frac{3}{4}$ or 2.75 or $11/4$ cao	2	B1 for $\frac{1}{4}$ or 0.25 or $2\frac{1}{2}$ or 2.5 or $5/2$ seen
15		$(\frac{1}{2} \times) 3 \times 4^2$ 24 www feet ² or ft ² or f ² or sq(ua)re feet	M1 A1 1	

16	(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 B1 for 1 right or 7 up Or B1 for $\begin{pmatrix} n \\ 7 \end{pmatrix}$ or $\begin{pmatrix} 1 \\ n \end{pmatrix}$ Or SC1 for 1 left, 7 down; (1,7); $\begin{pmatrix} -1 \\ -7 \end{pmatrix}$; $\begin{pmatrix} 7 \\ 1 \end{pmatrix}$ OR Alternatively B1 for reflection cao AND B2 for $y = -1/7x$ Or B1 for line drawn (approx. correct)
17	(a)	48	3	If adding areas B1 for width = 4 soi And M1 for $2 \times (6 \times \text{their } 4)$ OR If subtracting areas B1 for top of foot of L = 2 soi And M1 for $10 \times 6 - (6 \times \text{their } 2)$
	(b)	32	3	M1 for $10 + 6 +$ four other lengths oe And A1 for $10 + 6 + 4 + 2 + 6 + 4$ After 0, SC1 for answer of 40 or 36 or 30
18		Compass arc $6\text{cm} \pm 2\text{mm}$ from A Ruled perpendicular bisector drawn 2 points only , clearly identified as their solution, between boundaries and $6\text{cm} \pm 2\text{mm}$ from A	M1 B2 B2	Any length M1 for at least one pair of crossing compass arcs (not just touching) equal radius from B and C B1 for one point only , clearly identified as their solution, between boundaries and $6\text{cm} \pm 2\text{mm}$ from A

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1		12.50 7.60 5.90 11.40 37.40	1 1 1 1 1	If zero not shown award no marks for the first time (only) that this occurs FT from <i>their</i> four values added
2		20 2 full circles and $\frac{1}{2}$ circle 38 or 39 4 full circles and $\frac{1}{4}$ circle or less	1 1 1 1	
3	(a)	$4\frac{1}{2}$	2	B1 for 4 to 5 inclusive
	(b)	$\checkmark \times \checkmark \times$	2	B1 for 2 or 3 correct
4	(a)	Certain	1	
	(b)	Certain or likely	1	
	(c)	Evens	1	
	(d)	Impossible	1	
5	(a)	(4 or four) thousand or 4000	1	
	(b)	876 432	1	
	(c)	2, 3, 4, 6	1	
	(d)	4	1	
	(e)	$\begin{array}{r} 3\ 2(3)\ 7\ 4\ 6\ 8(6) \\ +\ 8\ 3(2)\ 3\ 7\ 4\ 6(8) \end{array}$	2	B1 for 6 and 8 in units column or 2 and 3 in ten thousands column
	(f)	2/6	1	
6	(a)	(i) 7	1	
		(ii) 2	2	M1 for $5y = 9 + 1$ or better or $10/5$ seen
		(iii) $\frac{2}{4}$ or $\frac{1}{2}$ or 0.5	2	M1 for $4t = 19 - 17$ or better
	(b)	6 cao -3	1 1	FT (<i>their</i> 6) - 9
7	(a)	Smallest and largest Difference or correct subtraction with nothing else	1 1 dep	SC2 for $25 - 2 = 23$ seen with no incorrect statements or working Or SC1 for 23 with no words or working
	(b)	Arrange in order Find the middle or 5th (number)	1 1 dep	SC2 for 10 with correct working and no incorrect statements Or SC1 for 10 with no working or correct statements

8	(a)	'Correct' circle	1	May be freehand but whole circumference must lie between a radius of 2.8 and 3.2cm
	(b)	(i) Cross between 4.6 and 4.9cm	1	Inclusive
		(ii) Line parallel to EF labelled Y	1	By eye, minimum 3cm
		(iii) Line perpendicular to EF labelled Z $\pm 5^\circ$	1	By eye, minimum 2cm After 0 in (ii) and (iii), SC1 for two correct unlabelled lines in (ii) and (iii)
		(iv) 9.5 or $9\frac{1}{2}$	1	± 0.2 cm
9	(a)	(i) Angle 123° drawn labelled, $\pm 2^\circ$	1	
		(ii) Angle 205° drawn labelled, $\pm 2^\circ$	2	B1 for angle unlabelled or correct angles drawn (within tolerance) but 155 angle labelled 205 or angle 205° drawn labelled, $\pm 5^\circ$
	(b)	(i) Obtuse between 90 and 180	1 1 dep	Dependent on mark for 'obtuse'
		(ii) Reflex between 180 and 360	1 1 dep	Dependent on mark for 'reflex'
10	(a)	110	3	M2 for $180 - ((180 - 40) \div 2)$ soi Or M1 for $(180 - 40) \div 2$ or 70 soi
	(b)	104	3	M2 for $180 - (360 - (80 + 115 + 89))$ soi Or M1 for $360 - (80 + 115 + 89)$ or 76 soi
11	(a)	Reality	1	
	(b)	$\frac{1}{6}$ cao	2	M1 for 60/360 oe or 0.17 or 0.167 or 0.16(6...) or 17% or 16.7% or 16.(6...)%
	(c)	143	2	M1 for $360 - (90 + 60 + 67)$ soi
12	(a)	$\frac{3}{16}$ or 0.1875 cao	1	
	(b)	$\frac{5}{16}$ or 0.3125 cao	1	SC1 for 3 out of (or in) 16 in (a) and 5 out of (or in) 16 in (b)
	(c)	$\frac{10}{16}$ isw or $\frac{5}{8}$ isw or 0.625	2	SC1 for 10 and 16 seen or $\frac{13}{16}$ isw

13	(a)	(i) 2	1	
		(ii) -6	1	
	(b)	(i) 15	1	
		(ii) -8	1	
	(c)	(i) 28.1	1	
		(ii) 28.06	1	
		(iii) 28.059	1	
	(d)	(i) 11	1	
		(ii) 27	1	
14	(a)	31.491	1	
	(b)	5.088	2	M1 for 12.72/2.5 or 636/125 or 5.09
15	(a)	$168 + 44x$ or $2(84 + 22x)$ or $2 \times 84 + 44x$	1	Mark final answer only
	(b)	8	3	Provided correct equation seen, no ft of expression in part (a) M2 for $44x = 352$ Or M1 for $2 \times 84 + 44x = 520$ oe If M0 , then SC2 for 8 or SC1 for 0.08
16	(a)	$280 \pm 2^\circ$	1	
	(b)	(i) Correct line drawn $\pm 2^\circ$	1	
		(ii) X marked correctly	1	$90^\circ \pm 10^\circ$, ft <i>their</i> line starting at S provided it is not the line PS and Richard's route is drawn on bearing $> 180^\circ$
		(iii) 90° or right angle	1	
17	(a)	Single, correct ruled line	3	M2 for two correct points plotted Or M1 for two correct x and y pairs in table. Ignore any incorrect. Accept any x values Or SC1 for any two of <i>their</i> points from table correctly plotted
	(b)	2.3 to 2.7	1	

18	(a)	4.5 or $4\frac{1}{2}$	3	M2 for $2x = 9$ or $(x =) 9/2$ Or M1 for $3x = x + 9$ or $2x - 5 = 4$ If M0, then SC2 for $3 \times 4.5 - 5 = 4.5 + 4$ (only as final answer)
	(b)	$x > 4.4$ or $x > 4\frac{2}{5}$	2	Mark final answer only M1 for $5x > 22$ or 4.4 or $22/5$
19		Red – 7.5 Yellow – 3 www White – 1.5	4	B3 for two correct values www Or M2 for <i>their</i> $12/(5 + 2 + 1) \times (5 \text{ or } 2)$ Or M1 for $12/(5 + 2 + 1)$ soi by 1.5
20		198	3	M2 for $6 \times 11 \times 3$ Or M1 for 11×3 only for area of base or $6 \times$ <i>their</i> base area
21		$2 \times 2 \times 3 \times 3$ or $2^2 \times 3^2$ or $(2 \times 3)^2$ or $2^2 \times 3 \times 3$ or $2 \times 2 \times 3^2$	2	Mark final answer M1 for factor tree or division or product of factors with at least two of the correct prime factors in each of these methods or all four prime factors not given as a product

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- 8 For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work.
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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.
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✓ and ✗

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These should be used whenever appropriate during your marking.

Abbreviations

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- 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 $63 \div 9 = 7$ BUT 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 M2 for $x + 7 = 5$ Or M1 for $2x + 14 = 10$ And M1 for $2x = 10$ – their 14
4		30	4	M1 for $40\% = 12$ soi And M1 for $10\% = 3$ or $20\% = 6$ And M1 for 3×10 or $12 + 12 + 6$ OR Alternatively M1 for $40\% = 12$ soi And M2 for $12 \div 0.4$ oe Or M1 for $12 \div 40\%$ OR SC2 for answer of 20 or 42 or for 18 seen
5	(a)	(i) -6	2	B1 for 4 or -10 seen
		(ii) $2\frac{3}{4}$ or 2.75 or $11/4$ cao	2	B1 for $\frac{1}{4}$ or 0.25 or $2\frac{1}{2}$ or 2.5 or $5/2$ seen
	(b)	5, 8, 11	2	B1 for 1 correct, in correct place Or SC1 for any two of these values seen
6	(a)	0.35 oe	2	M1 for $0.15 + 0.2$ soi by 0.17 or for 0.35/1
	(b)	0.16 oe	2	M1 for 0.4×0.4 or for 0.16/1
7		$(\frac{1}{2} \times) 3 \times 4^2$ 24 www feet ² or ft ² or f ² or sq(uare) feet	M1 A1 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 B1 for 1 right or 7 up Or B1 for $\begin{pmatrix} n \\ 7 \end{pmatrix}$ or $\begin{pmatrix} 1 \\ n \end{pmatrix}$ Or SC1 for 1 left, 7 down; (1,7); $\begin{pmatrix} -1 \\ -7 \end{pmatrix}$; $\begin{pmatrix} 7 \\ 1 \end{pmatrix}$ OR Alternatively B1 for reflection cao AND B2 for $y = -1/7x$ Or B1 for line drawn (approx. correct)
	(c)	$y = -\frac{1}{2}$ oe $x = 3\frac{1}{2}$ oe	1 1	After 0, SC1 for $x = -\frac{1}{2}$ and $y = 3\frac{1}{2}$
9	(a)	(i) 48	3	If adding areas B1 for width = 4 soi And M1 for $2 \times (6 \times \text{their } 4)$ OR If subtracting areas B1 for top of foot of L = 2 soi And M1 for $10 \times 6 - (6 \times \text{their } 2)$
		(ii) 32	3	M1 for $10 + 6 +$ four other lengths oe And A1 for $10 + 6 + 4 + 2 + 6 + 4$ After 0, SC1 for answer of 40 or 36 or 30
	(b)	(i) $y - x$ seen	B1	
		(ii) Width must be positive oe	B1 Dep	Dependent on (i) correct Or r must be positive oe or $y = x + r$ oe
		(iii) $2x - y$ or $x - (y - x)$ oe	B1	
		(iv) Width cannot be greater than length oe	B1 Dep	Dependent on (iii) correct Or p must be positive oe
		(v) $\frac{2x - y}{y}$ or $\frac{x(2x - y)}{xy}$ oe	2	B1 for px or $(x - r)x$ or $p(y - r)$ or $\text{their(iii)}x$ oe AND yx both seen
10	(a)	121 seen 125 or $25 + 100$ seen Not equal (so not a right angle) oe soi	1 1 1	FT final mark after 1 slip only in any part of calculation. Final mark dependent on a fully correct method.
	(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 only , clearly identified as their solution, between boundaries and 6cm \pm 2mm from A	M1 B2 B2	Any length M1 for at least one pair of crossing compass arcs (not just touching) equal radius from B and C B1 for one point only , clearly identified as their solution, between boundaries and 6cm \pm 2mm from A
12		$3\frac{1}{21}$ or equivalent mixed number	3	M1 for $\frac{8}{3}$ or $\frac{8}{7}$ oe And M1 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)	$5x(x - 2y)$	2	M1 for $5(x^2 - 2xy)$ or $x(5x - 10y)$
	(b)	$h = \frac{A - 2\pi r^2}{2\pi r}$ or $h = \frac{A}{2\pi r} - r$	3	M2 for $\frac{A}{2\pi r} = r + h$ OR M1 for $A = 2\pi r^2 + 2\pi rh$ And M1 for $A - 2\pi r^2 = 2\pi rh$
14	(a)	(i) 17 to 17.5 (ii) 7.5 to 8 (iii) 9(000) or in words	1 2 2	B1 for a weight of 21 or 13 to 13.5 seen B1 for CF value of 21(000) or in words seen
	(b)	U – 12.5 or 12.49 L – 11.5(0)	2	SC1 for one value correct in any position
15	(a)	2	1	
	(b)	Correct widths Heights: 0.4, 1.2, 1.6, 0.6	1 2	B1 for two correct bars on grid or two correct values in working -1 for extra bars
	(c)	4	1	
	(d)	Girls quicker oe or Girls have bigger range oe soi	1	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	1	
	(b)	B – 34 G – 46	3	B2 for 34 or 46 seen Or M1 for $\frac{230}{their400} \times 80$ or $\frac{170}{their400} \times 80$

17	(a)	2^{2x-3} final answer	2	B1 for $2^{2x \pm n}$ seen, $n \neq 0$ Or SC1 for $\frac{2^{2x}}{2^3}$ or $\frac{2^{2x}}{8}$ or $2^{2x} \times 2^{-3}$
	(b)	$x = 4$	3	B1 for 2^5 soi And M1 for <i>their</i> $(2x - 3) =$ <i>their</i> 5 soi
18	(a)	$\frac{1}{2}$ or 2^{-1} or 0.5	3	B1 for 8 from $64^{\frac{1}{2}}$ And B1 for 1/16
	(b)	$62 + 23\sqrt{7}$	3	B2 for three of 20, $8\sqrt{7}$, $15\sqrt{7}$, $6\sqrt{49}$ seen Or B1 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	M1 M1 M1 B1 B1	Equating or attempting 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 B0 , B0 allow SC1 for either both x or both y correct

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Mathematics Syllabus A

General Certificate of Secondary Education **J512/04**

Paper 4

Mark Scheme for June 2010

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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.

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

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1	(a)	5.088	2	M1 for $12.72/2.5$ or $636/125$ or 5.09
	(b)	10.19	2	M1 for $10.18(9\dots)$ or $10.2(0)$
2	(a)	$168 + 44x$ or $2(84 + 22x)$ or $2 \times 84 + 44x$	1	Mark final answer only
	(b)	8	3	Provided correct equation seen, no ft of expression in part (a) M2 for $44x = 352$ Or M1 for $2 \times 84 + 44x = 520$ oe If M0 , then SC2 for 8 or SC1 for 0.08
3	(a)	$280 \pm 2^\circ$	1	
	(b)	(i) Correct line drawn $\pm 2^\circ$	1	
		(ii) X marked correctly	1	$90^\circ \pm 10^\circ$, ft <i>their</i> line starting at S provided it is not the line PS and Richard's route is drawn on bearing $> 180^\circ$
		(iii) 90° or right angle	1	
4	(a)	(i) 51.85 or 51.9 www	2	M1 for $\frac{1}{2}(4.9 + 7.3) \times 8.5$ or $4.9 \times 8.5 + \frac{1}{2}(7.3 - 4.9) \times 8.5$
		(ii) 82 Alternate (angles)	1 1	Not Z angles or alternating or alternative
	(b)	43	2	M1 for 43 or 47 seen in a correct position on the diagram
5	(a)	3 www	3	Award SC2 for 50 m/min or $0.83(3\dots)$ m/s or 0.00083 km/s or 0.05 km/min Or M2 for $0.75 \div 0.25$ oe Or M1 for $0.75 \div$ figs15
	(b)	5 35	1	Both
	(c)	83 www	4	B3 for $15 + 43 + 25$ Or B2 for $5/12 \times 60$ or 25 Or B1 for $5/12$ If B0 or B1 or B2 , then also SC1 for $15 + 43 +$ <i>their</i> 25
6		Sometimes odd, sometimes even $5n$ is odd or even and +1 changes it to even or odd Or correct trials, clearly showing both n and output, of both odd & even number; if only trials used for reason, all trials must be correct	1 1	If 0 and 0, then SC1 for trials of both odd & even with conclusion correct for <i>their</i> results

7	(a)	4.5 or $4\frac{1}{2}$	3	M2 for $2x = 9$ or $(x =) 9/2$ Or M1 for $3x = x + 9$ or $2x - 5 = 4$ If M0, then SC2 for $3 \times 4.5 - 5 = 4.5 + 4$ (only as final answer)
	(b)	216	2	M1 for $\frac{x}{3} = 72$ or $x - 6 = 210$
	(c)	$x > 4.4$ or $x > 4\frac{2}{5}$	2	Mark final answer only M1 for $5x > 22$ or 4.4 or $22/5$
8		198	3	M2 for $6 \times 11 \times 3$ Or M1 for 11×3 only for area of base or $6 \times$ <i>their</i> base area
9	(a)	(i) $2 \times 2 \times 3 \times 3$ or $2^2 \times 3^2$ or $(2 \times 3)^2$ or $2^2 \times 3 \times 3$ or $2 \times 2 \times 3^2$	2	Mark final answer M1 for factor tree or division or product of factors with at least two of the correct prime factors in each of these methods or all four prime factors not given as a product
		(ii) Prime numbers in product are in pairs or Only squares of prime factors or Prime factors are squared or	1	ft (a)(i) if reference to 'it' or similar in <i>their</i> reason
	(b)	14 or 2×7	3	M2 for $2 \times 5 \times 5 \times 7$ or $350 \div 25$ Or M1 for factors of 350 e.g. factor tree or dividing 350 by square numbers only If M0, then SC1 for 56 or 126 or 224

10	(a)	21.45 – 21.5	4	<p>M3 for sum of all correct midpoints \times frequency / 31 (665/31) Or M2 for sum of all correct midpoints \times frequency (665) or sum of correct midpoints \times frequency with at most one error / 31 Or M1 for at least two midpoints \times frequency If M0, then SC2 for sum of all frequencies \times value in correct interval / 31 or SC1 for sum of all frequencies \times value in correct interval</p>
	(b)	Fully correct polygon points $\pm \frac{1}{2}$ small square	2	<p>M1 for all heights in correct class or all midpoints correct or 4 points correct Condone end points joined</p>
	(c)	(i) $10 \leq m < 20$	1	
		(ii) $10 \leq m < 20$	1	
	(d)	Average higher in July oe	1	Must refer to average, mean, median or modal class, may not use these words
	(e)	(i) Allow any number or range 0 to less than 20 15th & 16th or 15½th value must lie in $10 \leq m < 20$ class interval	M1 A1	<p>Alternative solution B2 for $10 \leq m < 20$ because that's already where the median is so adding one measurement to it would keep the median the same</p>
		(ii) $40 \leq m < 50$	1	
11	(a)	4, -1.625	1, 1	
	(b)	Fully correct	2	<p>B1 for both points plotted correctly $\pm \frac{1}{2}$ small square ft their points Or B1 for smooth cubic curve through at least 9 of the 10 points</p>
	(c)	-2.4	FT1	Strict ft <i>their</i> curve $\pm \frac{1}{2}$ small square (<i>their</i> 'curve' should not be a single straight line)
12		$x = -\frac{1}{2}, y = 7$ www	4	<p>Both, provided correct algebraic method B3 for one correct following correct algebraic method Or M2 for subtract equations with at least two terms correct or subst for x or for y Or M1 for attempt to multiply equations so that x or y have same coefficient or rearrange as $x =$ or $y =$ If M0 or M1, then SC2 only for both answers correct from no method or wrong working or non-algebraic method e.g. T & E</p>

13		6.5	4	M3 for $((52 \div 0.8) \div 1000) \times 100$ Or M2 for $52/0.8$ or figs 65 seen Or M1 for 0.8 or 80% oe used in working
14	(a)	(i) $x^4 y^4$ or $(xy)^4$	1	
		(ii) $9 x^8 y^2$	2	M1 for single product with two of 9, x^8 , y^2 correct
	(b)	0.78 & 24.22	3	M2 for $(25 \pm \sqrt{549})/2$ or $x - 12.5 = \pm\sqrt{137.25}$ Or M1 for correct substitution into formula or correct use of complete square
	(c)	$y = 784/x$ oe	2	M1 for $y = k/x$ oe or $196 = k/4$ oe or 784 seen
15	(a)	28.1 – 28.135 www or 28 with correct working shown	3	M2 for $\sin^{-1} 5.8/12.3$ Or M1 for $\sin x = 5.8/12.3$ or $5.8\sin 90/12.3$
	(b)	8.1 – 8.12 www or 8 with correct working shown	3	M2 for $10.3 \times \cos 38$ Or M1 for $\cos 38 = AB/10.3$
	(c)	28.69 – 28.7 or 29 www	2	M1 for $\frac{1}{2} \times 8.5 \times 15.4 \times \sin 26$ oe
16		17800 or 18000 www	4	M3 for 17802 – 17805 www Or M2 for $150/360 \times 2 \times \pi \times 6800$ Or M1 for $n/360 \times 2 \times \pi \times 6800$ If M0, then SC1 for $150/360 \times 2 \times \pi \times 13600$ or $150/360 \times \pi \times 6800$ or $150/360 \times \pi \times 6800^2$ If M0, M1, M2 or SC1, allow also SC1 for correct rounding <i>their</i> sensible answer to nearest hundred or thousand

17		<p>Finding either correct bound</p> <p>Use of tan or appropriate trig method to find the angle, or using angle 7.2 to find a side</p> <p>Both an upper bound for 300 and a lower bound for 2450 identified and used appropriately in the same calculation or within a comparison</p> <p>Complete correct method using two of 305, 2445 and 7.2</p> <p>'Yes' with correct comparison or supporting mathematical argument e.g. $7.1(1\dots)$ www with 7.2 or $\tan 7.2$ with 305/2445</p>	<p>M1</p> <p>M1</p> <p>M1</p> <p>M1 dep</p> <p>A1</p>	<p>First 3 M marks are independent</p> <p>Dep on 1st 3 marks awarded</p>
18	(a)	<p>$\frac{2}{7}$ $\frac{5}{7}$</p> <p>$\frac{3}{8}$ $\frac{5}{8}$</p> <p>$\frac{3}{7}$ $\frac{4}{7}$</p>	<p>1</p> <p>1</p> <p>1</p>	
	(b)	<p>$\frac{30}{56}$ www oe fraction</p>	<p>3</p>	<p>M2 for $(\frac{3}{8} \times \frac{5}{7}) + (\frac{5}{8} \times \frac{3}{7})$ Or M1 for either $\frac{3}{8} \times \frac{5}{7}$ or $\frac{5}{8} \times \frac{3}{7}$</p>

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