OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics C

General Certificate of Secondary Education **J517**

Mark Schemes for the Units

June 2009

J517/MS/R/09

Oxford Cambridge and RSA Examinations

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GCSE Mathematics C (J517)

MARK SCHEMES FOR THE UNITS

List of abbreviations

The following abbreviations are commonly found in GCSE Mathematics mark schemes.

- Where you see **cao** in the mark scheme it means **correct answer only.**
- Where you see **figs 237**, for example, this means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point, eg 237000, 2·37, 2·370, and 0·00237 would be acceptable, but 23070 or 2374 would not.
- Where you see **ft** in the mark scheme it means **follow through.**
- Where you see **isw** in the mark scheme it means **ignore subsequent working** (after correct answer obtained).
- Where you see **oe** in the mark scheme it means **or equivalent.**
- Where you see **rot** in the mark scheme it means **rounded or truncated.**
- Where you see **seen** in the mark scheme it means that the mark is earned if that number or expression is seen anywhere in the answer space, including on the answer line, even if it is not in the method leading to the final answer.
- 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.**

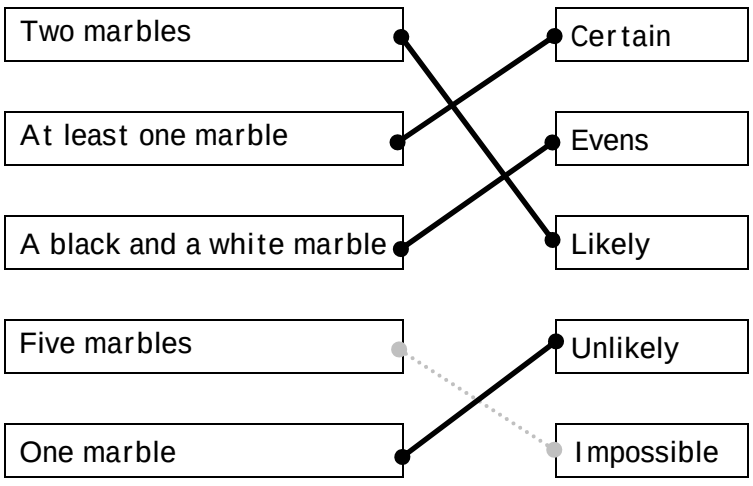
B271 Module Test M1

Section A

1	**(a)**	(i) Voronja	**1**	Accept Georgia or 2080
		(ii) one thousand (and) six hundred (and) two	**1**	Accept sixteen hundred and two
		(iii) 1730	**1**	
	(b)	90	**2**	**M1** for 65 + 25 soi
2	**(a)**	7	**2**	**M1** for "14" or "÷ 2" soi
	(b)	3 www	**3**	**M2** for 18 – 15 seen OR **M1** for "6 + 6 + 3 + 3" or equivalent or better seen
	(c)	Clitheroe North West	**1** **1**	**SC1** for Settle, Skipton and Clitheroe Accept NW
	(d)	140	**1**	or 140·0
	(e)	11:55, or five to 12, or equivalent	**2**	Accept all commonly used time formats **M1** for sight of 11:05 or equivalent or xx:55 or "five to xx"
3	**(a)**	(i) 14	**1**	
		(ii) 17	**1**	
	(b)		**1**	Condone three dots and three bars in any configuration
4	**(a)**	Pentagon	**1**	
	(b)	18 to 22 (cm)	**2**	**M1** for 5 × soi oe
	(c)	23 to 27 (cm^2)	**2**	**M1** for 2 outside correct range (either way), or for clear attempt to count squares as evidenced by numbers/dots/ticks in squares
5	**(a)**	21	**1**	
	(b)	4	**1**	

Section A Total: 25

Section B

6	**(a)**	39	**1**	
	(b)	2000	**1**	Condone 43
	(c)	94	**1**	
7	**(a)**	(5, 5) cao	**1**	
	(b)	(3, 5)	**1**	Ignore “yes” or “no”
	(c)	(3·8 to 4·2) or (38 to 42) cm or mm	**1** **1**	 Independent mark
8	**(a)**	21	**1**	
	(b)	45 is in the five times tables oe	**2**	**M1** for just mention of “5”
9		1 2 3 1 3 2 2 1 3 2 3 1 3 1 2 3 2 1	**2**	All four correct and no extras or errors **M1** for 3 or more correct, where errors and repeats may appear
10		Correct (in any orientation or sense)	**2**	**M1** for one or more sides the correct length; must be a triangle
11	**(a)**	Any odd number divisible by 5	**1**	Allow choice but do not condone errors
	(b)	Any even number divisible by 5	**1**	Allow choice but do not condone errors
12	**(a)**	14	**1**	
	(b)	6	**1**	
13		**W1** for each correct Do not condone choice  		

14		16·81 www	**3**	**M2** for digits 1681 seen OR **M1** for digits 288 seen OR **M1** for digits 1199 seen OR **SC1** for digits 168 seen

Section B Total: 25

B272 Module Test M2

Section A

1	**(a)**	(i) 1·55 cao	**2**	**M1** 3·10 or figs 155 or ÷ 4 oe **SC1** 4·65 seen
		(ii) 4·65 correct or ft (i)	**2**	**M1** 6·20 – *their* 1·55 soi, or figs 465
	(b)	23·40 cao	**4**	**W2** 117 seen OR **M1** attempt at 234 ÷ 2 (implied by figs 117 or 112) AND **M1** *their* 117 ÷ 5 soi <u>Alternative method:</u> **W2** 46·80 OR **M1** attempt at 234 ÷ 5 (implied by figs 468) AND **M1** *their* 46·80 ÷ 2
2	**(a)**	Elvis Presley 22·1 8 Jan 1945	**1**	All correct
	(b)	George Harrison Ray Charles Kurt Cobain	**3**	Must be in this order **W1** each **SC2** for 3·7, 5·3 and 26·3 in order
	(c)	42 cao	**2**	**M1** 27 36 40 42 58 71 73
	(d)	(i) 16·3 cao	**2**	**M1** attempt at 12·6 + 3·7, or figs 163
		(ii) 8·9 cao	**2**	**M1** attempt at 12·6 – 3·7, or figs 89 If 0 scored in (i) and (ii), then **SC1** figs 37 **and** 126 seen
3	**(a)**	London Cardiff 6	**1** **1** **2**	Accept ¯10 Accept ¯17 **W1** (¯)8 **and** (¯)14 seen, or ¯6
	(b)	Clockwise	**1**	
	(c)	108	**2**	**M1** 18 × 6 soi, or figs 48 or 60 seen

Section A Total: 25

Section B

4	**(a)**	Pyramid	**1**	
	(b)	Cone Cylinder	**1** **1**	 Must be in this order
5	**(a)**	(i) Octagon	**1**	
		(ii) Two correct sections	**1**	Condone any symmetrical pattern even if more than two sections shaded; must contain at least 2 not shaded
	(b)	× × ✓ ×	**1**	Accept any non-ambiguous indication
6	**(a)**	× ✓ × ×	**1**	Any non-ambiguous indication
	(b)	27 because take away 5 oe	**1+1**	Accept 27 after sequence (and 22 in answer) and −5 (direction **and** quantity needed)
	(c)	Coherent pattern **and** correct explanation	**1**	Four consecutive terms should fit the stated pattern.
7	**(a)**	$\frac{12}{16}$ oe isw	**1**	$\frac{3}{4}$, $\frac{6}{8}$, "three quarters" oe fraction
	(b)	3 "3 out of 10" or "3 tenths"	**1** **1**	Accept 3 squares shaded
	(c)	Any shape containing eight 1 cm squares clearly and accurately shown	**2**	**W1** freehand lines, poor shading, dots, ticks used OR **SC1** pattern of 8 squares drawn beside the grid that are not 1 cm squares
	(d)	6	**2**	**W1** 4 × 3, or 12, or ÷ 2, or 2 × 3, or 4 × 1·5
8		A E B D	**4**	Must be in this order **W1** each
9	**(a)**	Black	**1**	Condone "5"
	(b)	(i) B A	**1** **1**	 Accept 0 or impossible
		(ii) Arrow roughly halfway between A and B	**1**	By eye

Section B Total: 25

B273 Module Test M3

Section A

1	**(a)**	4·5 oe	**1**	
	(b)	27·5 oe	**1**	
	(c)	2·4	**1**	
	(d)	8	**1**	
	(e)	3	**2**	**M1** for 15 or 5 seen www
2	**(a)**	(i) 40	**1**	
		(ii) 11	**1**	
		(iii) Correct bar	**1**	
	(b)	1·60	**1**	Not 1·6
	(c)	268	**1**	
	(d)	(i) 1335 or 135 or 135pm	**1**	
		(ii) 25	**1**	
3	**(a)**	Correct enlargement	**2**	**W1** left block 6 × 2 or base 2 × 4 OR **SC1** correct size, incorrect orientation
	(b)	Height should be 9 Needs [more] depth/thickness/width	**1** **1**	
4		104 www	**4**	**W3** 130 – 26 (=), or 40 + 40 + 24 (=), or 80 + 24 (=) OR **W2** 26 or 80 **and** 24 seen, or 40, 40 **and** 24 seen <u>Alternative method:</u> **W1** 130 or 40 or 24 seen, or 10 **and** 6 seen AND **M2** attempt to find 80% of 130; can be done in parts, eg 80% of 50, 50 and 30 OR **M1** attempt to find 20% of 130; can be done in parts AND **M1** attempt to subtract *their* 20% from *their* 130, or attempt to add *their* 40, 40 and 24

5	**(a)**	37 to 39	**1**	
	(b)	(i) 34 to 35	**1**	
		(ii) 111 to 117 Find value of £30 and double it oe	**1** **1**	ft *their* (a) × 3 Any equivalent method (eg £40 + £20)

Section A Total: 25

Section B

6	**(a)**	289	**1**	
	(b)	27	**1**	
7	**(a)**	$\frac{1}{11}$ or 0·09 or 9%	**1**	
	(b)	$\frac{2}{11}$ or 0·18 or 18%	**1**	
8	**(a)**	(i) A	**1**	
		(ii) C	**1**	
	(b)	Correct cuboid	**2**	In any orientation or sense **W1** 1 correct face
9	**(a)**	15	**1**	
	(b)	8	**1**	
	(c)	9	**1**	
10		35 www	**2**	**M1** for 42 ÷ 6 or 7, or 42 × 5 or 210 seen
11	**(a)**	65	**1**	
	(b)	32·8 www	**3**	**M1** attempt to add all 10 numbers soi by 328 **M1** attempt to divide *their* total by 10 OR **SC2** 290·2
	(c)	13·8 – 14·2	**1**	
	(d)	4·85(0)	**1**	
12	**(a)**	33	**2**	**M1** for 18 × 1·5 or 27 seen
	(b)	26	**2**	**M1** for 3 × 7 or 21 seen
	(c)	No because 1100 (ml) is more than 1 litre	**2**	**M1** 250 or 1100 seen

Section B Total: 25

B274 Module Test M4

Section A

1	**(a)**	(i) 17·84	**1**	
		(ii) 7·92	**1**	
	(b)	(i) (0)·54	**1**	
		(ii) (0)·054	**1**	
2	**(a)**	Dishwasher Telephone	**1** **1**	
	(b)	Bar for 2005 is twice as long as bar for 1998	**1**	oe statement
3	**(a)**	2 1 1 4 2 1	**3**	**W2** for 4 or more correct OR **W1** for 2 or more correct
	(b)	$P = 2a + 2a + 2a + 3a$ isw	**2**	Accept equivalent expression **W1** for $2a + 2a + 2a + 3a$ oe seen, or for P = expression involving a
	(c)	60	**2**	**W1** for attempt at 15 × 4
4	**(a)**	13, 17, 21	**2**	**W1** for 2 correct, may ft error
	(b)	8	**1**	cao
5	**(a)**	Any two from 1, 2, 5, 10	**1**	
	(b)	One from 23, 29	**1**	
	(c)	Any even multiple of 5	**1**	(ie any multiple of 10)
6	**(a)**	(i) 15	**1**	
		(ii) 30 www	**2**	Correct or ft **W1** for '*their* 15' × 2, or for 30 minutes and '*their* 15' soi
	(b)	1 (hour) 15 (minutes)	**1**	
	(c)	11:45	**1**	Accept any correct equivalent

Section A Total: 25

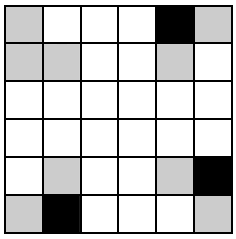
Section B

7	**(a)**	($^{-}$5, 1)	**1**	
	(b)	B plotted at ($^{-}$3, $^{-}$2)	**1**	
	(c)	D plotted at ($^{-}$3, 4)	**1**	Must ft *their* B
	(d)	Kite	**1**	Must ft *their* quadrilateral
8	**(a)**	$\frac{5}{12}$	**2**	**W1** for 5 as numerator, or 12 as denominator
	(b)	3	**2**	**W1** for quarter of spinner clearly indicated, or for attempt at 12 ÷ 4 seen, or for attempt to convert $\frac{1}{4}$ into twelfths
9	**(a)**	105	**2**	**W1** for 360 – (140 + 115) oe
	(b)	53	**2**	**W1** for 180 – (90 + 37) oe
10	**(a)**	(i) 16	**2**	**W1** for 15,17 as answer, or for ordered list of at least 8 numbers seen
		(ii) 21	**1**	cao
	(b)	Carlos because median is higher	**1**	Must ft *their* (a)
11	**(a)**	0·5	**1**	Accept equivalents
	(b)	400	**1**	
	(c)	24	**3**	**W2** for answer of 4 www, or 2000 ÷ 500, or 2 ÷ 0·5 OR **W1** for 2000 or 0·5 seen, or indication that 4 × 500 ml = 2 litres If 0 scored, **SC1** for answer 12 www
12	**(a)**	10 × 10·5 = 105	**1**	
	(b)	Correct trial with first number > 10 Further correct improved trial 18 and 18·5 on answer line	**1** **1** **1**	Including tick in correct column or correct answer As above

Section B Total: 25

B275 Module Test M5

Section A

1	**(a)**	2	**1**	
	(b)	3 correct squares shaded; no others 	**2**	**1** for 2 correct squares shaded and a maximum of 1 wrong, or for 3 correct and one extra
2	**(a)**	27	**1**	
	(b)	2^4	**1**	Mark final answer
	(c)	$\frac{5}{6}$	**1**	
	(d)	$\frac{3}{28}$	**1**	Ignore subsequent cancelling
	(e)	(i) $^-2$	**1**	
		(ii) $^-8$	**1**	
3	**(a)**	Number of edges 12 Number of faces 6	**1** **1**	
	(b)	(i) 30	**2**	**M1** for evidence of 2 × 3 × 5 attempted
		(ii) Correct net (5 more faces correctly placed), correct size	**W3**	Ignore extra flaps **W2** for 3 more correct pieces correctly placed; ignore extra pieces. OR **W1** for 2 more correct pieces correctly placed; ignore extra pieces. After 0 scored, **SC1** for a net of a cuboid of incorrect size
4		15 or 16 www '*their* 16' – *their* 15' Ana saves more by £1 cao	**W2** **M1** **A1**	Or **M1** for 50 × 0·3, or 40 ÷ 5 × 2 **SC2** Ana saves more by £1 without working
5	**(a)**	$9a + 2c$	**2**	**M1** for $9a$ or (+) $2c$ seen
	(b)	(i) 4	**1**	
		(ii) 5·5 oe	**2**	**M1** for $2x = 5 + 6$ or better or *their* $2x$ correctly halved

Section A Total: 25

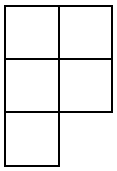
Section B

6	**(a)**	A1, A2, A3, A4, B1, B2, B3, B4, C1, C2, C3, C4	**2**	**M1** for at least 8 of these (not A1)
	(b)	$\frac{1}{12}$ or ft *their* (a)	**1**	Accept decimal and percentage equivalents
7	**(a)**	¯4 2 8	**1**	
	(b)	At least two points plotted of (0, ¯4), (3, 2) and (6, 8), or ft from table Correct ruled line drawn from at least (0, ¯4) to (5, 6)	**1** **1**	Tolerance ±1 mm Tolerance ±2 mm at these points
	(c)	¯3, or ft from *their* ruled straight line	**1**	Accept ¯2·9 to ¯3·1, or tolerance ±1 mm from *their* ruled straight line
8	**(a)**	24	**1**	
	(b)	21·2	**2**	**M1** for 6·2 or 15
9	**(a)**	5500	**1**	
	(b)	3452	**1**	
	(c)	12	**2**	**M1** for $\frac{96}{8}$ or $\frac{96}{800}$ (× 100)
10	**(a)**	(i) Yes because 90(°) or ¼	**1**	oe, eg 25%, right angle, etc
		(ii) 72(°) or 20% mentioned $\frac{360}{5}$ shown, or 20% linked to Conservative and 1/5	**1** **1**	Must also have 'Yes' to get both marks
		(iii) 25	**2**	Accept 24 or 26 for 2 marks **M1** for $\frac{45}{360}$ × 200 or 12·5% of 200 oe, tolerance 1° or 0·5%
	(b)	(i) 4·2	**1**	
		(ii) Beaton and range	**1**	Strictly ft *their* (i)
11	**(a)**	AC = 5·4 cm drawn, or arc this radius drawn BC = 6·1 cm drawn, or arc this radius drawn Both relevant compass arcs and triangle completed	**1** **1** **1**	Tolerance ±2 mm for both sides; arcs must be drawn in relevant position After 0 scored, **SC1** for an incorrect triangle with construction arcs
	(b)	75 to 79 or ft from *their* triangle	**1**	

Section B Total: 25

B276 Module Test M6

Section A

1	**(a)**	(i) 46	**1**	
		(ii) 96	**1**	
	(b)	$\frac{3}{20}$ or 0·15 or 15% final answer	**2**	**M1** for $\frac{2\times3}{5\times8}$ or $\frac{1}{5}\times\frac{3}{4}$ or better eg $\frac{6}{40}$ oe
2	**(a)**	$5x - 15$ final answer	**1**	
	(b)	$3(4y + 3)$ final answer	**1**	
3	**(a)**	0 | 8 9 1 | 2 5 6 8 9 2 | 0 1 4 6 7 8 3 | 4 6 8 8 9 4 | 0 3 9	**3**	**M2** for an ordered diagram with at least 3 rows correct or an unordered diagram which contains all the correct elements OR **M1** for an ordered diagram with at least 1 row correct or an unordered diagram with at least 2 rows with the correct elements
	(b)	(i) 26	**1**	Correct or ft *their* ordered diagram
		(ii) 41	**1**	Correct or ft *their* ordered diagram
4			**2**	**1** for one error which should be one missing square or one extra square Condone dotted internal lines and shading
5	**(a)**	2	**1**	
	(b)	(¯1, 1) marked [and labelled C]	**1**	Accept a cross, a letter C, or the intersection of two or more 'rays'
6	**(a)**	[The probabilities] "do not add up to 1" or "do not add up to 100%"	**1**	Accept any correct explanation eg "these probabilities add up to 1·1" or "add to 110%"
	(b)	120	**2**	**M1** for attempt at 160 ÷ (3 + 1) or 40 seen
	(c)	1·28 www	**5**	**M1** for 432 × 6 soi **M1** for correct full attempt at 432 × 6 using any system and including only arithmetic errors **M1** for attempt at 36·16 – '*their* 25·92' (it must be < 36·16) or 10·24 **M1** for '*their* 10·24' ÷ 8
7		*a* = 71° because alternate [angles] *b* = 138° because corresponding [angles]	**2**	**1** for each, penalise contradictions ignore irrelevant correct statements

Section A Total: 25

Section B

8		stopped 2·5 or 2½ 475	**1** **1** **1**	Allow equivalent expressions for 'stopped' Allow equivalents such as 'two and a half'
9	**(a)**	(i) F and N	**1**	Either way around
		(ii) Face IJKL marked or indicated	**1**	Accept IJKL as the answer
	(b)	82 www or 8200 **mm²** www	**3**	**M1** two of the three measurements (2 cm, 3 cm and 7 cm allowing ±1 mm) seen or implied from one of their areas (6, 14, 21, 12, 28 or 70) **M1 two different** correct areas seen from eg (i) 6, 14 and 21 (ii) 12, 28 and 42 or (iii) 70 alone is enough ft *their* measurements if they are incorrect and ft *their* method Candidates may mark a longer distance, eg the total length as 10 (or width 11); this will count as one length unless they show a part length as well. So 10 and 11 seen scores **M1 M0**. Figures may be on the diagram. Allow answers in mm
10	**(a)**	1 3 5 7 9	**1**	
	(b)	Correct ruled line	**2**	**M1** for four points plotted correctly (±2mm) ft *their* table
11		5·3	**2**	**M1** 37·23, 7·0064, or figs 53(13…) seen
12		3·5 oe www	**3**	Maximum of **M2** if answer not correct, from: **M1** collecting the x terms eg $5x - 3x + a = b$ or better **M1** collecting the constants eg $ax = 6 + bx + 1$ or better **M1** for $x = \frac{b}{a}$ after $ax = b$ ($a \neq 1$)

13	**(a)**	Four points plotted correctly	**2**	**1** for two points plotted correctly (±1 mm)
	(b)	Negative	**1**	Allow a description such as ‘ as the temperature increases the number sold decreases’
	(c)	Ruled line of best fit	**1**	From at least (5, 50 to 60) to (20, 18 to 28)
	(d)	35 to 45	**1**	Correct or ft *their* single ruled LOBF
14	**(a)**	55·38 to 55·44	**2**	**M1** $\pi \times 4{\cdot}22$
	(b)	19·68 or 19·7	**2**	**M1** $4{\cdot}8 \times 8{\cdot}2 \div 2$

Section B Total: 25

B277 Module Test M7

Section A

1	**(a)**	Ruled line of best fit	**1**	From at least (1·25, 42 to 47) to (3, 25 to 30)
	(b)	Read off at $x = 2{\cdot}3$ from *their* attempt at a straight LOBF	**1ft**	ft *their* LOBF only if it has a negative gradient
	(c)	Negative	**1**	Accept 'as the engine size increases fuel economy decreases' oe Ignore 'weak', 'strong', etc. Description must compare trend
2	**(a)**	$^{-}6$ $^{-}1$ 2 3 2 $^{-}1$ $^{-}6$	**1**	
	(b)	Parabola drawn within ±1 square cao	**2**	**P1** 6 points plotted either correctly or ft (a) ; tolerance ±1 square
	(c)	A comment referring to the points of intersection with the x-axis or (line) $y = 0$	**1**	
3	**(a)**	$x = 55°$ Correct reason related to parallel lines	**2** **1**	**M1** for any of the angles a, c, d, e, f, g, h found or seen on diagram, but not b $a = d = 122°$, $c = f = 55°$, $e = 58°$, $g = 125°$, $h = 58°$
	(b)	∠BAC is 95°, not 90°	**1**	Accept ∠BAC should be 90°
4	**(a)**	7^6	**1**	Accept $7^6/1$
	(b)	$x = 4$ $y = 1$	**1** **1**	If 0 scored, **SC1** for tree/ladder completed to prime factors with at most one error, or for 4 and 1 reversed
	(c)	2 or $\frac{2}{1}$	**1**	
5	**(a)**	$[7x - 2 =]\ 4x + 10$ $3x = k$ or $kx = 12$ $x = 4$ or $^{12}/_{3}$	**M1** **M1** **M1**	Accept $3{\cdot}5x - 1 = 2x + 5$ or $1{\cdot}5x = k$, or $kx = 6$ Correct or ft from *their* $ax = b$ $(a \neq 1)$ Allow **W3** for answer 4, dep on $3x$ and 12 seen, or trials
	(b)	$x > 5$ final answer	**2**	**M1** $2x > 10$ or answer of 5 with wrong inequality or $x = 5$.

6	**(a)**	40	**2**	**W1** 8 or 0·2 seen
	(b)	Division by a number less than one would give an answer > 8·16	**1**	Accept alternative valid arguments such as 'answer should not terminate since factors of 85 are 5 and 17'
7		$\frac{4}{9}$ and $\frac{7}{12}$	**2**	**W1** $\frac{4}{9}$, or $\frac{7}{12}$, or $\frac{4}{9}$ and $\frac{7}{12}$ and one other

Section A Total: 25

Section B

8	**(a)**	$\frac{52}{200}$ oe	**1**	Ignore incorrect cancelling/conversions after correct relative frequency seen
	(b)	Attempt to highlight the differences between the frequencies, eg unfair because the frequencies are <u>very</u> different	**1**	Accept fair with reference to chance (coincidence) or closeness of frequencies to 50 or (relative frequency) of ¼
9		£36 391 SFr	**2** **2**	**M1** 82·8 × $\frac{240}{552}$, 82·8 ÷ 2·3, oe **M1** 170 × $\frac{552}{240}$, 170 × 2·3, oe If 0 gained, **SC1** for any of these seen: 552 ÷ 240 or 2·3 240 ÷ 552 or 0·434 to 0·435 or 0·43 552 ÷ 82·8 or 6·66 to 6·67 or 6·6 or 6·7 240 ÷ 170 or 1·411 to 1·412 or 1·41 or 1·4, or for identifying a relevant ratio
10	**(a)**	$C = 24n + 35$	**2**	**W1** $24n$ Condone units used in formula
	(b)	$(n =) \frac{C - 15}{30}$	**2**	**M1** $30n = C - 15$, or $\frac{C}{30} = n + 0{\cdot}5$ or correct ft from error seen
11		$x^2 + 2x - 5x - 10$ or better	**2**	Condone ±5x and ±10 **M1** any 3 out of 4 terms correct
12		Midpoints soi *Their* midpoints × frequnecies Attempt at *their* $\sum fm \div 50$ 157·6 www	**M1** **M1** **M1** **A1**	at least 3 of 145, 155, 165, 175 at least 3 correct dep on *their* midpoints within intervals (7880 ÷ 50) Allow W4 www
13	**(a)**	7·8 www	**3**	**M2** (AB =) $\sqrt{13{\cdot}0^2 - 10{\cdot}4^2}$ or $\sqrt{60{\cdot}84}$ or $\sqrt{169 - 108{\cdot}16}$ OR **M1** $(AB^2 =) 13{\cdot}0^2 \pm 10{\cdot}4^2$ OR **SC1** $(AB^2 =) 277{\cdot}16$ or (AB=) 16·6(…)
	(b)	53·5	**1**	

14	**(a)**	$(2 \times \pi \times 5^2) + (2\pi \times 5 \times 12)$ or better 50π or 120π $(2 \times) \pi \times 5^2$ or $2\pi \times 5 \times 12$ 533·8 to 534·3 www	**M3** OR **M2** OR **M1** **A1**	eg $2 \times 25\pi + 120\pi$ or 170π 157 to 158 or 376·8 to 377·2 Allow W4 www **SC3** final answer of 455·2 to 455·8 or 145π from $25\pi + 120\pi$
	(b)	8·5 oe	**1**	

Section B Total: 25

B278 Module Test M8

Section A

1	**(a)**	Enlargement (0, 2·5), (10, 2·5), (2·5, 5), (7·5, 5)	**2**	**M1** enlargement with incorrect SF and centre (0, 0) correct, or correct SF and incorrect centre, or 2 correct vertices
	(b)	22 or 22·0	**2**	**M1** 2·5 × 8·8 seen or implied
2	**(a)**	(i) $x = 1$ correct	**1**	
		(ii) $y = x + 2$ correct	**1**	
	(b)	Region R correct	**2**	**M1** following correct lines in (a), for indicating a region on the correct side of two of the lines
3		$6\frac{11}{15}$	**3**	**M2** 11/15 or 101/15 OR **M1** 5/15 or 6/15 or 35/15 or 66/15
4		πab because eg length × length	**2**	**W1** πab
5	**(a)**	3·4	**1**	
	(b)	2·2 and 5·6 marked Box with only 3·4 marked, or only *their* 3·4 marked within box	**1** **1**	Condone not joined to 0·2 and 12
	(c)	Comments eg Average distance greater at H Smaller spread at H	**2**	For 2 marks one comment must be in context using distance/travel oe **W1** for each distinct comment referring to schools Must ft *their* box plots
6	**(a)**	Paraguay, Ecuador, Argentina, Brazil	**1**	
	(b)	$1·8 \times 10^7$	**2**	**M1** $1·78(...) \times 10^7$ or $1·7(...) \times 10^7$ or 18×10^6 oe
	(c)	20	**1**	Accept 21
7		$(x + 5)(x - 4)$ $^-5$ or 4 or ft *their* factors if two solns.	**2** **1**	**M1** for factors, using integers excluding 0, giving two terms correct when expanded Both solutions required Both solutions without method scores 1 mark only

Section A Total: 25

Section B

8	**(a)**	Triangle B vertices (1, 2) (2, 2) (1, 0)	**2**	**M1** 180° rotation but incorrect centre
	(b)	Triangle C vertices (5, 4) (6, 4) (5, 2)	**2**	**M1** one direction correct ft *their* B for W2 and M1
	(c)	Rotation 180° about (2, 3) OR Enlargement SF ¯1 centre (2, 3)	**2**	**M1 either** Rotation 180° **or** about (2, 3) Description must ft *their* C for W2 and M1
9		$x = 2y - 4$	**2**	**M1** $2y = x + 4$ or $\frac{x}{2} = y - 2$ From incorrect 1st step allow ft to *their* final answer
10		£420 www	**3**	**M2** 493·50 ÷ 1·175 oe OR **M1** 1·175 or 117·5 seen
11	**(a)**	$8a + 5c = 2300$	**1**	
	(b)	$8a + 8c = 2960$ or $5a + 5c = 1850$ $3c = 660$ or $3a = 450$ $a = 150$, $c = 220$	**M1** **M1** **W1**	ft from (a) Condone 1 error in multiplication Condone 1 error in subtraction
12		77 or 77·4 to 77·5 without wrong method used	**3**	**M2** $95 \times 0{\cdot}96^5$ OR **M1** 0·96
13	**(a)**	Tree diagram correct	**2**	**M1** first spin 'lose' as 5/8
	(b)	25/64 isw, or 0·39(...), or 39·(...)%	**2**	**M1** 5/8 × 5/8 fractions oe <1 **A1** ft *their* fractions oe <1
14		43·4 to 43·5 www	**3**	**M1** cos x = 9·8/13·5 oe 0·72[…] **M1** inverse trig function soi, ft *their* trig function **A1** 43 to 44, dependent on at least M1 scored

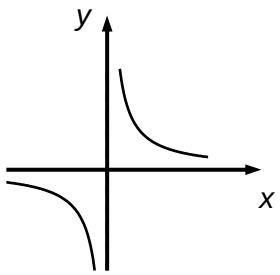
Section B Total: 25

B279 Module Test M9

Section A

1	**(a)**	$4{\cdot}2 \times 10^9$	**2**	**W1** for $4{\cdot}2 \times 10^n$ ($n \neq 9$), or for $[n \times]10^9$, or for 4 200 000 000 or $4{\cdot}2^9$ etc
	(b)	(i) $\frac{1}{8}$ or 0·125	**1**	
		(ii) 1	**1**	
		(iii) 3	**1**	allow ± 3
2	**(a)**	0·4 on first branch and appropriate labels throughout 0·9 and 0·1 on both sets of second branches	**1** **1**	
	(b)	1 − P(no practice, no practice) [1 −] 0·4 × 0·1 0·96 o.e.	**M1** **M1** **A1**	 1 − 0·4 × 0·1 implies previous M1 if not seen already Accept equiv fractions or %
		Alternative Method: 0·6 × 0·9 + 0·6 × 0·1 + 0·4 × 0·9, or for 0·6 + 0·4 × 0·9 0·96	 **M2** **A1**	 **M1** for correct three branches identified, or for two of three correct products 0·6 × 0·9, 0·6 × 0·1, 0·4 × 0·9, or *their* outcomes, or ft from *their* tree

3	**(a)**	$5(2x+7)-2(12x+3)$ or $5(2x+7)-6(4x+1)$ oe soi	**M1**	For attempt to multiply at least one of LHS numerators by 2, 5 or 10 ; may be numerators of two separate fractions or of one fraction, or M1 for at least one fraction 'eliminated' by attempt to multiply
		$10x + 35 - 24x - 6$	**M1**	For correct expansion of at least one pair of brackets, ft from one previous error, award as numerator of a single fraction or as numerator of two fractions with the same denominator or as lhs after both fractions eliminated by multiplying
		Their LHS with no fractions = 5 × 5 × 2 [or 50] or ft seen [oe after any simplification, for those who multiply up one fraction at a time and simplify in between]	**M1**	For correctly dealing with RHS when eliminating fractions; allow **M1ft** for $ax+b=5c$ ft their $\frac{ax+b}{c}=5$ $(c \neq \pm 1)$ after wrong subtraction
		[x =] −3/2 oe cao	**A1**	**A0** from wrong working ; allow recovery from missing brackets/sign error
		<u>Alternative Method:</u> $x + 3\cdot5 - (2\cdot4x + 0\cdot6)$ oe	**M2**	Condone missing brackets; **M1** for two terms correct ignoring signs
		$^{-}1\cdot4x = 2\cdot1$ oe	**M1**	At least one side correct after simplification
		[x =] $^{-}3/2$ oe cao	**A1**	**W0** for [x =] $^{-}3/2$ oe without evidence of correct algebra
	(b)	$(3x - 1)(x - 2)$	**M2**	**M1** for other versions of $(3x \pm 1)(x \pm 2)$ or other factors of form $(ax + b)(cx + d)$ with a, b, c, d non-zero giving two of the three terms correct
		$x = \frac{1}{3}$ oe or 2 [both required]	**W1**	**Or W1 ft** for other answers ft from their factors of form $(ax + b)(cx + d)$ with a, b, c, d non-zero
4		$y = 2x + 5$	**3**	**M1** for $y = 2x$ [$+k$], $k \neq 5$ or $^{-}1$ **M1** for 11 = *their* gradient × 3 + k oe or for *their* k = 11 − 3 × *their* gradient (may be stepping off on diagram) or for *their* equation being for a line going through (3, 11) OR **M2** for $y - 11 = 2(x - 3)$

5	**(a)**	$xy = 20$ or $y = \frac{20}{x}$ or $x = \frac{20}{y}$ oe	**2**	**M1** for $xy = k$ or $y = \frac{k}{x}$ oe with other letters, but not a number instead of *k*, or for 10 = *k*/2 oe
	(b)	¯5 www or ft	**1**	ft from (a) only if **M1** gained there
	(c)		**2**	**M1** if one branch correct shape and position

Section A Total: 25

Section B

6		[x =] $\sqrt[3]{\frac{y}{8}}$ or [x =] $\frac{\sqrt[3]{y}}{2}$ as final answer	**2**	**M1** for a correct constructive first step in rearrangement, or for cube root seen
7		104 $\angle$ at centre is double $\angle$ at circumference 52 [$\angle$ in] alternate segment	**1** **1** **1** **1**	 or $\angle$ at circumference is half $\angle$ at centre Dep on angle correct; or mention of both isosceles triangle and angle between tangent and radius = 90°
8		9 www	**2**	**M1** for 8·8 or $66 \times \frac{100}{750}$ oe
9	**(a)**	[speed =] distance ÷ time [max =] max ÷ min or [ub =] ub ÷ lb	**1** **1**	May be incorporated in their words Or for max/ub distance and min/lb time mentioned, or for max/ub of 383 and min/lb of 43·7, or for 383·5 is ub and 43·65 is lb
	(b)	8·74 www	**2**	**M1** for 382·5 ÷ 43·75 or other rot versions of 8·742857(…) to at least 2 dp
10		Frequency densities seen or implied: 2·8, 3·4, 4, 4·6, 2·2 Bars correct widths/ endpoints Bars correct height and vertical axis correctly scaled, using a scale of 1 cm to 1 unit or 2 cm to 1 unit	**1** **1** **1**	Condone one error; may be implied by heights of bars using their scale Tolerance for width and height ≤ 1 mm; eg condone 5 to 10 bar starting at 4 No ft from wrong frequency densities for last mark
11	**(a)**	(4, 1·5, 2)	**2**	**1** for two coordinates correct
	(b)	7 or 7·0 www	**2**	**M1** for $6^2 + 3^2 + 2^2$ soi [accept 48·8 to 49]; condone an error in one of 6, 3, 2 or for two equivalent applications of 2D Pythagoras OR **M1** for the diagonal of a face found to 2 or more sf
12		8·8 to 8·92 inclusive www	**3**	**M2** for $\frac{150}{360} \times \pi \times 2{\cdot}6^2$ oe OR **M1** for $\frac{150}{360}$ oe or $\frac{360}{150}$ oe [= 2·4] soi, or for $\pi \times 2{\cdot}6^2$ or 21·2(…) seen unless spoiled by circumference etc used

13		18·8(097...) to 3 or more sf www	**3**	**M2** for [linear] sf = $\sqrt[3]{5}$ soi OR **M1** for [volume] sf = 5 soi Allow **A1** for 19 if **M2** earned Alternative method: **M1** for ratio of lengths = $\sqrt[3]{200} : 10$ oe soi AND **M1** for $\frac{11}{\sqrt[3]{200}} \times 10$ oe

Section B Total: 25

B280 Module Test M10

Section A

1	**(a)**	$0\cdot1\dot{3}$	**2**	**W1** for 0·13 … seen
	(b)	80 has [prime] factors of 2 and 5 www, or the prime factors of 80 are factors of 10 www	**2**	For 2 marks there must be no incorrect comment made in addition **W1** for 0·0125 seen or 2, 2, 2, 2, 5 seen, or for correct reason given but error in prime factors seen
2		$\frac{62}{110}$ oe www isw cancelling and conversion	**4**	**W3** for $\left(\frac{3}{11}\times\frac{2}{10}\right)+\left(\frac{8}{11}\times\frac{7}{10}\right)$ oe OR **W1** for each of $\left(\frac{3}{11}\times\frac{2}{10}\right)$ *or* $\left(\frac{8}{11}\times\frac{7}{10}\right)$ oe seen, or for $\frac{2}{10}$ oe **and** $\frac{7}{10}$ oe seen OR **SC2** for answers $\frac{62}{121}$ oe or $\frac{73}{121}$ oe, or $\frac{73}{110}$ oe or $\frac{65}{110}$ oe or $\frac{70}{110}$ oe OR **SC1** for $\left(\frac{3}{11}\times\frac{2}{11}\right)$ *or* $\left(\frac{8}{11}\times\frac{7}{11}\right)$ *or* $\left(\frac{3}{11}\times\frac{3}{11}\right)$ *or* $\left(\frac{8}{11}\times\frac{8}{11}\right)$ *or* $\left(\frac{3}{11}\times\frac{3}{10}\right)$ *or* $\left(\frac{8}{11}\times\frac{8}{10}\right)$ oe seen
3	**(a)**	**p** + **q** oe cao	**1**	
	(b)	2/3 (**p** + **q**) oe isw	**1ft**	ft 2/3 *their* (a)
	(c)	¯**q** + 2/3 (**p** + **q**) or better isw or **p** – 1/3 (**p** + **q**) or better isw	**1ft**	ft ¯**q** + *their* (b) or **p** – ½ *their* (b) simplified correct answer is 2/3 **p** – 1/3 **q**
4	**(a)**	[*y* =] $(x[+]-3)^2+19$ final answer	**3**	**W2** for $(x\ [+]\ {}^{-}3)^2$, **W1** for $b = 28 - (\textit{their}\ {}^{-}3)^2$ correctly evaluated If correct expression seen then spoilt allow **SC2**
	(b)	(i) 19	**1ft**	ft *their* (a) provided in form $y = (x-a)^2+b$
		(ii) x = 3 oe	**1ft**	ft x = ¯(*their* ¯3) provided in form $y = (x-a)^2+b$

5	**(a)**	204 and 336	**2**	**W1** for either value seen with no extras, or both correct with extras
	(b)	6 with a reason	**1**	eg Six complete sine waves over interval 0 to 360 oe, or 360 ÷ 60 = 6
6	**(a)**	$x^2 + (2x + 1)^2 = 10$	**M1**	Brackets essential but can be recovered later
		$[(2x + 1)^2 =] 4x^2 + 4x + 1$ oe	**M1**	Implied by $5x^2 + 4x + 1 = 10$ www
		$5x^2 + 4x – 9 = 0$	**A1**	Dependent on **M2** and no errors seen Must have = 0
	(b)	$(5x + 9)(x – 1)$	**M2**	**M1** for $(5x \pm 9)(x \pm 1)$, or for $(5x \pm 1)(x \pm 9)$
		Must be answered in this part and not in part (a)		Alternative method for **M2**, accept: $5x(x - 1) + 9(x – 1)$ or $x(5x + 9) – 1(5x + 9)$
		¯9/5 oe and 1 mark final answers	**A1**	ft *their* brackets dep on **M1** earned for factors

Section A Total: 25

Section B

7	**(a)**	$520^2 + 310^2 - 2 \times 520 \times 310 \cos 38$ Square root soi 335 or 340 www	**M1** **M1** **A2**	If cos 38 not stated allow 0·78 to 0·8 to imply **M1** Dependent on previous **M1** [112445·(…)]; **Not** for 44100 cos 38 implied by answer 186·(…) If cos 38 not stated, final answer in range 329 to 340 implies **M2** www **A1** for 335· (…) Allow **W4** for answer 335 or 340 www
	(b)	½ × 520 × 310 sin 38 oe 49600 to 49650 4·96 to 4·965 www	**M1** **A1** **A1ft**	Allow 50 000 after **M1** earned Implies previous A mark if correct ft *their* area ÷ 10 000 evaluated to 2sf or better; dependent on **M1** earned Allow answer 5 after **M1** earned and no errors seen Allow **W3** for answer 4·96 to 4·965 www
8	**(a)**	85	**1**	
	(b)	$62 \times 0{\cdot}97^5 + 23$ 76·2 to 76·25, or 76 www	**M1** **A1**	**W1** for answer 42 **or M1** for $0{\cdot}97^m = \frac{40-23}{62}$ or better OR If formula not rearranged **M1** for one correct trial in range $36 \le m \le 46$ seen (evaluation to 1dp or better rounded or truncated) Allow **W2** for 76·2 to 76·25, or 76 www
	(c)	42·48 or 42·5 or 43	**2**	
9		$5(x + 1) + 2(x – 3) = 3(x + 1)(x – 3)$ oe $3x^2 - 13x – 8$ [= 0] oe cao $\frac{13 \pm \sqrt{((-)13)^2 - 4 \times 3 \times -8}}{2 \times 3}$ or better [$\sqrt{265}$] 4·88 and ⁻0·55 cao	**M2** **A1** **M2** **A2**	Must clear all fractions correctly **M1** for $5(x + 1) + 2(x – 3)$ or better seen (could still be in one or two fractions) Must be trinomial ft *their* eqn provided quadratic and a, b and $c \neq 0$ and must come from some previous working (i.e. not be invented) **M1** for one error in quadratic formula **A1** for either correct After **A0** allow **SC1** for both answers which round to 4·88 and ⁻0·55 or for 4·9 and ⁻0·5

10		Graph translated by $\begin{pmatrix}2\\0\end{pmatrix}$	**1**	Same shape by eye and intention to cross *x*-axis at 2 and 4
11	**(a)**	235	**2**	**M1** for **three** of 6 × 5, 13 × 5, 7.5 × 10, 4·5 × 10 or 1 × 20 soi [30], [65], [75], [45], [20]
	(b)	Reasons with 0 and 50 being the limits but not actual data values	**1**	eg The largest waiting time could be less than 50, or we don't know the individual times, only the groups
	(c)	**No** with $\frac{30+65+75}{their(a)}$ × 100 correctly calculated [72[·3] %] in working OR **No** with 0·8 × *their* (a) oe (188) correctly calculated **and** 170 seen in working OR **Yes** or **No** − either is OK − when their 0·8 × *their* (a) is between 165 and 175 with 0·8 × *their* (a) oe correctly calculated and 170 seen, or for $\frac{30+65+75}{their(a)}$ correctly calculated and when *their* % is 77% to 83%	**2ft**	**M1** for $\frac{30+65+75}{their(a)}$ [× 100] oe **or** 0.8 × *their* (a) oe [188] seen in working NB Allow scaled versions of frequencies in this part eg $\frac{6+13+15}{6+13+15+9+4}$ [× 100] [= 34/47[× 100]] gets **M1** and could earn both marks if a correct decision is made

Section B Total: 25

B281 Terminal Paper (Foundation Tier)

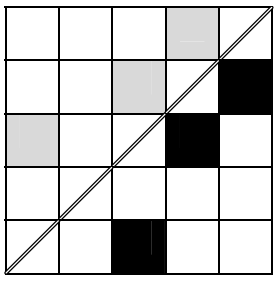
Section A

1	**(a)**	161	**2**	**M1** for 61 or 159 or 261 or 171
	(b)	13	**1**	
2	**(a)**	Tuesday	**1**	Accept ¯4
	(b)	7	**1**	
	(c)	¯3	**1**	
3		26	**2**	**M1** 20 or 6 (from 3*b*; not from 4 + 2 = 6)
4	**(a)**	(i) 480	**1**	
		(ii) bar with height 440	**1**	±1 mm (height and width); condone freehand
		(iii) 60	**1**	
	(b)	(i) Financial Times	**1**	
		(ii) 3 000 000	**1**	Accept 3(m)
		(iii) 833 000	**1**	
	(c)	(i) mode 70p median 55p	**1** **2**	 **W1** 45 and 65 selected (as median) OR **M1** prices ordered
		(ii) Reason referring to data from question	**1**	eg Mode is too high oe
5	**(a)**	£150	**2**	**M1** 600/4, or eg 10% + 10% + 5% with at least one correct (or ft correct) OR **W1** 450 seen
	(b)	£138 www	**4**	**W2** 588 OR **W1** 490 or 98 or 480 or 108 OR **M1** complete multiplication method which, with no arithmetic errors, would lead to the correct solution AND **M1** *their* 588 + *their* 150 correct AND **A1** 138, or **A1 ft** *their* 738 – 600 correct

6	**(a)**	22	**2**	**W1** for 8 or 6 (or 14) www, or 28 (four sides used) OR **M1** 33 ÷ 1.5
	(b)	36 www	**3**	**M1** 108 or 9 × 12 AND **M1** 108 ÷ 3 or *their* 108 ÷ 3 AND **A1** 36
7	**(a)**	20	**1**	
	(b)	13	**2**	**M1** for (2*x* =) 26, or *their* 26 ÷ 2
8	**(a)**	3*n* + 3 or 3(*n* + 1) as final answer	**1**	
	(b)	3(*n* + 1), or 3 is a factor of 3*n* and 3 oe	**1dep**	Dependent on (a) correct **0** for an answer not using (a)
9	**(a)**	400	**1**	
	(b)	160	**2**	**M1** for 800 ÷ 5 or 1/5 of 800 or for answer 640
	(c)	3 : 5, or $\frac{3}{5}$: 1, or 0·6 : 1, or 1 : $\frac{5}{3}$ isw	**2**	**M1** for partial simplification, eg 6 : 10 or 48 : 80 etc isw
10	**(a)**	$(2 + 5) \times {}^{-}4 = {}^{-}28$ $2 \times (5 + {}^{-}4)^2 = 2$ $(2 \times 5 + {}^{-}4)^2 = 36$	**1** **1** **1**	
	(b)	15*x* − 20	**1**	
	(c)	3*x* (2 + *x*)	**2**	**M1** for 3*x* (…), or for *x* (6 + 3*x*), or for 3 (2*x* + x^2), or for (2 + *x*)(…)
11	**(a)**	⁻1 3 5 5 3 ⁻1	**1**	
	(b)	All six points plotted Smooth curve through correct points	**1** **1**	±2 mm; allow ft from table ±2 mm (from correct position of points); no ft from wrong table; must have daylight between top of curve and (1·5, 5)
	(c)	⁻0·7 to ⁻0·9 or 3·7 to 3·9, or ft *their* graph	**2**	**W1** each; ±2 mm

Section A Total: 50

Section B

12	**(a)**	A ($^{-}$1, 2) and B (5, 4) plotted	**2**	**1** each (clear intention)
	(b)	Midpoint correct for *their* AB	**1**	Clear intention
	(c)	(2, 3)	**1**	Or ft *their* M (labelled or otherwise)
13	**(a)**	(i) 21	**1**	
		(ii) add 4	**1**	Or up in 4s, count on 4 or 4*n* + 1
	(b)	(i) 80	**1**	
		(ii) Halve or divide by 2	**1**	
14	**(a)**	10 to 13	**2**	**M1** evidence of adding squares OR **W1** 9 to 9·9, or 13·1 to 14
	(b)	South east or SE	**1**	Condone 135
	(c)	4 to 5 km	**3**	**W2** 4 to 5 OR **W1** 3 to 3·9, or 5·1 to 6 OR **M1** 8 to 10 (cm), or *their* '8 to 10' ÷ 2 AND **W1** km on answer line
	(d)	£1·79 www	**3**	**W2** 179 OR **M1** figs 240, or figs 81, or figs 107 seen AND **M1** 321(p) or (£)3·21, or 5 − *their* 3·21, or 500 − 321
	(e)	27 minutes	**1**	
15		eg 3 + 5 = 8 3 × 5 = 15	**1** **1**	
16	**(a)**		**2**	**M1** one error, ie 2 squares correctly shaded OR **W1** diagram correct with one line of symmetry, but more than 3 squares shaded
	(b)	2 3 5	**2**	**W1** 2 correct

17	**(a)**	159 000 www	**3**	**W1** 795 (000) **M1** *their* total ÷ 5 **A1** 159 000
	(b)	Pie chart correct and labelled 3 ruled sectors within 1% or 3°	**3**	**M1** 36 90 234(°) seen or 10 25 65(%) seen OR **W2** 2 sectors correct with or without labels OR **W1** 1 sector correct with label
18		50 because (angles on a straight) line add up to 180 145 because (the sum of the 4 angles in) a quadrilateral is 360	**1** **1** **1** **1**	 **SC 0, 0** for 125 with correct reason ft *their* 50 **SC 0, 0** for 15 with correct reason
19	**(a)**	600	**2**	**M1** 4 × 15 × 10
	(b)	24 cm	**2**	**M1** *their* (a) ÷ 25, or 25 × h = *their* (a) **A1 ft** *their* (a)
20	**(a)**	Triangle with vertices at (3, 5), (3, ¯1) and (6, ¯1)	**3**	**2** if two vertices correct OR **1** for enlargement sf 3 drawn in wrong place, or for enlargement with centre (0, 2) but wrong sf
	(b)	$\begin{pmatrix} -5 \\ 2 \end{pmatrix}$	**1**	

<table>
<tr><td>21</td><td>(a)</td><td>28 32
15 25
43 57</td><td>1</td><td></td></tr>
<tr><td></td><td>(b)</td><td>$\frac{57}{100}$ oe</td><td>1</td><td>ft from their table
isw wrong conversions</td></tr>
<tr><td></td><td>(c)</td><td>$\frac{15}{40}$ oe [eg 3/8, 37.5%]</td><td>1</td><td>isw wrong conversions</td></tr>
<tr><td></td><td>(d)</td><td>Suitable question and

• 4 to 12 response boxes
• non-overlapping clearly defined categories
• covering all times
• referring to hours or fractions of a day</td><td>2</td><td>1 Suitable question with minimum 3 responses and fulfilling 3 of the bullet points

eg 1 for only 3 appropriate response boxes
or 4 or more boxes with an overlap or not covering all times
or for more than 12 boxes covering all times and no overlaps

0 for 4 or more with an overlap and not covering all times etc
0 for only 3 boxes with overlaps or time omissions</td></tr>
<tr><td>22</td><td></td><td>Correctly evaluated trial of value <u>between</u> 2 and 3

Correct trials of 2·3 and 2·4 or better (ie outcomes closer to zero with one positive, one negative outcome)
OR
Correct trials of 2·25 and 2·35 or better (i.e. outcomes closer to zero with one pos, one neg outcome)

Answer 2·3</td><td>1

1

1</td><td>
<table>
<tr><td>2.1</td><td>-1.539</td><td></td><td>2.31</td><td>-0.15361</td></tr>
<tr><td>2.2</td><td>-0.952</td><td></td><td>2.32</td><td>-0.07283</td></tr>
<tr><td>2.3</td><td>-0.233</td><td></td><td>2.33</td><td>0.009337</td></tr>
<tr><td>2.4</td><td>0.624</td><td></td><td>2.34</td><td>0.092904</td></tr>
<tr><td>2.5</td><td>1.625</td><td></td><td>2.35</td><td>0.177875</td></tr>
<tr><td>2.6</td><td>2.776</td><td></td><td>2.36</td><td>0.264256</td></tr>
<tr><td>2.7</td><td>4.083</td><td></td><td>2.37</td><td>0.352053</td></tr>
<tr><td>2.8</td><td>5.552</td><td></td><td>2.38</td><td>0.441272</td></tr>
<tr><td>2.9</td><td>7.189</td><td></td><td>2.39</td><td>0.531919</td></tr>
</table>
</td></tr>
</table>

Section B Total: 50

B282 Terminal Paper (Higher Tier)

Section A

1	**(a)**	400	**1**	
	(b)	160	**2**	**M1** for 800 ÷ 5 or 1/5 of 800 or for answer 640
	(c)	3 : 5, or $\frac{3}{5}$: 1, or 0·6 : 1, or 1 : $\frac{5}{3}$ isw	**2**	**M1** for partial simplification, eg 6 : 10 or 48 : 80 etc isw
2	**(a)**	$(2 + 5) \times {}^{-}4 = {}^{-}28$ $2 \times (5 + {}^{-}4)^2 = 2$ $(2 \times 5 + {}^{-}4)^2 = 36$	**1** **1** **1**	
	(b)	$15x - 20$	**1**	
	(c)	$3x\,(2 + x)$	**2**	**M1** for $3x\,(\ldots)$, or for $x\,(6 + 3x)$, or for $3\,(2x + x^2)$, or for $(2 + x)(\ldots)$
3	**(a)**	$3n + 3$ or $3(n + 1)$ as final answer	**1**	
	(b)	$3(n + 1)$, or 3 is a factor of $3n$ and 3 oe	**1dep**	Dependent on (a) correct **0** for an answer not using (a)
4	**(a)**	Angle bisector drawn with correct arcs	**2**	**W1** for angle bisector drawn with no or wrong arcs
	(b)	4·8 (accept 4·6 to 5·0)	**1dep**	Dependent on at least 1 mark scored in (a)
5	**(a)**	⁻1 3 5 5 3 ⁻1	**1**	
	(b)	All six points plotted Smooth curve through correct points	**1** **1**	±2 mm; allow ft from table ±2 mm (from correct position of points); no ft from wrong table; must have daylight between top of curve and (1·5, 5)
	(c)	⁻0·7 to ⁻0·9 or 3·7 to 3·9, or ft *their* graph	**2**	**W1** each; ±2 mm
6	**(a)**	1·5 oe www	**3**	**M2** for $4x = 6$ OR **M1** for *x*s or numbers collected and simplified correctly AND **M1** for final division correct ft from $ax = b$ or $ax + b = 0$ soi
	(b)	(i) $12a^5b^2$	**2**	**M1** for two 'terms' correct
		(ii) x^{12}	**1**	

7	**(a)**	3·7	**1**	
	(b)	0·5 www	**2**	Accept 0·48 to 0.52 **M1** for at least one of 4·55 and 5·05 seen
	(c)	eg On average, the boys jumped further than the girls The results for the girls were more spread out than those for the boys	**1** **1**	**1** each for two valid worthwhile comments For **2** marks, at least one comment must refer to distance or lengths or jumped or results Comments must be about different aspects – do not accept both comments about spread **0** if just statistics quoted and no explicit comparison or for just comparison of one or both endpoints or UQ and/or LQ
8	**(a)**	106 because angle at **centre** is twice angle at **circumference** oe	**1** **1**	
	(b)	82 because [angle in] alternate segment [angles on] [straight] line [add to 180°]	**1** **1** **1**	More than just 'line' required Allow only when RTU used as 56, or 82 seen as answer
		Alternative reason for 2nd and 3rd marks: angles in triangle [add to 180°] [angle in] alternate segment	 **1** **1**	Allow only when alternate segment theorem used to get final answer eg 82 obtained

9	**(a)**	3/10, 5/10 and 2/10 oe 2/9, 5/9, 2/9 on top set and 3/9, 4/9, 2/9 on middle set and 3/9, 5/9, 1/9 on bottom set	1 2	On first set of branches **M1** for one of the three sets of second branches correct
	(b)	$\frac{6}{90}$ oe or ft [isw wrong cancelling following this]	2	eg **2** for 9/100 following use of replacement of fruit **M1** for $\frac{3}{10}\times\frac{2}{9}$ or ft *their* tree
	(c)	eg $\frac{3}{10}\times\frac{5}{9}\times\frac{5}{10}\times\frac{2}{10}\times\frac{5}{9}$ or $\frac{3}{10}\times\frac{5}{9}+\frac{5}{10}\times\frac{3}{9}+\frac{5}{10}\times\frac{4}{9}+\frac{5}{10}\times\frac{2}{9}+\frac{2}{10}\times\frac{5}{9}$ or $\frac{5}{10}\times\frac{5}{9}+\frac{5}{10}$ oe	M2	For completely correct method ft *their* tree; **M1** for listing at least 3 correct products, ft from *their* tree with probabilities [may be seen by tree], or for identifying all five correct branches, ft from *their* tree (even if numbers of fruit, not probabilities, on tree) OR **M1** for correct calculation of four wrong branches and then **M1 dep** for subtraction of result from 1 Alternative Method: For other valid 'non-tree' approaches, allow **M2/M1** similarly: e.g. P(at least one apple) = P(a, a) + P(a, a') + P(a', a) **M1** = $\frac{5}{10}\times\frac{4}{9}+\frac{5}{10}\times\frac{5}{9}+\frac{5}{10}\times\frac{5}{9}$ **M1** = $\frac{20}{90}+\frac{25}{90}+\frac{25}{90}=\frac{70}{90}$ **A1** or $\frac{5}{10}\times\left(\frac{4}{9}+\frac{5}{9}+\frac{5}{9}\right)$ 2nd **M1** if not earned earlier $\left[=\frac{5}{10}\times\frac{14}{9}\right]=\frac{70}{90}$ or $\frac{7}{9}$ **A1** OR (Most elegantly;) P(at least one apple) = 1 − P(a', a'): P(a', a') = $\frac{5}{10}\times\frac{4}{9}\left[=\frac{2}{9}\right]$ oe **M1** 1 − *their* P(a', a') **M1dep** = $\frac{7}{9}$ oe **A1**
		$\frac{70}{90}$ oe cao [isw wrong cancelling following this]	A1	Allow **W3** for $\frac{70}{90}$ oe cao www

10		$x^2 + 7x + 9 = x + 4$	**M1**	Or subtraction of equations attempted soi or substitution of $y - 4$ for x
		$x^2 + 6x + 5$ [= 0] or $y^2 - 2y - 3$ [=0] oe	**M1 dep**	(dep on first **M1**) condone one error in rearrangement
		$(x + 1)(x + 5)$ [=0] or $(y + 1)(y - 3)$	**M1 dep**	(dep on first **M1**), allow if sign error in one factor or for factors giving two terms correct or for substitution into quadratic formula with at most one error; ft *their* equation if first **M1** earned Full completing square method after initial **M1** earns both 2nd and 3rd **M1**s, condoning one error
		[x =] ¯1 or ¯5 isw	**A1**	
		y = 3 or ¯1 isw	**A1**	Or **A1** for (¯1, 3) and **A1** for (¯5, ¯1) If **M3** not earned, allow **W1** for (¯1, 3) and (¯5, ¯1) obtained e.g. from tables of values

Section A Total: 50

Section B

11	**(a)**	Triangle with vertices at (3, 5), (3, ¯1) and (6, ¯1)	**3**	**2** if two vertices correct OR **1** for enlargement sf 3 drawn in wrong place, or for enlargement with centre (0, 2) but wrong sf
	(b)	$\begin{pmatrix} -5 \\ 2 \end{pmatrix}$	**1**	
12	**(a)**	28 32 15 25 43 57	**1**	
	(b)	$\frac{57}{100}$ oe	**1**	ft from *their* table isw wrong conversions
	(c)	$\frac{15}{40}$ oe [eg 3/8, 37.5%]	**1**	isw wrong conversions
	(d)	Suitable question and • 4 to 12 response boxes • non-overlapping clearly defined categories • covering all times • referring to hours or fractions of a day	**2**	**1** Suitable question with minimum 3 responses and fulfilling 3 of the bullet points eg **1** for only 3 appropriate response boxes or 4 or more boxes with an overlap **or** not covering all times or for more than 12 boxes covering all times and no overlaps **0** for 4 or more with an overlap **and** not covering all times etc **0** for only 3 boxes with overlaps or time omissions
13		407·25	**2**	**1** for other rounded or truncated versions of 407·2459(…) or for 211·12
14		Correctly evaluated trial of value between 2 and 3 Correct trials of 2·3 and 2·4 or better (ie outcomes closer to zero with one positive, one negative outcome) OR Correct trials of 2·25 and 2·35 or better (i.e. outcomes closer to zero with one pos, one neg outcome) Answer 2·3	**1** **1** **1**	2.1 -1.539 2.31 -0.15361 2.2 -0.952 2.32 -0.07283 2.3 -0.233 2.33 0.009337 2.4 0.624 2.34 0.092904 2.5 1.625 2.35 0.177875 2.6 2.776 2.36 0.264256 2.7 4.083 2.37 0.352053 2.8 5.552 2.38 0.441272 2.9 7.189 2.39 0.531919

15		Area of circle = $\pi \times 1{\cdot}3^2$ or 5·3[09…]	**M1**	May be implied by correct volume formula **M0** if *their* area does not involve π
		Volume = *their* area × 11·4	**M1**	
		= 60·4 to 60·6	**A1**	Condone 60 or 61; if volume answer not seen, allow **A1** for volume implied by **A2** or **A1** earned for density
		Density = mass ÷ *their* volume seen or used	**M1**	
		Answer 0·7 or 0·74 www	**A2**	**A1** for other versions of 0·74 to 0·75
16	**(a)**	0·88 × 70 oe	**M2**	**M1** for 0·12 × 70 oe or for 8·4(0)
		61·60	**A1**	Allow **W3** for 61·60 www, or **W2** for 61·6 www **SC1** for digits 616 with wrong position of decimal point
	(b)	492 ÷ 80 (× 100) oe	**M2**	**M1** for 80% = 492 seen or for 0·8 or $\frac{80}{100}$ seen
		615	**A1**	allow **W3** for 615 www
17	**(a)**	3·6 www	**3**	**M1** for 108 seen or attempt at Σfx (or at least 3 correct values seen of 3, 14, 12, 24, 30, 18, 7) **and M1** for their $\Sigma fx \div 30$ or $\Sigma fx \div$ *their* Σf Allow **A1** for 4 if M2 earned or earlier answer of 3.6, and no errors seen
	(b)	$9{\cdot}9 \times 10^8$ or $9{\cdot}89 \times 10^8$	**2**	**W1** for digits 989 or 99 seen
18		3·5 www	**3**	**M2** for $8 \cdot 4 \times \frac{4}{9 \cdot 6}$ oe seen OR **M1** for scale factor = 2·4 or 4 ÷ 9·6 seen, or for ratio of sides of PQR : 9·6 ÷8·4 [= 1·14…] or 8·4 ÷ 9·6 [= 0.875]
19		7	**2**	**M1** for one correct trial seen with $1 < t < 10$

2	0.2	6	0.00032
3	0.04	7	6.4E-05
4	0.008	8	1.28E-05
5	0.0016	9	2.56E-06

20	**(a)**	$[y] < \frac{3}{2}$ or $\frac{3}{2} > y$ www oe as final answer	**2**	**M1** for $3 > 2y$ oe OR **W1** for 1·5 oe obtained as answer, or for answer ft *their a* > *by* with positive *b*
	(b)	$[p =][\pm]\sqrt{\frac{C}{2}}$ oe as final answer	**2**	**M1** for 1st step correct or 2nd step correct ft OR **SC1** for answer $[p =][\pm]\frac{\sqrt{C}}{2}$
	(c)	$(x - 4)^2 - 11$ or $(x - 4)^2 + {}^{-}11$	**3**	**W1** for $a = 4$ or $(x - 4)^2$ OR **W2** for $b = {}^{-}11$ or **M1** for $5 - 4^2$
21	**(a)**	$17^2 - 8^2$ or $\sqrt{17^2 - 8^2}$ Completion to 15 following 225 or $\sqrt{225}$ or $\sqrt{17^2 - 8^2}$ = 15 Allow eg 289 − 64 seen to imply **M1**	**M1** **A1**	<u>Alternative method:</u> **M1** for = $17^2 - 15^2$ or $\sqrt{17^2 - 15^2}$ **A1** for completion to 8 following 64 or $\sqrt{64}$ or $\sqrt{17^2 - 15^2}$ = 8 Similarly for showing 8 and 15 gives hypotenuse 17; **M1** for $8^2 + 15^2 = 17^2$ oe; **A1** for supporting calculations <u>Alternative method:</u> **2** for complete correct trigonometric method eg tan VMO = 15/8 and obtaining 61·9(…), then VM = 8 ÷ cos 61·9 = 17·0
	(b)	1280	**2**	**M1** for $\frac{1}{3} \times 16^2 \times 15$
	(c)	$\sin \text{VMO} = \frac{15}{17}$ or $\tan \text{VMO} = \frac{15}{8}$ or $\cos \text{VMO} = \frac{8}{17}$ oe Use of inverse trig function seen 61·9(…) or 62°	**M1** **M1** **A1**	or cos rule or sine rule used with relevant trig fn as subject [ft *their* trig fn]; may be implied by correct answer Allow **W3** for 61·9(…) or 62° www, but **0** for question if scale drawing used, not trigonometry

Section B Total: 50

Grade Thresholds

General Certificate of Secondary Education
Mathematics C (J517)
June 2009 Examination Series

Unit Threshold Marks (Module Tests)

Unit		Maximum Mark	a*	a	b	c	d	e	f	g	p	u
B271	Raw	50								28	14	0
	UMS	59								40	20	0
B272	Raw	50							37	23	15	0
	UMS	70							60	40	30	0
B273	Raw	50							27	12		0
	UMS	79							60	40		0
B274	Raw	50						39	24	14		0
	UMS	90						80	60	50		0
B275	Raw	50						28	13			0
	UMS	99						80	60			0
B276	Raw	50					32	18				0
	UMS	119					100	80				0
B277	Raw	50				28	14					0
	UMS	139				120	100					0
B278	Raw	50			32	16						0
	UMS	159			140	120						0
B279	Raw	50		28	14							0
	UMS	179		160	140							0
B280	Raw	50	31	15								0
	UMS	200	180	160								0

Unit Threshold Marks (Terminal Papers)

Unit		Maximum Mark	a*	a	b	c	d	e	f	g	u
B281	Raw	100				69	57	45	34	23	0
	UMS	279				240	200	160	120	80	0
B282	Raw	100	86	69	52	35	21	14			0
	UMS	400	360	320	280	240	200	180			0

Notes

The table above shows the raw mark thresholds and the corresponding key uniform scores for each unit entered in the June 2009 session. Raw marks in between grade boundaries are converted to uniform marks by a linear map. For example, 28 raw marks on unit B278 would score 135 UMS in this series.

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

For a spreadsheet designed to calculate UMS scores for this specification, please visit the GCSE Maths C e-community at:
http://community.ocr.org.uk/community/maths-gcse-ga/home

The grade shown in the table as 'p' indicates that a candidate has achieved at least the minimum raw mark necessary to access the uniform score scale for that unit but gained insufficient uniform marks to merit a grade 'g'. This avoids having to award such candidates a 'u' grade. Grade 'p' can only be awarded to candidates for B271 (M1) and B272 (M2). It is not a valid grade within GCSE Mathematics and will not be awarded to candidates when they aggregate for the full GCSE (J517).

Statistics are correct at the time of publication.

Specification Options

Foundation Tier

	A*	A	B	C	D	E	F	G
Overall Threshold Marks				460	380	300	220	140
Percentage in Grade				20.2	24.4	20.1	19.4	12.3
Cumulative Percentage in Grade				20.2	44.5	64.6	84.0	96.3

The total entry for the Foundation Tier was 27 348.

Higher Tier

	A*	A	B	C	D	E	F	G
Overall Threshold Marks	700	620	540	460	380	300		
Percentage in Grade	9.6	20.9	29.4	30.0	9.1	0.9		
Cumulative Percentage in Grade	9.6	30.5	59.8	89.8	98.9	99.8		

The total entry for the Higher Tier was 31 774.

Overall

	A*	A	B	C	D	E	F	G
Percentage in Grade	5.3	11.5	16.2	25.6	15.9	9.5	8.7	5.5
Cumulative Percentage in Grade	5.3	16.8	33.0	58.6	74.5	84.0	92.7	98.2

The total entry for the examination was 59 122.

Statistics are correct at the time of publication.

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