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

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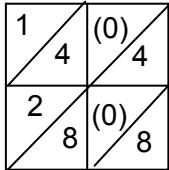**MR** - Misread
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1	(a)	Circle	1	
	(b)	Hexagon	1	
	(c)	Rhombus	1	
	(d)	Trapezium	1	
	(e)	Cylinder	1	
2	(a)	2389, 12 000, 25 490, 100 000	1	
	(b)	57	1	
	(c)	(i) 218 112	1	Condone £ in answers
		(ii) 173 900	1	Condone £ in answers
		(iii) Four thousand (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 *their* (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)	½ oe	1	
	(b)	0.75 cao	1	
	(c)	25 cao	1	
	(d)	3/25 final answer	2	Allow **M1** for 12/100 oe
6		8.50	4	**B1** for (adults) = 13 **and B1** for (children) = 13.5(0) **and M1** for *their* [13 + 13.50] – 18 *Misreads of numbers of adults and/or children in this question would not score the respective B marks.*
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…) or 11(.1…)%	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 $\dfrac{21}{7}$ 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 **M1** complete grid, 2 products correct **A1** whole grid correct
	(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 (*their* 12) × 3	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 or 60) – (23 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)	*In (a) mark the best part of the answer* (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** √64 = 8	1	Soi e.g. 7^2 = 49 **or** answer is too small
		(iii) E.g. Answer should be 7(.0) or 6 ÷ 1 = 6	1	Soi e.g. 70 × 0.9 = 63 or 63 ÷ 9 = 7 **BUT** withhold mark if their answer to 6.3 ÷ 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 ¾ or 2.75 or 11/4 cao	2	**B1** for ¼ or 0.25 or 2½ or 2.5 or 5/2 seen
15		(½ ×) 3 × 4^2 24 www feet^2 or ft^2 or f^2 or sq(uare) 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); $\begin{pmatrix} -1 \\ -7 \end{pmatrix}$; $\begin{pmatrix} 7 \\ 1 \end{pmatrix}$ <u>**OR Alternatively**</u> **B1** for reflection cao **AND B2** for $y = -1/7x$ **Or B1** for line drawn (approx. correct)
17	(a)	48	**3**	<u>**If adding areas**</u> **B1** for width = 4 soi **And M1** for 2 × (6 × *their* 4) <u>**OR If subtracting areas**</u> **B1** for top of foot of L = 2 soi **And M1** for 10 × 6 – (6 × *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 6cm ± 2mm from A Ruled perpendicular bisector drawn 2 points **only**, clearly identified as their solution, between boundaries and 6cm ± 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 ± 2mm from A

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1		12.50	**1**	If zero not shown award no marks for the first time (only) that this occurs
		7.60	**1**	
		5.90	**1**	
		11.40	**1**	
		37.40	**1**	**FT** from *their* four values added
2		20	**1**	
		2 full circles and ½ circle	**1**	
		38 or 39	**1**	
		4 full circles and ¼ circle or less	**1**	
3	(a)	4½	**2**	**B1** for 4 to 5 inclusive
	(b)	✓ ✗ ✓ ✗	**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)	3 **2(3)** 7 4 6 **8(6)** + 8 **3(2)** 3 **7** 4 6**(8)**	**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) 2/4 or ½ or 0.5	**2**	**M1** for $4t = 19 - 17$ or better
	(b)	6 cao	**1**	
		-3	**1**	**FT** (*their* 6) − 9
7	(a)	Smallest and largest	**1**	**SC2** for 25 − 2 = 23 seen with no incorrect statements or working
		Difference or correct subtraction with nothing else	**1** **dep**	**Or SC1** for 23 with no words or working
	(b)	Arrange in order	**1**	**SC2** for 10 with correct working and no incorrect statements
		Find the **middle** or **5th** (number)	**1** **dep**	**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 ± 5°	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	± 0.2cm
9	(a)	(i) Angle 123° drawn labelled, ± 2°	1	
		(ii) Angle 205° drawn labelled, ± 2°	2	**B1** for angle unlabelled or correct angles drawn (within tolerance) but 155 angle labelled 205 or angle 205° drawn labelled, ± 5°
	(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) ÷ 2) soi **Or M1** for (180 − 40) ÷ 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)	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)	3/16 or 0.1875 cao	1	
	(b)	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)	10/16 isw or 5/8 isw or 0.625	2	**SC1** for 10 and 16 seen **or** 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 ± 2°	1	
	(b)	(i) Correct line drawn ± 2°	1	
		(ii) X marked correctly	1	90° ± 10°, ft *their* line starting at S provided it is not the line PS and Richard's route is drawn on bearing > 180°
		(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 *their* points from table correctly plotted
	(b)	2.3 to 2.7	1	

18	(a)	4.5 or 4½	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 $x > 4\ 2/5$	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 *their* 12/(5 + 2 + 1) × (5 or 2) **Or M1** for 12/(5 + 2 + 1) soi by 1.5
20		198	3	**M2** for 6 × 11 × 3 **Or M1** for 11 × 3 only for area of base or 6 × *their* base area
21		2 × 2 × 3 × 3 or 2² × 3² or (2 × 3)² or 2² × 3 × 3 or 2 × 2 × 3²	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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		(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 ÷ 0.4 oe **Or M1** for 12 ÷ 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 ¾ or 2.75 or 11/4 cao	2	**B1** for ¼ or 0.25 or 2½ 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		(½ ×) 3 × 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	Must be a <u>single</u> transformation type
		1 right, 7 up or $\begin{pmatrix} 1 \\ 7 \end{pmatrix}$	2	**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); $\begin{pmatrix} -1 \\ -7 \end{pmatrix}$; $\begin{pmatrix} 7 \\ 1 \end{pmatrix}$ <u>**OR Alternatively**</u> **B1** for reflection cao **AND B2** for $y = -1/7x$ **Or B1** for line drawn (approx. correct)
	(c)	$y = -½$ oe $x = 3½$ oe	1 1	 After 0, **SC1** for $x = -½$ and $y = 3½$
9	(a)	(i) 48	3	<u>**If adding areas**</u> **B1** for width = 4 soi **And M1** for 2 × (6 × *their* 4) <u>**OR If subtracting areas**</u> **B1** for top of foot of L = 2 soi **And M1** for 10 × 6 – (6 × *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) $\dfrac{2x-y}{y}$ or $\dfrac{x(2x-y)}{xy}$ oe	2	**B1** for *px* or $(x - r)x$ or $p(y - r)$ or *their*(iii)*x* oe **<u>AND</u>** *yx* <u>both</u> 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 ± 2mm from A Ruled perpendicular bisector drawn	M1 B2	Any length **M1** for at least one pair of crossing compass arcs (not just touching) equal radius from B and C
		2 points **only**, clearly identified as their solution, between boundaries and 6cm ± 2mm from A	B2	**B1** for one point **only**, clearly identified as their solution, between boundaries and 6cm ± 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	1	
		(ii) 7.5 to 8	2	**B1** for a weight of 21 or 13 to 13.5 seen
		(iii) 9(000) or in words	2	**B1** for CF value of 21(000) or in words seen
	(b)	U – 12.5 or 12.4$\dot{9}$ 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 $\frac{230}{their\,400} \times 80$ or $\frac{170}{their\,400} \times 80$

17	(a)	2^{2x-3} final answer	2	**B1** for $2^{2x \pm n}$ seen, $n \neq 0$ **Or SC1** for $\dfrac{2^{2x}}{2^3}$ or $\dfrac{2^{2x}}{8}$ or $2^{2x} \times 2^{-3}$
	(b)	$x = 4$	3	**B1** for 2^5 soi **And M1** for *their*$(2x-3)$ = *their* 5 soi
18	(a)	½ or 2^{-1} or 0.5	3	**B1** for 8 from $64^{½}$ **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		$(x+5)(x-7) = 2x-3$	M1	Equating or **attempting** to subtract the two equations
		$x^2 - 4x - 32 = 0$	M1	Collecting to equal zero. Allow 1 term error.
		$(x-8)(x+4)$	M1	Factorising *their* $x^2 + bx + c$ in the form $(x+p)(x+q)$ where either $pq = c$ or $p + q = b$
		$x = 8$, $y = 13$ cao	B1	
		or $x = -4$, $y = -11$ cao	B1	After **B0, B0** allow **SC1** for either **both** x or **both** y correct

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GCSE

Mathematics Syllabus A

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

Paper 4

Mark Scheme for June 2010

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)	5.088	2	**M1** for 12.72/2.5 or 636/125 or 5.09
	(b)	10.19	2	**M1** for 10.18(9...) 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)	$280 \pm 2°$	1	
	(b)	(i) Correct line drawn $\pm 2°$	1	
		(ii) X marked correctly	1	$90° \pm 10°$, ft *their* line starting at S provided it is not the line PS and Richard's route is drawn on bearing > 180°
		(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..) m/s or 0.00083 km/s or 0.05 km/min **Or M2** for 0.75 ÷ 0.25 oe **Or M1** for 0.75 ÷ figs15
	(b)	5 35	1	Both
	(c)	83 www	4	**B3** for 15 + 43 + 25 **Or B2** for 5/12 × 60 or 25 **Or B1** for 5/12 If **B0** or **B1** or **B2**, then also **SC1** for 15 + 43 + *their* 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 *their* results

7	(a)	4.5 or 4½	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 $\dfrac{x}{3} = 72$ or $x - 6 = 210$
	(c)	$x > 4.4$ or $x > 4\,2/5$	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 $6 \times$ *their* 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 oe	1	ft (a)(i) if reference to 'it' or similar in *their* 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	**M3** for sum of all correct midpoints × frequency / 31 (665/31) **Or M2** for sum of all correct midpoints × frequency (665) or sum of correct midpoints × frequency with at most one error / 31 **Or M1** for at least two midpoints × frequency If M0, then **SC2** for sum of all frequencies × value in correct interval / 31 or **SC1** for sum of all frequencies × value in correct interval
	(b)	Fully correct polygon points ± ½ small square	2	**M1** for all heights in correct class or all midpoints correct or 4 points correct Condone end points joined
	(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 **$15½^{th}$** value must lie in $10 \leq m < 20$ class interval	M1 A1	**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
		(ii) $40 \leq m < 50$	1	
11	(a)	4, -1.625	1, 1	
	(b)	Fully correct	2	**B1** for both points plotted correctly ± ½ small square ft *their* **points** **Or B1** for smooth cubic curve through at least 9 of the 10 points
	(c)	-2.4	FT1	Strict ft *their* curve ± ½ small square (*their* 'curve' should not be a single straight line)
12		$x = -½$, $y = 7$ www	4	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

13		6.5	4	**M3** for ((52 ÷ 0.8) ÷ 1000) × 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 5.8sin90/12.3
	(b)	8.1 – 8.12 www or 8 with correct working shown	3	**M2** for 10.3 × cos38 **Or M1** for cos38 = AB/10.3
	(c)	28.69 – 28.7 or 29 www	2	**M1** for ½ × 8.5 × 15.4 × sin 26 oe
16		17800 or 18000 www	4	**M3** for 17802 – 17805 www **Or M2** for 150/360 × 2 × π × 6800 **Or M1** for n/360 × 2 × π × 6800 If M0, then **SC1** for 150/360 × 2 × π × 13600 or 150/360 × π × 6800 or 150/360 × π × 6800^2 If M0, M1, M2 or SC1, allow also **SC1** for correct rounding *their* sensible answer to nearest hundred or thousand

17		Finding either correct bound	**M1**	
		Use of tan or appropriate trig method to find the angle, or using angle 7.2 to find a side	**M1**	First 3 M marks are independent
		Both an upper bound for 300 **and** a lower bound for 2450 identified and used **appropriately** in the same calculation or within a comparison	**M1**	
		Complete correct method using two of 305, 2445 and 7.2	**M1 dep**	Dep on 1st 3 marks awarded
		'Yes' with correct comparison or supporting mathematical argument e.g. 7.1(1...) www with 7.2 or tan7.2 with 305/2445	**A1**	
18	(a)	2/7 5/7 3/8 5/8 3/7 4/7	**1** **1** **1**	
	(b)	30/56 www oe fraction	**3**	**M2** for (3/8 × 5/7) + (5/8 × 3/7) **Or M1** for either 3/8 × 5/7 or 5/8 × 3/7