



Cambridge IGCSE™

MATHEMATICS

0580/22

Paper 2 Extended

October/November 2022

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **7** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao – correct answer only

dep – dependent

FT – follow through after error

isw – ignore subsequent working

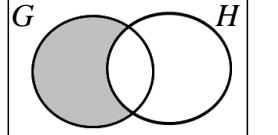
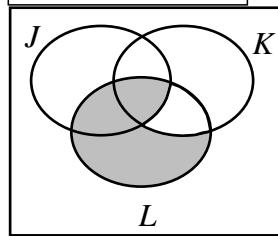
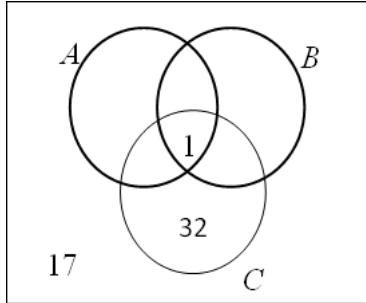
oe – or equivalent

SC – Special Case

nfww – not from wrong working

soi – seen or implied

Question	Answer	Marks	Partial Marks
1	112	2	M1 for $180 - 34 \times 2$ oe
2	$-50y$	1	
3	0	1	
4	$3x + x^3$ final answer	2	B1 for one correct term from two in final answer or for correct answer then spoilt
5	6.55	3	M2 for $(33.48 - 2.4 \times 0.85)$ oe or M1 for 2.4×0.85
6(a)	2 –9	2	B1 for one correct
6(b)	Sequence A $7n - 4$ oe final answer	2	B1 for $7n + c$ or $kn - 4$ $k \neq 0$ or for correct answer seen then spoilt
	Sequence B $3n^2 - 1$ oe final answer	2	M1 for finding second differences of 6 or has an answer that is a quadratic sequence or for correct answer seen then spoilt
7	$\frac{10}{18}$ and $\frac{3}{18}$	M1	Allow any correct common denominator $18k$
	$\frac{7}{18}$ cao	A1	
8(a)	3.5	2	M1 for values in correct order 1.5 2 2 3 4 4.5 5 18 or 3 and 4 identified as middle numbers
8(b)	One extreme value oe	1	
9(a)	A and C	1	
9(b)	ASA	1	
10(a)	3456	1	
10(b)	0.75 or $\frac{3}{4}$ oe	1	
10(c)	0.25 or $\frac{1}{4}$	1	
11(a)	5	2	M1 for $(0 - 3)(0 + b)(0 + 2) = -30$ oe or better

Question	Answer	Marks	Partial Marks
11(b)	(3, 0)	1	
12	5×199^{57}	2	M1 for $[315 =] 3^2 \times 5 \times 7$ oe or $3^2 \times 5^2 \times 7 \div 315 = 5$
13(a)	A correct cumulative frequency diagram	3	B1 for correct horizontal placement for 7 plots B1 for correct vertical placement for 7 plots B1FT dep on at least B1 for reasonable increasing curve or polygon through <i>their</i> 7 points If 0 scored SC1 FT for 6 out of 7 points correctly plotted
13(b)	33 to 34.5	1	FT <i>their</i> increasing cumulative frequency graph
14	104	2	M1 for 0.5×136 oe or 0.25×144 oe
15	Opposite angles add up to 180 oe	1	
16(a)	 	2	B1 for each
16(b)		2	B1 for 2 correct
17(a)	9	1	
17(b)	$2x - 5$ final answer	2	M1 for correct first step e.g. $x = \frac{y+5}{2}$ or $2y = x + 5$ or $y - \frac{5}{2} = \frac{x}{2}$ or better

Question	Answer	Marks	Partial Marks
17(c)	11	3	M1 for $\frac{x^2 + 5}{2}$ M1 for $hh^{-1}(63) = 63$ soi
18	419.19 – 4.19 oe	M1	
	$\frac{83}{198}$ cao	A2	A1 for $\frac{415}{990}$ oe If M0 scored SC1 for $\frac{k}{990}$ or correct answer with insufficient working
19	$\frac{3}{7}$ oe	3	M1 for clearly identifying the 7 even outcomes 2 6, 3 5, 3 7, 3 9, 5 5, 5 7, 5 9 M1 for clearly identifying the 3 even outcomes with just one five 3 5, 5 7 and 5 9 If 0 scored SC1 for answer $\frac{1}{4}$ oe
20(a)	$27x^{12}$ final answer	2	B1 for kx^{12} or $27x^c$ final answer or for $27x^{12}$ then spoilt
20(b)	[±] y	1	
21	228 or 228.3 to 228.4	4	M1 for $\frac{1}{3} \times \pi \times \left(\frac{9.2}{2}\right)^2 \times 12.5$ oe M1 for $\frac{9.2}{12.5} = \frac{\text{diameter}}{12.5 - 5.5}$ oe or better M1 for $\frac{1}{3} \times \pi \times \left(\frac{\text{their } 5.152}{2}\right)^2 \times (12.5 - 5.5)$ oe OR M2 for $\frac{\pi}{3} \times \left(\frac{9.2}{2}\right)^2 \times 12.5 - \frac{\pi}{3} \times r^2 \times (12.5 - 5.5)$ oe for any $r < 4.6$ If 0 scored SC1 for 913 or 913.3 to 913.5

Question	Answer	Marks	Partial Marks
22	45	3	<p>M2 for $\sqrt[3]{\frac{875}{56}} \times 18$ oe</p> <p>or M1 for $\sqrt[3]{\frac{875}{56}}$ or $\sqrt[3]{\frac{56}{875}}$ oe or</p> $\frac{18^3}{h^3} = \frac{56}{875} \text{ oe}$
23	$[0 =] 6x^2 - 19x + 3$	B5	<p>B4 for $8x - 20 + 2x + 2 = 6x^2 + 6x - 15x - 15$ or better OR M2 for $4(2x - 5) + 2(x + 1) = 3(x + 1)(2x - 5)$ oe</p> <p>or M1 for $4(2x - 5) + 2(x + 1)$ or better or common denominator $(x + 1)(2x - 5)$ or better</p> <p>B1 for $2x^2 + 2x - 5x - 5$ or better seen</p> <p>M1 for correctly simplifying <i>their</i> quadratic to the form $[0 =] ax^2 + bx + c$</p>
	Correct method to solve <i>their</i> three term quadratic	M1	e.g. $\frac{(6x - 1)(x - 3)}{-(-19) \pm \sqrt{(-19)^2 - 4 \times 6 \times 3}} \\ 2 \times 6$
	$x = 3, x = \frac{1}{6}$ oe	B1	



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

October/November 2022

MARK SCHEME

Maximum Mark: 130

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Abbreviations

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oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	75	2	M1 for $\frac{45}{3} [\times k]$ where k is 1, 5 or 8
1(a)(ii)	2.332 oe	2	M1 for 2.65 [million] $\times \left(1 - \frac{12}{100}\right)$ oe or B1 for 0.318 [million] seen
1(a)(iii)	23 280 cao	2	M1 for $\frac{6.25}{100} \times x = 1455$ or better
1(a)(iv)	1450 or 1449 to 1450	3	M2 for $1631 = k \left(1 + \frac{4}{100}\right)^3$ oe or better or B1 for $\left(1 + \frac{4}{100}\right)^3$ oe seen or M1 for $1631 = k \left(1 + \frac{4}{100}\right)^n$, $n > 0$ oe
1(b)(i)	$\frac{7x}{2}$ oe	1	
1(b)(ii)	$x + 12$ $\frac{7x}{2} - 26$ oe final answer	2	FT their (b)(i) B1 for $x + 12$ B1 for their $\frac{7x}{2} - 26$

Question	Answer	Marks	Partial Marks
1(b)(iii)	$\frac{7x}{2} - 26 = 3(x + 12)$ oe leading to 124	4	M1dep for <i>their</i> $\left(\frac{7x}{2} - 26\right) = 3 \times$ <i>their</i> $(x + 12)$ oe M2dep for isolating x terms, dep on eqn with term in x and constant on each side and with a bracket or fraction. or M1dep for correctly removing brackets or dealing with fractions, dep on eqn with term in x and constant on each side and with a bracket or fraction.
2(a)(i)	28	1	
2(a)(ii)	Correct curve	4	B3FT for 9 or 10 correct points or B2FT for 7 or 8 correct points or B1FT for 5 or 6 correct points
2(a)(iii)	2.5 to 2.8 8.2 to 8.5	2	B1 for each value
2(b)(i)	$2x^2 + 4x(9 - x)$ oe	M1	Accept the sum of individual areas if done in smaller parts
	$2x^2 + 36x - 4x^2$ oe Leading to $36x - 2x^2$	A1	With intermediate step shown and brackets removed with no errors or omissions
2(b)(ii)	144	3	B1 for $x = 6$ identified from graph or using calculus M1 for $36 \times$ <i>their</i> 6 – $2 \times (\text{their } 6)^2$

Question	Answer	Marks	Partial Marks
3(a)(i)	211.275	4	<p>M1 for mid-points soi (90, 125, 175, 250, 350)</p> <p>M1 for use of $\sum fm$ with m in correct interval including both boundaries</p> <p>M1 for (dep on 2nd M1) for $\sum fm \div 200$</p>
3(a)(ii)	$32 \times 350 - 32 \times 330$ oe or better, or the reverse of this	M1	
	3.2 or –3.2 final answer	B1	
3(a)(iii)	1.75 7.6 1.6	3	<p>B2 for two correct heights or B1 for one correct height or 3 correct frequency densities</p> <p>or M1 for scale factor of 5 or 0.2</p>
3(b)	$\frac{4}{25}$ oe	1	
3(c)(i)	$\frac{39}{995}$ oe	2	<p>M1 for $\frac{40}{200} \times \frac{39}{199}$ oe</p>
3(c)(ii)	$\frac{147}{4975}$ oe	3	<p>M2 for $[2 \times] \frac{84}{200} \times \frac{7}{199}$ oe</p> <p>or B1 for $\frac{84}{200}$ and $\frac{7}{199}$ or $\frac{84}{199}$ and $\frac{7}{200}$ oe</p> <p>If 0 scored, SC1 for answer $\frac{147}{5000}$ oe</p>

Question	Answer	Marks	Partial Marks
4(a)(i)	Translation $\begin{pmatrix} 7 \\ -8 \end{pmatrix}$ oe	2	B1 for each
4(a)(ii)	Rotation 90° [anticlockwise] oe $(0, 8)$	3	B1 for each
4(a)(iii)	Enlargement [sf] $\frac{1}{2}$ oe [centre] $(-1, -4)$	3	B1 for each
4(b)	Image at $(-4, 4) (-3, 4) (-2, 5) (-2, 3) (-4, 3)$	2	B1 for the line $y = x + 8$ drawn soi long enough to be fit for purpose or correct size and orientation but wrong position

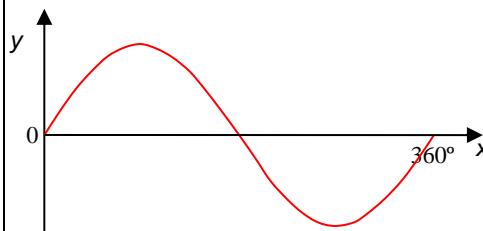
Question	Answer	Marks	Partial Marks
5(a)(i)	$\frac{14}{18}$ oe	1	
5(a)(ii)	17.5	4	<p>M3 for $\frac{1}{2}(10+24)18 + 22 \times 24 - 134 = 40v$ oe or M2 for $\frac{1}{2}(10+24)18 + 22 \times 24$ oe or B2 for [distance covered by bus =] 700 or M1 for correct method for any partial area for the car or for $40v$</p>
5(b)	92.8 or $92\frac{4}{5}$	3	<p>M1 for $\frac{\text{figs162}[4]}{\text{their } 10 \text{ min } 30 \text{ sec}}$ oe M1 for correct conversion to km/h, e.g. $\times \frac{60}{1000}$</p>

Question	Answer	Marks	Partial Marks
6(a)	-1.5 or $-1\frac{1}{2}$ or $-\frac{3}{2}$	2	M1 for $4x = 9 - 15$ or $x + \frac{15}{4} = \frac{9}{4}$
6(b)	$(a - 3)(a + 3)$ final answer	1	
6(c)	$\frac{8c}{3d}$ final answer	3	B2 for $\frac{8ac}{3ad}$ or $\frac{40c}{15d}$ or $\frac{4}{1} \times \frac{2c}{3d}$ seen or for correct answer seen then spoiled or M1 for $\frac{4a}{5} \times \frac{10c}{3ad}$ or $\frac{8ac}{10c} \div \frac{3ad}{10c}$ oe
6(d)	$n + 1$ final answer	2	M1 for 5×5^n or 5^{n+1} seen
6(e)	$(2x - 1)(2x + 5) [= 0]$ oe	B2	M1 for $2x(2x + 5) - [1](2x + 5) [= 0]$ or $2x(2x - 1) + 5(2x - 1) [= 0]$ or for $(2x + m)(2x + n) [= 0]$ with and $mn = -5$ or $n + m = 4$
	$\frac{1}{2}$ or 0.5 and -2.5 or $-2\frac{1}{2}$ or $-\frac{5}{2}$	B1	
6(f)(i)	7	3	M1 for $y = k(x + 3)^3$ or better M1 for $108 = \text{their } k(x + 3)^3$
6(f)(ii)	4	2	M1 for $\left(\frac{1}{2}\right)^2$ oe or $\frac{k}{4d^2}$ oe seen or better

Question	Answer	Marks	Partial Marks
6(g)	$2x^3 + 7x^2 - 9$ final answer	3	B2 for correct expansion unsimplified or for simplified 4 term expression of correct form with 3 terms correct or B1 for one pair of brackets expanded with at least 3 terms out of 4 correct
6(h)	$6x + 4$	2	B1 for $6x$ or 4 or $6x + 4$ with one extra term seen

Question	Answer	Marks	Partial Marks
7(a)(i)	52.[0] or 52.01...	4	M2 for $[\cos P =] \frac{39.4^2 + 46.5^2 - 38.2^2}{2 \times 39.4 \times 46.5}$ oe or M1 for $38.2^2 = 39.4^2 + 46.5^2 - 2 \times 39.4 \times 46.5 \times \cos P$ oe A1 for 0.616 or 0.6155...
7(a)(ii)	36.6 or 36.64 to 36.65	3	M2 for $\frac{d}{46.5} = \sin(\text{their } 52.01)$ oe or M1 for recognition that the line from Q is perpendicular to PR
7(b)(i)	41[.]0 or 41.01... nfww	3	M2 for $29^2 + 21^2 + 20^2$ oe or better or M1 for $29^2 + 21^2$ oe or $29^2 + 20^2$ oe or $21^2 + 20^2$ oe or better
7(b)(ii)	29.2 or 29.18 to 29.2	3	M2 for $\sin[GAC] = \frac{20}{\text{their AG}}$ oe or M1 for angle GAC identified
7(c)	bearing 286	B2	B1 for angle $MLK = 49$ or for angle $MKL = 35$ correctly identified or angle from North to $ML = 106$
	distance 64.6 or 64.59...	B3	M2 for $\frac{112 \times \sin(\text{their } 35)}{\sin(96)}$ oe or M1 for the implicit form

Question	Answer	Marks	Partial Marks
8(a)	(22, 11)	2	B1 for each value
8(b)	$\frac{\text{their } 11 - 3}{\text{their } 22 - 2}$ oe or better	M1	
	$-\frac{1}{\text{their } m}$	M1	
	Substitution of (12, 7) into $y = (\text{their } m)x + c$	M1	Accept $y - 7 = \text{their } m(x - 12)$ oe
	leading to $2y + 5x = 74$ final answer	A1	Without error or omission
8(c)	32	1	
8(d)	145	2	M1 for $\frac{1}{2} \times (\text{their } 32 - 3) \times 10$ oe or $\frac{1}{2} \times \sqrt{(7-3)^2 + (12-2)^2} \times \sqrt{(\text{their } 32 - 7)^2 + (2-12)^2}$ oe

Question	Answer	Marks	Partial Marks
9(a)	Correct sketch to go through (0, 0), and (360, 0) 	2	M1 for correct sine curve shape through the origin or for almost correct sketch fitting all tramlines but with an omission at either end or incorrect curvature in one place only
9(b)	233.1 or 233.13... and 306.9 or 306.86 to 306.87	3	B2 for one correct angle or M1 for $\sin x = -0.8$ oe If 0 scored SC1 for 2 reflex angles that add to 540 or two non-reflex angles that add to 180
10(a)	42.05 final answer	2	M1 for $11.4 + 0.05$ oe or $14.8 + 0.05$ oe or $15.7 + 0.05$ oe
10(b)	319 or 318.5 to 318.6	2	M1 for $\frac{150}{360} \times \pi \times 15.6^2$ oe
10(c)	$\frac{360-x}{360} \times 2\pi r + 2r = 3 \left(\frac{x}{360} \times 2\pi r + 2r \right) \text{ oe}$ $\frac{4x}{360} \times 2\pi[r] = 2\pi[r] - 4[r] \text{ oe}$ Leading to $\frac{90(\pi-2)}{\pi}$	M2 M1 for $\frac{x}{360} \times 2\pi r$ oe seen or $\frac{360-x}{360} \times 2\pi r$ oe seen M1	i.e. M mark for isolating and collecting terms in x With no errors or omissions

Question	Answer	Marks	Partial Marks
11(a)	2.5 and -2.5 oe	3	M2 for $1681m^2 = \frac{42025}{4}$ oe or M1 for $(9m)^2 + (40m)^2$ oe
11(b)(i)(a)	$\mathbf{c} - \mathbf{a}$ final answer	1	
11(b)(i)(b)	$\frac{3}{4}\mathbf{a}$ final answer	1	
11(b)(i)(c)	$\mathbf{c} + \frac{3}{4}\mathbf{a}$ final answer	1	FT c + their (b)(i)(b) , must be a vector in terms of \mathbf{a} and/or \mathbf{c} in its simplest form
11(b)(ii)	$\mathbf{a} + \frac{4}{3}\mathbf{c}$ oe	2	B1 for $[\overrightarrow{BQ}] = \frac{1}{3}\mathbf{c}$ or $[\overrightarrow{AQ}] = \frac{4}{3}\mathbf{c}$ or M1 for a correct route or for answer $\mathbf{a} + k\mathbf{c}$ oe, where $k > 1$



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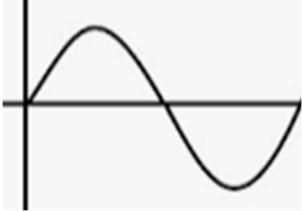
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1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Question	Answer	Marks	Partial Marks
1	13 or -13	1	
2	54	2	M1 for $\frac{360}{8+5+4+3} [\times 3]$ or $\frac{3}{8+5+4+3} [\times 360]$ oe
3	11 27	3	M1 for $500 \div 43$ oe M1 for $500 - \text{their } 11 \times 43$ oe <i>their</i> 11 must be an integer from 2 to 11
4	102	1	
5	180	3	M2 for $[2 \times] (8 \times 6 + 8 \times 3 + 3 \times 6)$ oe or M1 for 8×6 or 8×3 or 3×6
6	0.48 oe	2	M1 for $1 - (0.2 + 0.32)$ oe
7	103.32 cao	2	M1 for $126 \times \left(1 - \frac{18}{100}\right)$ oe or B1 for 22.68
8	13 16 21	2	B1 for 2 correct terms in correct position or SC1 for 12, 13, 16
9	239	2	M1 for $180 + 59$ or $360 - (180 - 59)$ oe or indicates correct angle on diagram
10(a)(i)	$\begin{pmatrix} 3 \\ 4 \end{pmatrix}$	1	
10(a)(ii)	$\begin{pmatrix} 12 \\ 48 \end{pmatrix}$	1	
10(b)	5	2	M1 for $(\text{their } 3)^2 + (\text{their } 4)^2$ or better
11	24	1	
12(a)	correct graph	3	B1 for line from (0, 0) to (1.5, 30) B1 for horizontal line from (<i>their</i> 1.5, <i>their</i> 30) for 0.5 hours B1 for a line from (<i>their</i> 2, <i>their</i> 30) ending at distance 70 with a gradient of 16 Provided it fits on the grid and <i>their</i> 30 is <70

Question	Answer	Marks	Partial Marks
12(b)	15.6 or 15.55 to 15.56 nfww	3	M2 for $70 \div (\text{their final time in hours})$ (final time =) $1.5 + 0.5 + \frac{70 - \text{their}30}{16}$ or 4.5 or <i>their</i> final time from graph or M1 for $70 \div$ any time
13	$\frac{33}{8}$ or $\frac{17}{6}$ $2\frac{1}{8} - \frac{5}{6}$	B1	Correct step for dealing with mixed numbers Allow $\frac{33k}{8k}$ or $\frac{17k}{6k}$
	$\frac{99}{24}$ and $\frac{68}{24}$ [2] $\frac{3}{24} - \frac{20}{24}$	M1	Correct method to find common denominator e.g. $4\frac{3}{24}$ and $2\frac{20}{24}$
	$1\frac{7}{24}$ cao and correct working	A1	
14	2.6[0] or 2.600...	3	M2 for $\sqrt[10]{1328.54 + 4540}$ or M1 for $4540 \times k^{10} = 1328.54 + 4540$ for any k If 0 scored SC1 for answer -11.6 or -11.56...
15	$4a^2b$ final answer	2	M1 for two correct parts out of three from 4, a^2 and b in final answer
16(a)	$(M \cup G) \cap P'$	1	
16(b)	22	1	
16(c)	$\frac{8}{23}$ oe	2	M1 for $\frac{k}{23}$ or $\frac{k}{3+9+5+6}$ or $\frac{8}{c}$ or $\frac{3+5}{c}$ $c \neq 1$ or for 8 and 23 identified
17(a)	 Correct sketch to go through (0, 0), (180, 0) and (360, 0)	2	B1 for correct sine curve shape through the origin

Question	Answer	Marks	Partial Marks
17(b)	199.5 or 199.47... and 340.5 or 340.52 to 340.53...	3	B2 for one correct or M1 for $\sin x = -\frac{1}{3}$ oe If 0 scored SC1 for two reflex angles with sum of 540 or two non-reflex angles with sum of 180
18(a)	2.5	3	M1 for $y = k \times \sqrt[3]{x+1}$ M1 for $y = \text{their } k \times \sqrt[3]{124+1}$
18(b)	multiplied by 4 oe	1	
19(a)	$\frac{x+8}{7}$ final answer	2	M1 for $x = 7y - 8$ or $y + 8 = 7x$ or $\frac{y}{7} = x - \frac{8}{7}$
19(b)	4	2	M1 for $4 \div \frac{1}{3} + 5$ oe or better
20(a)	$(2m+3p)(1-4k)$ final answer	2	B1 for $2m+3p-4k(2m+3p)$ or better or $2m(1-4k)+3p(1-4k)$ or correct answer seen and spoilt
20(b)	$5(x-2y)(x+2y)$ final answer	3	B2 for $(5x-10y)(x+2y)$ or $(x-2y)(5x+10y)$ or correct answer seen then spoilt or B1 for $5(x^2-4y^2)$ or for $(x-2y)(x+2y)$
21	[a =] 2 [b =] -1	5	M2 for correct method to find two simultaneous equations e.g. two from $a \times 1^2 + b \times 1 - 4 = -3$ $a \times 2^2 + b \times 2 - 4 = 2$ $3a + b = 2 -- 3$ or M1 for 1 correct equation M1 for correctly eliminating one variable for <i>their</i> simultaneous equations A1 for a = 2 A1 for b = -1
22	4 : 3 oe	2	M1 for $\overrightarrow{AD} = -\frac{4}{7}x + \frac{4}{7}y$ oe or $\overrightarrow{DB} = -\frac{3}{7}x + \frac{3}{7}y$ oe

Question	Answer	Marks	Partial Marks
23	18.4 or 18.40...	4	$\text{M3 for } \frac{600 - \frac{1}{2} \times 4 \times \pi \times 6.2^2}{6.2 \times \pi} \text{ oe}$ <p>or M2 for</p> $\frac{1}{2} \times 4 \times \pi \times 6.2^2 + \pi \times 6.2 \times l = 600 \text{ oe}$ <p>or $\frac{600 - 4 \times \pi \times 6.2^2}{6.2 \times \pi}$ or better</p> <p>or M1 for $\left[\frac{1}{2} \right] \times 4 \times \pi \times 6.2^2$ or $\pi \times 6.2 \times l$</p>



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2022

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **9** printed pages.

Generic Marking Principles

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GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
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6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	150	2	B1 for answer $150k$ or M1 for prime factors of 30 or 75 seen or a list of multiples of both 30 and 75 with at least 3 of each or for $\frac{30 \times 75}{15}$ oe or for answer $2 \times 3 \times 5^2$
1(b)	152 190 266	3	Accept in any order B2 for two correct answers or M1 for $\frac{608}{4+5+7} \times k$ oe where $k=1, 4, 5, 7$
1(c)	2.61×10^{-2} 2.61×10^{-2} or $2.608\dots \times 10^{-2}$	2	B1 for figs 2608 or 261 seen If 0 scored, SC1 for answer $2.6[0] \times 10^{-2}$ without more accurate value in standard form seen
1(d)	$\frac{27}{99}$ oe fraction	1	
1(e)	2.8 g/cm^3 or g cm^{-3}	1 1	
2(a)	$PQR = 90$ angle in semi-circle $PRQ = 61$ angle sum of triangle [= 180] $PSQ = 61$ angle in same segment	B1 B1 B1	
2(b)	57	4	B1 for $ABT = 98$ B1 for TAB or $ATB = 41$ B1 for $BTC = 41$ or $TBC = 82$ or $ATC = 82$ soi
3(a)	8.25 or 8.246...	3	M2 for $(3-5)^2 + (2-4)^2$ oe or better or M1 for $(3-5)$ and $(2-4)$ oe seen
3(b)	$[y =] 4x + 7$	5	B1 for [midpoint] $(-1, 3)$ soi M1 for [gradient of $l =] \frac{4-2}{-5-3}$ oe M1 for gradient $-1 / \text{their} \left(-\frac{1}{4} \right)$ M1 dep on at least M1 for $\text{their } (-1, 3)$ substituted into $y = \text{their } m \times x + c$ oe

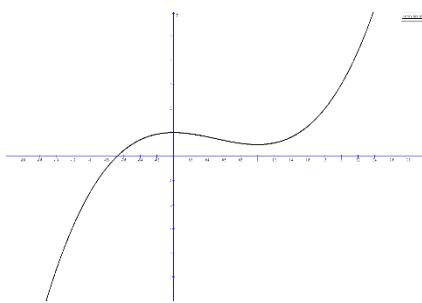
Question	Answer	Marks	Partial Marks
3(c)	(0, -8) and (0, 16)	4	<p>B3 for (0, -8) or (0, 16) or for -8 and 16 OR B2 for distance = $[\pm]12$ soi or M1 for $13^2 - (5[-0])^2$ oe B1 for both answers (0, k), $k \neq 0$ or 4</p> <p>ALT METHOD B3 for (0, -8) or (0, 16) or for -8 and 16 OR M2 for $y^2 - 8y - 128 [= 0]$ or for $(y - 4)^2 = 144$ or better or M1 for $13^2 = (-5 - 0)^2 + (4 - y)^2$ oe</p> <p>B1 for both answers (0, k), $k \neq 0$ or 4</p>
4(a)	7.06 or 7.058... or 7.059	3	<p>M2 for $\sqrt{6.4^2 + 10.9^2 - 2 \times 6.4 \times 10.9 \times \cos 38}$ oe</p> <p>OR M1 for $6.4^2 + 10.9^2 - 2 \times 6.4 \times 10.9 \times \cos 38$ oe</p> <p>A1 = 49.8...</p>
4(b)(i)	97	1	
4(b)(ii)	15.3[0...]	3	<p>M2 for $[AB =] \frac{10.9 \times \sin \text{their } 97}{\sin 45}$ or M1 for $\frac{\sin \text{their } 97}{AB} = \frac{\sin 45}{10.9}$ oe</p>
4(c)	72.8 to 72.81...	3	<p>M2 for $\frac{1}{2}(6.4) \times 10.9 \times \sin 38 + \frac{1}{2}\text{their } 15.3 \times 10.9 \times \sin 38$ oe or M1 for $\frac{1}{2} \times 6.4 \times 10.9 \times \sin 38$ oe or $\frac{1}{2} \times \text{their } 15.3 \times 10.9 \times \sin 38$ oe or M1 for height = $10.9 \times \sin 38$ oe</p>
5(a)	Correct lines drawn	2	B1 for one correct with no incorrect lines
5(b)(i)(a)	Translation or translate $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$ oe	2	B1 for each
5(b)(i)(b)	Rotation or rotate 90 [anticlockwise] oe [centre] (2, 1)	3	B1 for each
5(b)(ii)(a)	Triangle at (-5, 6) (-2, 6) (-2, 5)	2	B1 for reflection in $y = k$

Question	Answer	Marks	Partial Marks
5(b)(ii)(b)	Triangle at (1, 5) (1, 7) (7, 7)	2	B1 for correct size and orientation, wrong position
6(a)	42 028	2	M1 for $\frac{380}{500}$ oe soi isw
6(b)	$\frac{47}{66}$ oe	4	<p>0.712[1...]</p> <p>M3 for $2\left(\frac{5}{12} \times \frac{4}{11}\right) + 2\left(\frac{4}{12} \times \frac{3}{11}\right) + 2\left(\frac{5}{12} \times \frac{3}{11}\right)$ oe</p> <p>or $1 - \left(\frac{5}{12} \times \frac{4}{11} + \frac{4}{12} \times \frac{3}{11} + \frac{3}{12} \times \frac{2}{11}\right)$ oe</p> <p>or M2 for sum of 3 or more correct product pairs and no incorrect pairs</p> <p>or for $\frac{5}{12} \times \frac{4}{11} + \frac{4}{12} \times \frac{3}{11} + \frac{3}{12} \times \frac{2}{11}$ and no other pairs</p> <p>or M1 for $\frac{k}{12} \times \frac{j}{11}$ seen</p> <p>If 0 scored SC1 for answer $\frac{94}{144}$ oe</p>
6(c)	52	2	M1 for $x \times \frac{100-16}{100} = 43.68$ oe or better
6(d)(i)	70 or 70.16[5...] or 70.17 or 70.2	3	<p>M2 for $\frac{29750 \text{ to } 29800}{400+25}$ or $\frac{29750 \text{ to } 29800}{400+24}$ or $\frac{29800-50}{400 \text{ to } 425}$</p> <p>or B1 for 29 750 or 29 850 or 29 849 or 375 or 425 or 424 seen</p>
6(d)(ii)	2399 or 2400 nfww	2	B1 for 27 450 or 27 550 or 27 549 or 29 850 or 29 849 seen
7(a)	25.2 or 25.23...	4	<p>M1 for midpoints soi</p> <p>M1 for use of $\sum fx$ with x in correct interval including both boundaries</p> <p>M1 (dep on 2nd M1) for $\sum fx \div 150$</p>
7(b)	5 correct blocks	4	<p>B3 for 4 correct blocks</p> <p>or B2 for 3 correct blocks</p> <p>or B1 for 2 correct blocks</p> <p>or block widths 10, 10, 5, 15, 10</p> <p>If 0 scored SC1 for 4 correct frequency densities from 1.2, 3.8, 6.4, 3.33[3...] and 1.8 oe soi</p>
7(c)(i)	12, 50, 82, 132, 150	2	B1 for 3 or 4 correct

Question	Answer	Marks	Partial Marks
7(c)(ii)	92	2	M1 for $150 - 12 = 92$ oe seen If 0 scored, SC1 for answer 8[%]
8(a)	$\frac{1}{2}$ or 0.5 oe	2	M1 for $10 - 3 = 11p + 3p$ oe or better
8(b)	$[m =] \frac{2k}{c^2 - g}$ oe final answer	3	M1 for correctly isolating m terms M1 for correctly factorising M1 for dividing by a bracket with two terms to the final answer Maximum mark M2 if final answer incorrect
8(c)	0 4.5 oe	5	B4 for $2x^2 - 9x = 0$ or $9x - 2x^2 = 0$ or better OR M2 for $(2x+3) + 4(x-3) = (x-3)(2x+3)$ or better or M1 for $(2x+3) + 4(x-3)$ seen oe or common denominator $(x-3)(2x+3)$ oe B1 for $2x^2 - 6x + 3x - 9 = 0$ or better seen
8(d)	$y^2 - 10y + 21 = 0$ or $x^2 - 4x - 12 = 0$	M2	M1 for $y^2 + 5(12 - 2y) = 39$ oe or $5x + \frac{(12-x)^2}{2^2} = 39$ seen oe
	$(y-3)(y-7) = 0$ or $(x+2)(x-6) = 0$	M1	or for correct factors for <i>their</i> 3– term quadratic equation or for correct substitution into quadratic formula or correctly completing the square for <i>their</i> 3– term quadratic equation
	$x = -2$ $y = 7$ $x = 6$ $y = 3$	B2	B1 for $x = -2$, $x = 6$ or for $y = 7$, $y = 3$ or for one correct pair of x and y values
8(e)	$2x^3 + x^2 - 54x + 72$ final answer	3	B2 correct expansion of three brackets unsimplified or for final answer of correct form with 3 out of 4 terms correct or B1 correct expansion of two brackets with at least three terms out of four correct
9(a)	$PMR = MSR = \text{right angle}[s]$ or 90°	B1	
	$PRM = MRS$ same angle	B1	
	AAA oe OR $MPR = SMR$ 3rd angle of triangle	B1	Dep on B1B1 and no errors seen

Question	Answer	Marks	Partial Marks
9(b)(i)	5.5	2	M1 for $\frac{x}{4.5} = \frac{9.9}{8.1}$ oe
9(b)(ii)	16.7 or 16.73 to 16.74	2	M1 for $25 \times \left(\frac{8.1}{9.9}\right)^2$ oe or $25 \times \left(\frac{4.5}{their\ 5.5}\right)^2$ oe
10(a)	1, 2, 3	2	M1 for $15 - 8 > 5n - 3n$ oe If 0 scored, B1 for 2 correct answers and no others or 3 correct answers with one extra value
10(b)(i)	$10y + 8x \leq 80$ oe final answer $x > 4$ oe final answer $2y > x - 4$ oe final answer	3	B1 for each If 0 scored, SC1 for $10y + 8x < 80$ oe final answer and $x \geq 4$ oe final answer and $2y \geq x - 4$ oe final answer
10(b)(ii)	23 final answer	2	M1 for 7 and 2 selected soi
11(a)(i)	4.455 to 4.456... [= 4.46]	2	M1 for $[r =] \frac{28}{2\pi}$ oe
11(a)(ii)	1250 or 1247 to 1249.9...	2	M1 for $20 \times \pi \times 4.46^2$ oe
11(a)(iii)	66[.] or 65.95 to 66.02	3	M2 for $[\tan] = \frac{20}{2 \times 4.46}$ oe or B1 for identifying angle <i>ANB</i> on cylinder not on rectangle
11(b)	11.8 or 11.82 to 11.83	5	M2 for $[r =] \sqrt[3]{\frac{310 \times 3}{2\pi}}$ oe or $[h =] \sqrt[3]{\frac{310 \times 3 \times 4}{\pi}}$ oe or M1 for $310 = \frac{1}{3}\pi \times r^2 \times 2r$ or $310 = \frac{1}{3}\pi \left(\frac{h}{2}\right)^2 h$ M2 for $\sqrt{(their\ r)^2 + (2 \times their\ r)^2}$ oe or M1 for $[l^2 =] (their\ r)^2 + (2 \times their\ r)^2$ oe

Question	Answer	Marks	Partial Marks
12(a)	$3x^2 - 2kx$	M2	M1 for $3x^2$ or $-2kx$
	<i>their</i> $\frac{dy}{dx} = 6$	M1	Dep on at least M1 for derivative
	$x = 2$ substituted in <i>their</i> $\frac{dy}{dx}$	M1	Dep on at least M1 for derivative
	Correct working leading to 1.5 oe	A1	A0 if any errors in working leading to 1.5
12(b)	(0, 1) (1, 0.5)	4	B3 for $x = 0$ and $x = 1$ or for (1, 0.5) OR M1 for <i>their</i> $\frac{dy}{dx} = 0$ B1 for $3x^2 - 3x$ oe or better
12(c)	correct sketch	2	with max on positive y-axis and min in 1st quadrant B1 for positive cubic or for graph with one max which is on pos y-axis and one min which is in 1st quadrant





Cambridge IGCSE™

MATHEMATICS

0580/22

Paper 2 (Extended)

February/March 2022

MARK SCHEME

Maximum Mark: 70

Published

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

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Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

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- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

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Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	40°	1	
2	80.50 cao	2	B1 for 80.498... or 80.5 or correctly rounding their more accurate decimal to 2 dp
3	7 [h] 18 [min]	1	
4	166	3	M2 for $[2 \times] (7 \times 4 + 4 \times 5 + 5 \times 7)$ or M1 for 7×4 or 4×5 or 5×7
5(a)	5	1	
5(b)	(0, 7)	1	
6	correct triangle with arcs	2	B1 for correct triangle with incorrect or no arcs or for two correct arcs. or a triangle with arcs but one side not in range
7	$n > -1$ oe	1	
8(a)(i)	triangle at $(-1, 1)$ $(-4, 2)$ $(-3, 5)$	1	
8(a)(ii)	triangle at $(-2, -3)$ $(1, -2)$ $(0, 1)$	2	B1 for translation by $\begin{pmatrix} -3 \\ k \end{pmatrix}$ or by $\begin{pmatrix} k \\ -4 \end{pmatrix}$
8(b)	enlargement [sf] $\frac{1}{2}$ [centre] $(9, -1)$	3	B1 for each
9	$3a(4a^2 - 7)$ final answer	2	B1 for $3(4a^3 - 7a)$ or $a(12a^2 - 21)$ or for $3a(4a^2 - 7)$ seen then spoilt
10(a)	8 11 16	2	B1 for two correct
10(b)	$23 - 8n$ oe final answer	2	B1 for $j - 8n$ or $23 - kn$ $k \neq 0$ or $23 - 8n$ seen then spoilt
11	Positive	1	

Question	Answer	Marks	Partial Marks
12(a)	805	3	B2 for 105 or M2 for $\frac{700 \times 2.5 \times 6}{100} + 700$ oe or M1 for $\frac{700 \times 2.5 [\times 6]}{100}$ oe
12(b)	2.3[0...]	3	M2 for $\sqrt[17]{\frac{1030.35}{700}}$ oe or M1 for $1030.35 = 700(k)^{17}$ oe for any k
13(a)	h^7 final answer	1	
13(b)	$\frac{x^3}{343}$ final answer	1	
13(c)	6	1	
14	29.5 or 29.53...	2	M1 for $2 \times \pi \times 4.7$ oe
15	$\frac{7}{3}$ oe improper fraction	M1	or $\frac{k}{3} \times \frac{11}{14}$ where $k > 3$
	$1\frac{5}{6}$ cao	A2	A1 for $\frac{77}{42}$ or $\frac{11}{6}$ or $1\frac{35}{42}$
16(a)	$[y =] -2x - 7$ final answer	2	B1 for $-2x + c$ or $kx - 7$, $k \neq 0$ final answer
16(b)	$y = \frac{1}{2}x [\pm 0]$ final answer	2	FT $-\frac{1}{\text{their gradient in (a)}}$ B1 for $y = kx [\pm 0]$ oe, $k \neq 0$ or $y = \text{their } \frac{1}{2}x + c$ oe for any c or $\text{their } \frac{1}{2}x [\pm 0]$ oe

Question	Answer	Marks	Partial Marks
17	77.8 or 77.77 to 77.80	5	<p>B4 for answer 22.2[%] or 22.20[%] to 22.23[%] OR M1 for $\tan^{-1} \frac{11}{4}$ oe or $\tan^{-1} \frac{4}{11}$ oe</p> <p>M2 for $4 \times 11 - \frac{\text{their acute angle}}{360} \times \pi \times 4^2$ oe or M1 for $\frac{\text{their acute angle}}{360} \pi \times 4^2$ oe</p> <p>M1 for $\frac{\text{their shaded area}}{4 \times 11} [\times 100]$ oe or $\frac{\text{their sector area}}{4 \times 11} \times 100$ oe</p>
18	A correct equation leading to 41	3	<p>M2 for $4x = 164$ or M1 for $x + 2(x - 24) + x - 16 = 100$ oe</p> <p>or M1 for correctly simplifying <i>their</i> equation to the form $kx = c$ provided at least one part correct from $[2](x - 24)$ oe or $x - 16$</p> <p>or B1 for answer 41 without an equation in x shown</p>
19	$\frac{2}{3}$ oe	3	<p>M1 for $y = \frac{k}{\sqrt{x+4}}$</p> <p>M1 for $y = \frac{\text{their } k}{\sqrt{77+4}}$</p>

Question	Answer	Marks	Partial Marks
20	$x^2 + 6x - 40 [=0]$ or $y^2 - 40y - 41 [=0]$	M2	M1 for correct method to eliminate one variable e.g. $x^2 - 2(11-3x) = 18$ or $\frac{(11-y)^2}{3^2} - 2y = 18$
	$(x-4)(x+10) [=0]$ or $(y-41)(y+1) [=0]$	M1	or for correct factors for <i>their</i> quadratic equation or for correct use of quadratic formula for <i>their</i> quadratic equation or for correctly completing the square for <i>their</i> quadratic equation
	$x = 4, y = -1$ $x = -10, y = 41$	B2	B1 for $x = 4, x = -10$ or for $y = -1, y = 41$ or for a correct pair of x and y values If B0 scored and at least 1 method mark scored SC1 for correct substitution shown of both of <i>their</i> x values or <i>their</i> y values into $3x + y = 11$ or $x^2 - 2y = 18$
21(a)	35.1 or 35.05 to 35.06	4	M3 for $\tan = \frac{14.5}{\sqrt{18.6^2 + 9^2}}$ oe or M2 for $[AC^2 =] 18.6^2 + 9^2$ oe or better or $[AG^2 =] 18.6^2 + 9^2 + 14.5^2$ or M1 for recognising the angle GAC

Question	Answer	Marks	Partial Marks
21(b)	$30 - \sqrt{18.6^2 + 9^2 + 14.5^2}$ $30 - \frac{14.5}{\sin(\text{their(a)})}$ or $30 - \frac{\sqrt{18.6^2 + 9^2}}{\cos(\text{their(a)})}$	M2	M1 for $AG^2 = 18.6^2 + 9^2 + 14.5^2$ oe or better or $\sin(\text{their(a)}) = \frac{14.5}{AG}$ or $\cos(\text{their(a)}) = \frac{\sqrt{18.6^2 + 9^2}}{AG}$
	4.75 to 4.78...	A1	
22(a)	$a - \frac{2}{5}b$ oe simplified	2	M1 for $-b + a + \frac{3}{5}b$ or a correct route
22(b)	$\frac{5}{2}a$ oe	2	B1 for $k\vec{a}$ where $k > 1$ or $\frac{5}{2}\vec{a}$ OR



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

February/March 2022

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the February/March 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **10** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	184	2	M1 for $\frac{852-300}{300} [\times 100]$ oe or for $\frac{852}{300} \times 100 [-100]$ oe
1(b)	497	2	M1 for $\frac{852}{5+7} \times k$ oe where $k = 1, 5 or } 7$
1(c)(i)	Forty thousand six hundred	1	
1(c)(ii)	4.06×10^4	1	
1(d)	435	3	M2 for $3000 \times \left(1 - \frac{48}{100} - \frac{3}{8}\right)$ oe or B2 for 2565, or 1440 and 1125 or 1875 and 1440 or 1560 and 1125 or M1 for $1 - \frac{48}{100} - \frac{3}{8}$ or $3000 \times \left(\frac{48}{100} + \frac{3}{8}\right)$ oe or B1 for 1440 or 1125 or 1560 or 1875 If 0 scored SC1 for answer 975
1(e)	35.7	3	M2 for $\frac{100+15}{100} \times \frac{100+18}{100} [-1]$ oe or better or M1 for $k \times \frac{100+15}{100} \times \frac{100+18}{100}$ oe
2(a)	1[.] 0.9	2	B1 for each
2(b)	correct curve	4	B3 FT for 6 or 7 points B2 FT for 4 or 5 points B1 FT for 2 or 3 points

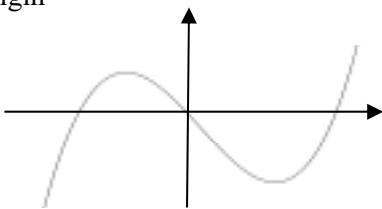
Question	Answer	Marks	Partial Marks
2(c)	ruled line at $y = -1$	B1	
	0.3 to 0.32	B1	
3(a)(i)	169	2	M1 for $g(13)$ or $(1+4x)^2$ or better
3(a)(ii)	$1+4x^2$ final answer	1	
3(a)(iii)	x	1	
3(b)	3.5 or $\frac{7}{2}$	2	M1 for $1+4x=15$
4(a)(i)	40.9 or 40.91...	3	M2 for $[\sin ABC =] \frac{29.5 \sin 51.6}{35.3}$ oe or for $[\cos ABC =] \frac{35.3^2 + 45^2 - 29.5^2}{2 \times 35.3 \times 45}$ or M1 for $\frac{29.5}{\sin ABC} = \frac{35.3}{\sin 51.6}$ oe or for correct implicit cosine rule
4(a)(ii)	520 or 520.0 to 520.2...	2	FT their (a)(i) if used provided working shown M1 for $0.5 \times 29.5 \times 45 \times \sin 51.6$ oe or for $0.5 \times 35.3 \times 45 \times \sin(\text{their}(a)(i))$ or for $0.5 \times 35.3 \times 29.5 \sin(180 - 51.6 - \text{their}(a)(i))$
4(b)(i)	41.2 or 41.21 to 41.23	4	M1 for $SQ = 2 \times 32 \times \sin\left(\frac{1}{2} \times 56\right)$ oe or $\sqrt{32^2 + 32^2 - 2 \times 32 \times 32 \times \cos 56}$ oe or $\frac{32 \sin 56}{\sin((180 - 56) \div 2)}$ oe M2 for $SR^2 = 47^2 + (\text{their } SQ^2) - 2 \times 47 \times \text{their } SQ \times \cos 60$ or M1 for implicit form
4(b)(ii)	28.3 or 28.25 to 28.29...	3	M2 for $32 \times \sin 62$ oe or M1 for recognition that line from P is perpendicular to SQ
5(a)	121 or 120.8... or $120 \frac{5}{6}$	4	M1 for midpoints soi M1 for use of $\sum fx$ with x in correct interval including both boundaries but not if x is 50, 50, 100 and 300 M1 (dep on 2nd M1) for $\sum fx \div 120$

Question	Answer	Marks	Partial Marks
5(b)	12.4 5 1.4	3	B1 for each If 0 scored SC1 for fd's [0.86,] 0.62, 0.25 and 0.07 oe
5(c)	43 74 99 120	2	B1 for 2 or 3 correct
5(d)	Correct diagram	3	B1 for correct horizontal placement for 4 plots B1FT for correct vertical placement for 4 plots B1FT dep on at least B1 for reasonable increasing curve or polygon through <i>their</i> 4 points If 0 scored SC1 FT for 3 out of 4 points correctly plotted
5(e)(i)	Strict FT <i>their median</i> reading	1	
5(e)(ii)	Strict FT <i>their UQ</i> reading	1	
5(e)(iii)	Strict FT <i>their</i> reading at 40th percentile	2	B1 for 48 written or mark at cf = 48 on graph
5(e)(iv)	Strict FT <i>their</i> reading at 400 – <i>their</i> reading at 250	2	B1 for either correct reading at 250 or 400
6(a)	15	2	M1 for $\frac{360}{180-156}$ or for $\frac{180(n-2)}{n} = 156$ oe
6(b)	38	2	B1 for $AOB = 76$
6(c)	68	2	B1 for $RSP = 68$ or $RQP = 112$

Question	Answer	Marks	Partial Marks
6(d)	Two pairs of equal angles identified with fully correct reasons	M3	<p>M2 for one pair of equal angles identified with fully correct reasons</p> <p>$KMG = 90$ angle in semicircle and $OGH = 90$ angle between tangent and radius</p> <p>OR</p> <p>$KMG = OGH$ alternate segment</p> <p>OR</p> <p>$GOH = MGK$ alternate angles</p> <p>OR</p> <p>Angle FGM = angle GHO corresponding and angle FGM = GKM alternate segment and angle H = angle K</p> <p>or M1 for $KMG = 90$, angle in semicircle</p> <p>or OGH = 90, angle between tangent and radius</p>
	Two or three pairs of angles equal [so similar] oe	A1	Dep on M3 with no incorrect work seen
7(a)	31.5	3	<p>M2 for $17.5 \times \sqrt{\frac{1134}{350}}$ oe</p> <p>or M1 for $\sqrt{\frac{1134}{350}}$ oe isw or $\sqrt{\frac{350}{1134}}$ oe isw</p> <p>or for $\frac{1134}{350} = \left(\frac{x}{17.5}\right)^2$ oe</p>
7(b)	163.9375 or $163\frac{15}{16}$ final answer	2	B1 for $15 + 0.25$ or $10.5 + 0.25$ or better seen
7(c)	40.5[0]	2	M1 for $x \times \left(1 - \frac{18}{100}\right) = \frac{166.05}{[5]}$ oe
7(d)	\$2.23 final answer	3	<p>B2 for $2.227\dots$ or 2.23 seen</p> <p>OR</p> <p>M2 for $57 - \frac{48.2}{0.88}$ oe</p> <p>or M1 for $\frac{48.2}{0.88}$ oe</p> <p>If 0 scored SC1 for 57×0.88 oe seen</p>

Question	Answer	Marks	Partial Marks
8(a)	$\frac{12}{x} + \frac{26}{x+10} = 2.8$ oe isw	3	B2 for $\frac{12}{x} + \frac{26}{x+10}$ oe isw OR B1 for $\frac{26}{x+10}$ seen B1 for time = 2.8 or $\frac{168}{60}$ or $2\frac{48}{60}$ oe
8(b)	$12(x+10) + 26x = 2.8x(x+10)$ or better	M2	FT their time, provided 2 algebraic fractions one in x and other in $\pm x \pm 10$ M1 for $12(x+10) + 26x$ seen or better
	$12x + 120 + 26x = 2.8x^2 + 28x$	M1	FT their equation dep on M2
	$2.8x^2 - 10x - 120 = 0$ oe or $30x + 300 + 65x = 7x^2 + 70x$ or better leading to $7x^2 - 25x - 300 = 0$	A1	with no errors or omissions
8(c)	$\frac{[-]25 \pm \sqrt{([-]25)^2 - 4 \times 7 \times -300}}{2 \times 7}$ oe	B2	B1 for $\sqrt{([-]25)^2 - 4(7)(-300)}$ or better or for $\frac{[-]25 + \sqrt{q}}{2 \times 7}$ or $\frac{[-]25 - \sqrt{q}}{2 \times 7}$
	-5 and 8.57 or 8.571...	B2	B1 for each or SC1 for final answers 5 and -8.57
8(d)	84 to 84.01...	2	FT $\frac{720}{\text{their positive answer}}$ to 3 sf or better M1 for $\frac{12}{\text{their positive answer}} [\times 60]$ oe
9(a)	54[.] or 53.99 to 54.03...	6	M2 for $[h =] 95.4 \times 3 \div (\pi \times 2.4^2)$ oe or M1 for $95.4 = \frac{1}{3} \times \pi \times 2.4^2 \times h$ M2 for [slant ht, $l =] \sqrt{(\text{their } h)^2 + 2.4^2}$ or M1 for $(\text{their } h)^2 + 2.4^2$ M1 for $\frac{x}{360} \times 2 \times \pi \times \text{their } l = 2 \times \pi \times 2.4$ oe or $\frac{x}{360} \times \pi \times (\text{their } l)^2 = \pi \times 2.4 \times \text{their } l$

Question	Answer	Marks	Partial Marks
9(b)	14500 or 14470 to 14480	4	<p>M3 for $200 \times 60 \times 24 \times \pi \times 4^2 [\div 1000]$ or $2 \times 60 \times 24 \times \pi \times 0.04^2 [\times 1000]$</p> <p>or M2 for $200 \times \pi \times 4^2$ or for $2 \times \pi \times 0.04^2$</p> <p>or M1 for $\pi \times 4^2$ oe or $\pi \times 0.04^2$ seen oe isw</p> <p>or $1000 \text{ cm}^3 = 1 \text{ litre}$ soi or $1 \text{ m}^3 = 1000 \text{ litres}$ soi</p> <p>or for 24×60 seen oe</p>
10(a)	$x^3 + 2x^2 - 5x - 6$ final answer	3	<p>B2 for correct expansion of three brackets unsimplified or for simplified expression of correct form with 3 out of 4 terms correct</p> <p>or B1 for correct expansion of 2 of the 3 given brackets with at least 3 terms out of four correct</p>
10(b)	$\frac{Mc}{M-2f}$ or $\frac{-Mc}{2f-M}$ final answer	4	<p>M1 for clearing $g - c$ from denominator e.g. $M(g - c) = 2fg$</p> <p>M1 for correctly isolating terms in g in numerator on one side</p> <p>M1 for correctly factorising or simplifying, to single term in g in an equation</p> <p>M1 for correctly dividing by bracket to final answer</p>
10(c)	$\frac{4x}{x+4}$ final answer	3	<p>B1 for $4x(x - 4)$</p> <p>B1 for $(x + 4)(x - 4)$</p>
11(a)(i)	$\frac{1}{6}$ oe on all late branches $\frac{5}{6}$ oe on all not late branches	2	<p>B1 for one correct vertical pair $\frac{1}{6}$ oe and $\frac{5}{6}$ oe</p>
11(a)(ii)	$\frac{5}{36}$ oe	2	<p>FT <i>their</i> tree</p> <p>M1 for <i>their</i> $\frac{1}{6} \times$ <i>their</i> $\frac{5}{6}$</p>
11(b)(i)	$(G \cup T \cup M)'$ oe	1	
11(b)(ii)	28	1	
11(b)(iii)	$\frac{17}{50}$ oe	1	

Question	Answer	Marks	Partial Marks
11(b)(iv)	$\frac{4}{7}$ oe	3	M2 for $\frac{16}{21} \times \frac{15}{20}$ or M1 for $\frac{n}{21} \times \frac{n-1}{20}$ or for $\frac{16}{21}$ and $\frac{15}{20}$ seen If 0 scored SC1 for answer $\frac{256}{441}$ oe
12(a)	85[.]0, 265[.]0 and no others	2	B1 for each If 0 scored SC1 for two values in the range with a difference of 180 but not multiples of 90
12(b)	correct shape and passes through origin 	3	B1 for any positive cubic shape B1 for sketch with one max and one min and with 3 roots including zero If 0 scored, SC1 for $x(x + 2)(x - 2)$ soi
12(c)	$a = -12$ $b = 5$ $k = -11$	6	B5 for 2 correct OR B2 for $3x^2 + a$ or B1 for $3x^2$ isw M1dep on at least B1 for their $\frac{dy}{dx} = 0$ M1dep on at least B1M1 for $x = 2$ or $x = -2$ substituted in their $\frac{dy}{dx} = 0$ equation M1 for $k = 2^3 + 2 \times \text{their } a + b$ and $10 - k = (-2)^3 + (-2) \times \text{their } a + b$



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MATHEMATICS

0580/22

Paper 2 (Extended)

May/June 2021

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π , use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 70.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages. Any blank pages are indicated.

- 1 The probability that Jane wins a game is $\frac{7}{10}$.

(a) Find the probability that Jane does not win the game.

..... [1]

(b) Jane plays this game 50 times.

Find the number of times she is expected to win the game.

..... [1]

- 2 Calculate $\sqrt[4]{0.0256}$.

..... [1]

- 3 Emma has 15 mathematics questions to complete.

The stem-and-leaf diagram shows the time, in minutes, it takes her to complete each question.

0	3	5	6	7	7	8	8
1	1	2	2	3	6	6	6
2	0						

Key: 2 | 0 = 20 minutes

Complete the table.

Mode min
Median min
Range min

[3]

- 4 Write down an expression for the range of k consecutive integers.

..... [1]

- 5 (a) Henrik draws this scatter diagram.



Put a ring around the **one** correct statement about this scatter diagram.

It shows no correlation.

It is not possible to tell if there is correlation as there are not enough points.

It shows negative correlation.

It shows positive correlation.

[1]

- (b) Each of the four scatter diagrams shows the same set of data.
A line has been drawn on each diagram.

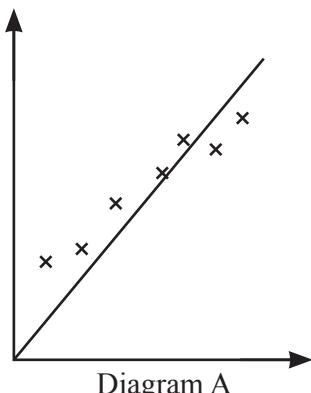


Diagram A

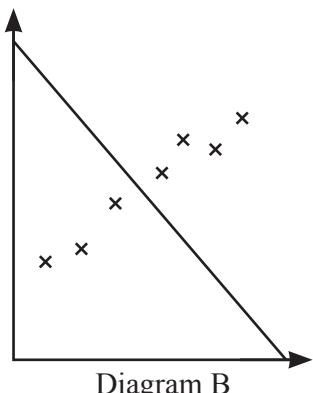


Diagram B

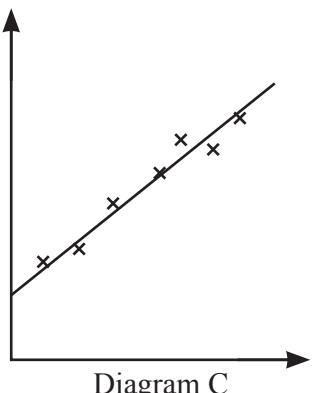


Diagram C

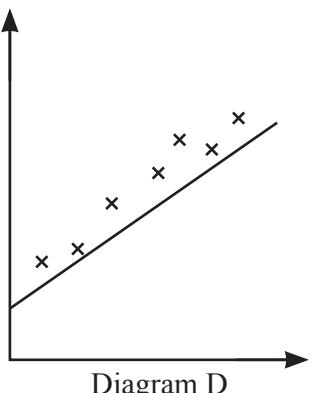


Diagram D

Complete the statement.

The line in Diagram is the most appropriate line of best fit.

[1]

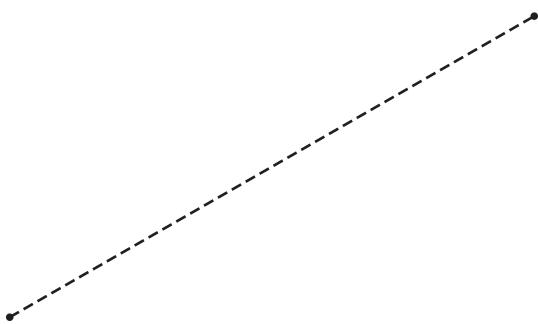
- 6 A rhombus has side length 6.5 cm.

The rhombus can be constructed by drawing two triangles.

Using a ruler and compasses only, construct the rhombus.

Leave in your construction arcs.

One diagonal of the rhombus has been drawn for you.



[2]

- 7 (a) Complete these statements.

The reciprocal of 0.2 is

A prime number between 90 and 100 is

[2]

(b)

- $\frac{7}{5}$ 0.6 $\sqrt{7}$ 8 $\sqrt{9}$

From this list, write down an irrational number.

..... [1]

8 $a = \frac{b^2}{5c}$

Find b when $a = 5.625$ and $c = 2$.

$b = \dots$ [2]

9 **Without using a calculator**, work out $\frac{2}{3} \div 1\frac{3}{7}$.

You must show all your working and give your answer as a fraction in its simplest form.

\dots [3]

10 (a) Write 0.00654 in standard form.

\dots [1]

(b) The number 1.467×10^{102} is written as an ordinary number.

Write down the number of zeros that follow the digit 7.

\dots [1]

- 11 Write $0.\dot{0}\dot{4}$ as a fraction in its simplest form.

..... [1]

- 12 (a) $\mathcal{E} = \{\text{integers greater than } 2\}$

$$A = \{\text{prime numbers}\}$$

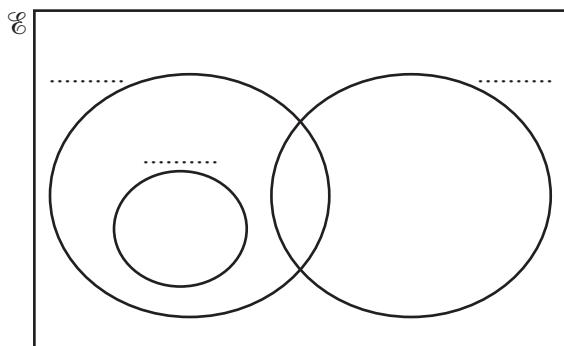
$$B = \{\text{odd numbers}\}$$

$$C = \{\text{square numbers}\}$$

- (i) Describe the type of numbers in the set $B' \cap C$.

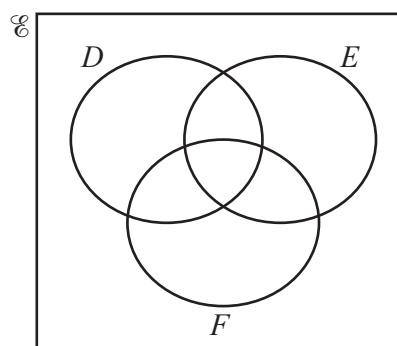
..... [1]

- (ii) Complete the set labels on the Venn diagram.



[1]

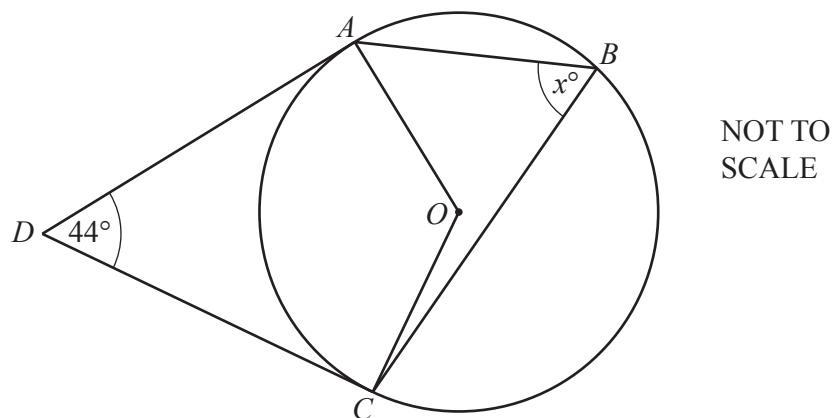
(b)



Shade the region $D' \cup (E \cap F)'$.

[1]

13



A , B and C are points on a circle, centre O .

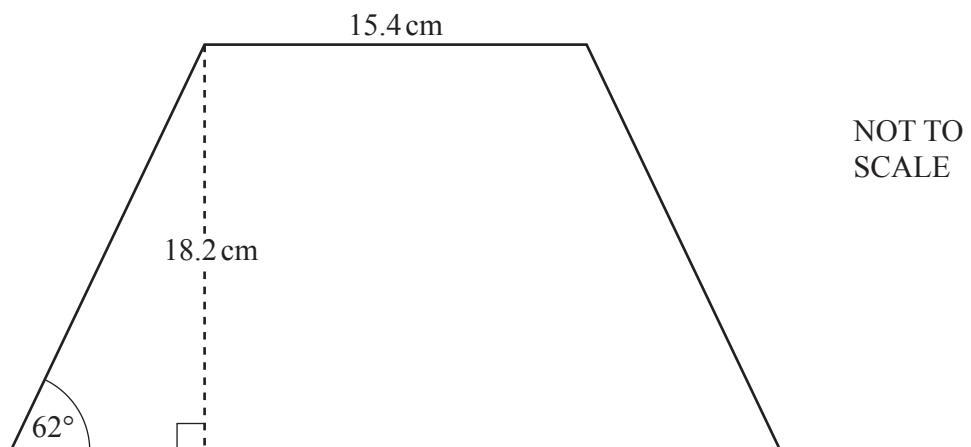
DA and DC are tangents.

Angle $ADC = 44^\circ$.

Work out the value of x .

$$x = \dots \quad [3]$$

14



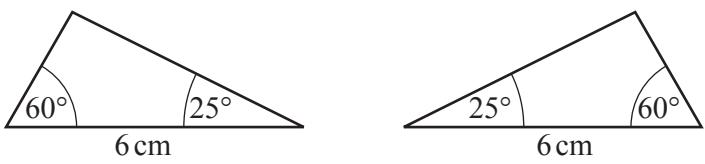
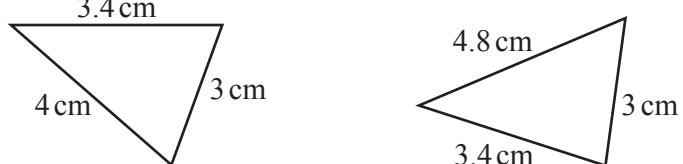
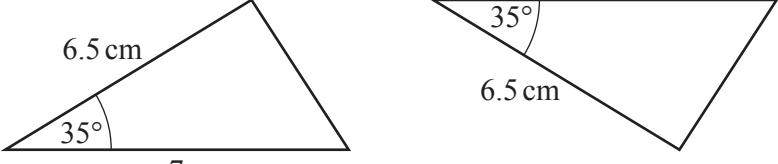
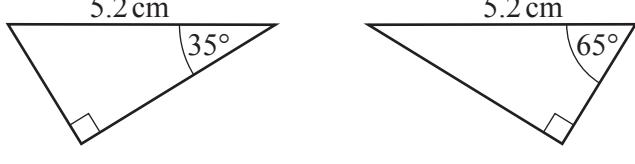
The diagram shows a trapezium.

The trapezium has one line of symmetry.

Work out the area of the trapezium.

..... cm^2 [4]

- 15 Complete the table showing information about the congruence of pairs of triangles.
 The first two rows have been completed for you.
 All diagrams are not to scale.

Pair of triangles	Congruent or not congruent	Congruence criterion
	Congruent	ASA
	Not congruent	None
		
		
		

[3]

16 A is the point $(5, 7)$ and B is the point $(9, -1)$.

(a) Find the length AB .

..... [3]

(b) Find the equation of the line AB .

..... [3]

17 Find the gradient of the line that is perpendicular to the line $3y = 4x - 5$.

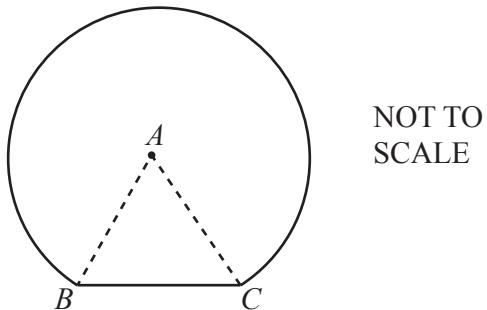
..... [2]

18 $f(x) = x^2 - 25$ $g(x) = x + 4$

Solve $fg(x+1) = gf(x)$.

$x = \dots$ [4]

19 (a)



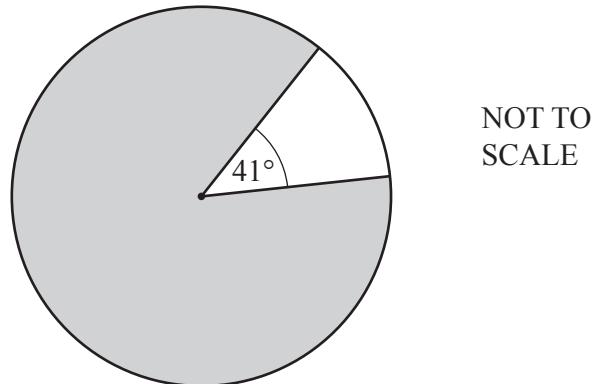
The diagram shows a shape made from an equilateral triangle ABC and a sector of a circle.
Points B and C lie on the circle, centre A .

The side length of the equilateral triangle is 12.4 cm.

Work out the perimeter of the shape.

..... cm [3]

(b)



The diagram shows two sectors of a circle.

The major sector is shaded.

The area of the major sector is 74.5 cm^2 .

Calculate the radius of the circle.

..... cm [3]

- 20 Expand and simplify.

$$(x-2)(2x+5)(x+3)$$

..... [3]

- 21 The force of attraction, F Newtons, between two magnets is inversely proportional to the square of the distance, d cm, between the magnets.

When $d = 1.5$, $F = 48$.

- (a) Find an expression for F in terms of d .

$F =$ [2]

- (b) When the distance between the two magnets is doubled the new force is n times the original force.

Work out the value of n .

$n =$ [1]

22 Simplify.

$$\frac{2x^2 - 5x - 12}{3x^2 - 12x}$$

..... [4]

23 Find all the solutions of $4 \sin x = 3$ for $0^\circ \leq x \leq 360^\circ$.

..... [2]

24 Solve.

$$\frac{1}{x+1} + \frac{9}{x+9} = 1$$

$$x = \dots \text{ or } x = \dots [5]$$

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MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2021

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π , use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages.

- 1 (a) A 2.5-litre tin of paint costs \$13.50 .
In a sale, the cost is reduced by 14%.

(i) Work out the sale price of this tin of paint.

\$ [2]

(ii) Work out the cost of buying 42.5 litres of paint at this sale price.

\$ [2]

- (b) Henri buys some paint in the ratio red paint : white paint : green paint = 2 : 8 : 5.

(i) Find the percentage of this paint that is white.

..... % [1]

(ii) Henri buys a total of 22.5 litres of paint.

Find the number of litres of green paint he buys.

..... litres [2]

- (c) Maria paints a rectangular wall.

The length of the wall is 20.5 m and the height is 2.4 m, both correct to 1 decimal place.

One litre of paint covers an area of exactly 10m^2 .

Calculate the smallest number of 2.5-litre tins of paint she will need to be sure all the wall is painted.

Show all your working.

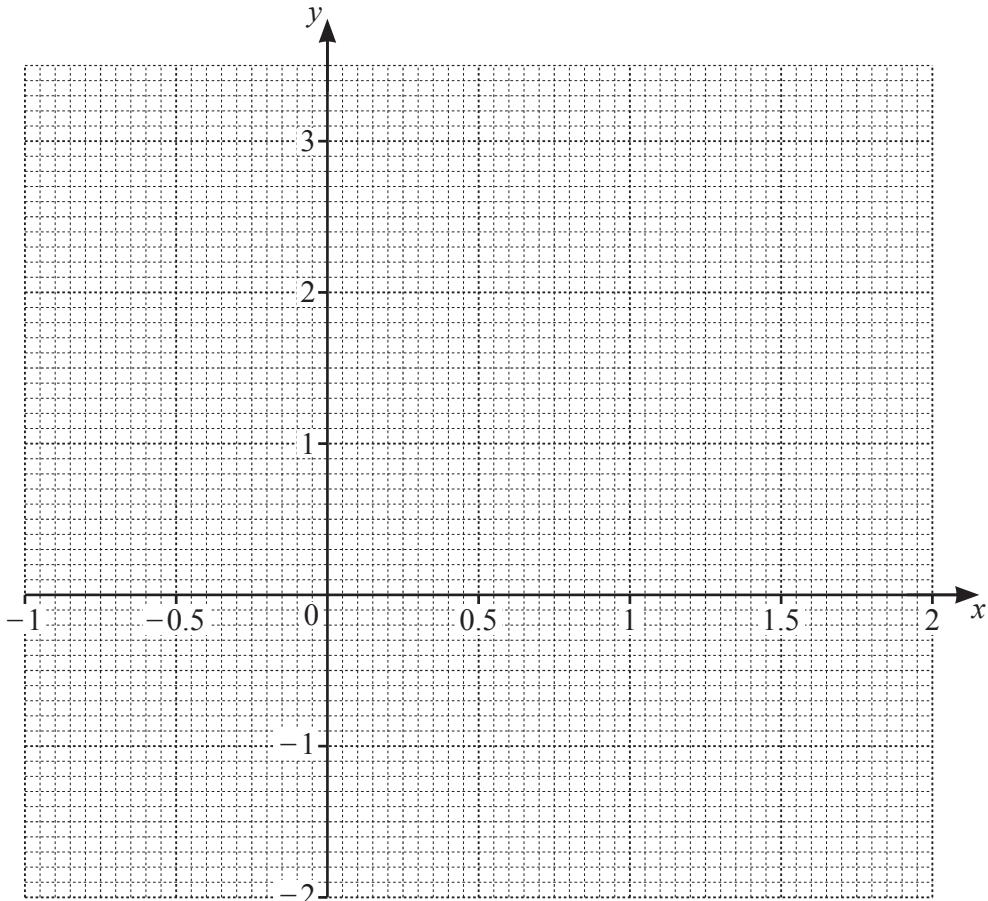
..... [4]

- 2 The table shows some values for $y = 2 \times 0.5^x - 1$.

x	-1	-0.5	0	0.5	1	1.5	2
y	3	1.83		0.41	0	-0.29	

(a) (i) Complete the table. [2]

(ii) On the grid, draw the graph of $y = 2 \times 0.5^x - 1$ for $-1 \leq x \leq 2$.



[4]

(b) By drawing a suitable straight line, solve the equation $2 \times 0.5^x + 2x - 3.5 = 0$ for $-1 \leq x \leq 2$.

$$x = \dots \quad [3]$$

(c) There are no solutions to the equation $2 \times 0.5^x - 1 = k$ where k is an integer.

Complete the following statements.

The highest possible value of k is

The equation of the asymptote to the graph of $y = 2 \times 0.5^x - 1$ is [2]

3 (a) Simplify, giving your answer as a single power of 7.

(i) $7^5 \times 7^6$

..... [1]

(ii) $7^{15} \div 7^5$

..... [1]

(iii) $42 + 7$

..... [1]

(b) Simplify.

$$(5x^2 \times 2xy^4)^3$$

..... [3]

(c) $P = 2^5 \times 3^3 \times 7$ $Q = 540$

(i) Find the highest common factor (HCF) of P and Q .

..... [2]

(ii) Find the lowest common multiple (LCM) of P and Q .

..... [2]

(iii) $P \times R$ is a cube number, where R is an integer.

Find the smallest possible value of R .

..... [2]

(d) Factorise the following completely.

(i) $x^2 - 3x - 28$

..... [2]

(ii) $7(a+2b)^2 + 4a(a+2b)$

..... [2]

(e) $3^{2x-1} = \frac{1}{9^x} \times 3^{2y-x}$

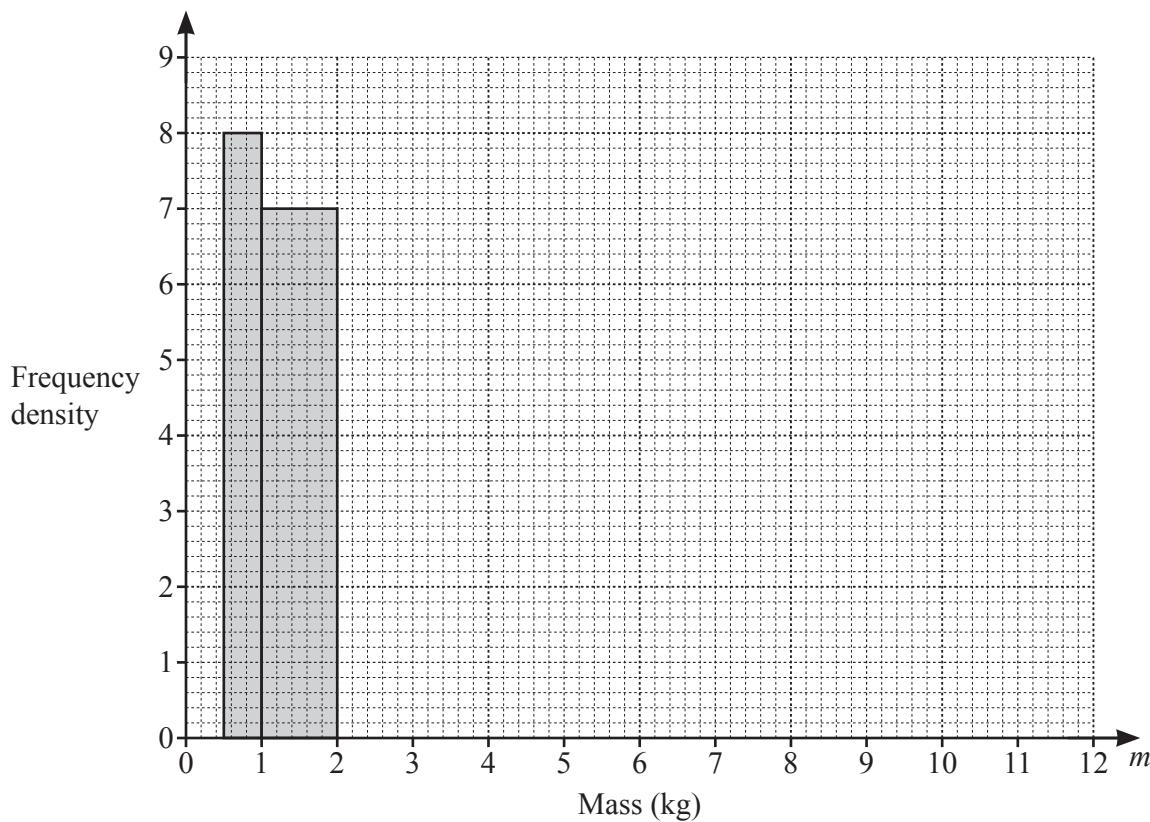
Find an expression for y in terms of x .

$y =$ [4]

- 4 (a) The mass, m kg, of each of 40 parcels in a warehouse is recorded.
 The table shows information about the masses of these parcels.

Mass (m kg)	$0.5 < m \leq 1$	$1 < m \leq 2$	$2 < m \leq 4$	$4 < m \leq 7$	$7 < m \leq 12$
Frequency	4	7	15	10	4

- (i) Complete the histogram to show this information.



[3]

- (ii) Calculate an estimate of the mean mass of the parcels.

..... kg [4]

- (iii) A parcel is picked at random from the 40 parcels.

Find the probability that this parcel has a mass of 2 kg or less.

..... [1]

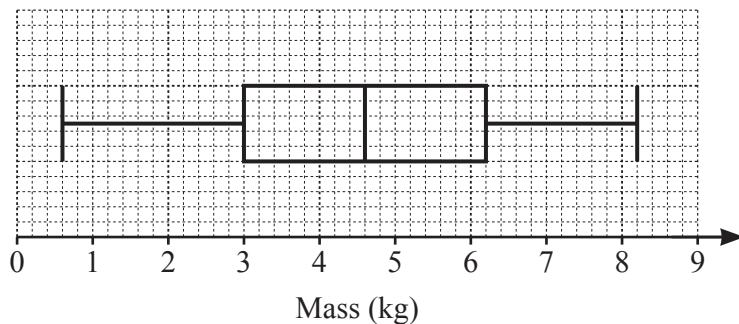
- (iv) Two parcels are picked at random without replacement from those with a mass **greater than 2kg**.

Work out the probability that one of them has a mass greater than 7kg and the other has a mass of 4kg or less.

..... [3]

- (b) A van delivers parcels from a different warehouse.

The box-and-whisker plot shows information about the masses of the parcels in the van.



- (i) Find the median.

..... kg [1]

- (ii) Find the interquartile range.

..... kg [1]

- (iii) Two parcels are removed from the van at the first delivery.
The masses of these parcels are 2.4kg and 5.8kg.

Describe the effect that removing these parcels has on the median mass of the remaining parcels.

Give a reason for your answer.

.....

[2]

5 (a) $\mathbf{a} = \begin{pmatrix} -3 \\ 8 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$

(i) Find

(a) $\mathbf{b} - \mathbf{a}$,

$$\left(\quad \quad \right) [1]$$

(b) $2\mathbf{a} + \mathbf{b}$,

$$\left(\quad \quad \right) [2]$$

(c) $|\mathbf{b}|$.

..... [2]

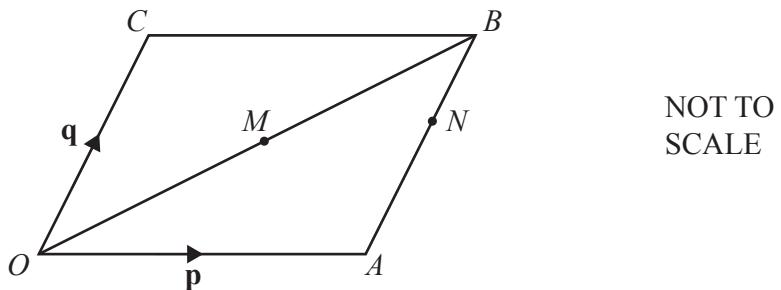
(ii) $\mathbf{a} + k\mathbf{b} = \begin{pmatrix} 13 \\ m \end{pmatrix}$, where k and m are integers.

Find the value of k and the value of m .

$k = \dots$

$m = \dots$ [3]

(b)



$OABC$ is a parallelogram and O is the origin.

M is the midpoint of OB .

N is the point on AB such that $AN : NB = 3 : 2$.

$\overrightarrow{OA} = \mathbf{p}$ and $\overrightarrow{OC} = \mathbf{q}$.

(i) Find, in terms of \mathbf{p} and \mathbf{q} , in its simplest form.

(a) \overrightarrow{OB}

$$\overrightarrow{OB} = \dots \quad [1]$$

(b) \overrightarrow{CM}

$$\overrightarrow{CM} = \dots \quad [2]$$

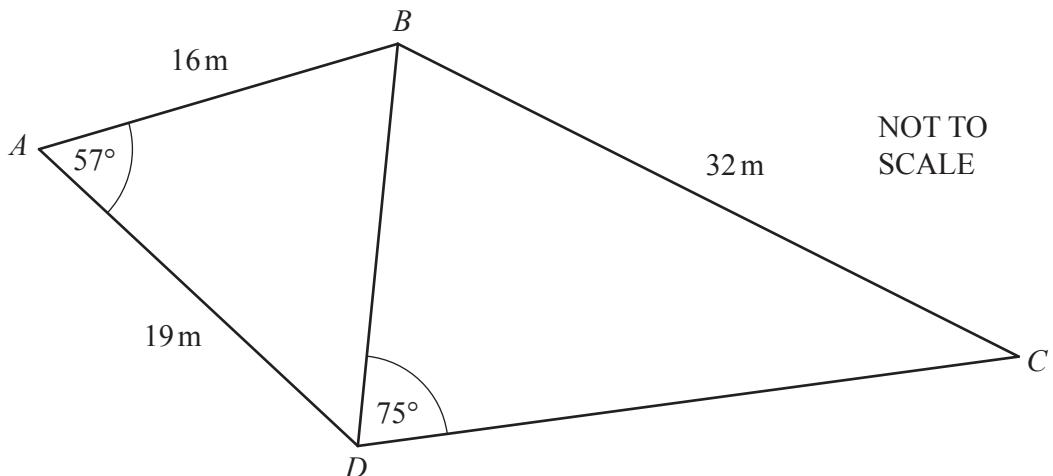
(c) \overrightarrow{MN}

$$\overrightarrow{MN} = \dots \quad [2]$$

(ii) CB and ON are extended to meet at D .

Find the position vector of D in terms of \mathbf{p} and \mathbf{q} .
Give your answer in its simplest form.

..... [3]



The diagram shows a quadrilateral $ABCD$ made from two triangles, ABD and BCD .

- (a) Show that $BD = 16.9$ m, correct to 1 decimal place.

[3]

- (b) Calculate angle CBD .

Angle CBD = [4]

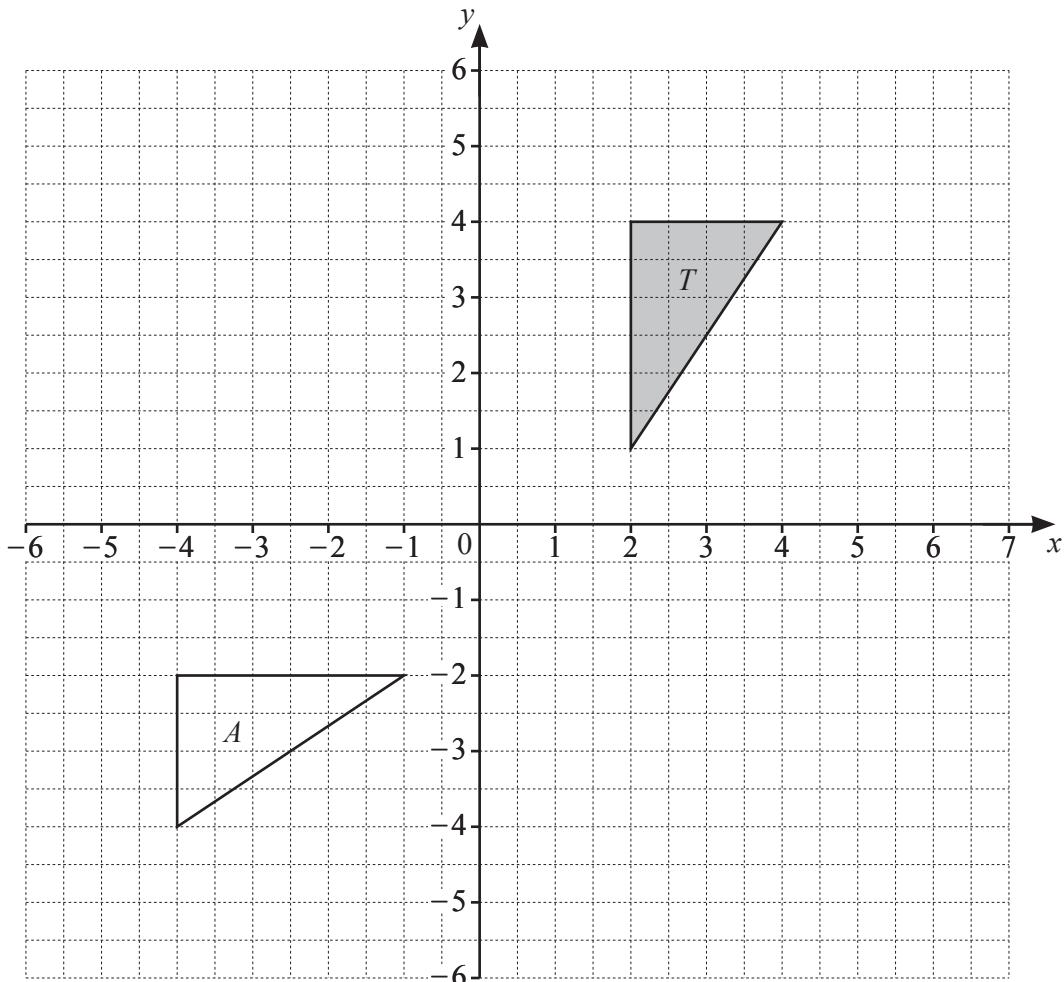
- (c) Find the area of the quadrilateral $ABCD$.

..... m^2 [3]

- (d) Find the shortest distance from B to AD .

..... m [3]

7



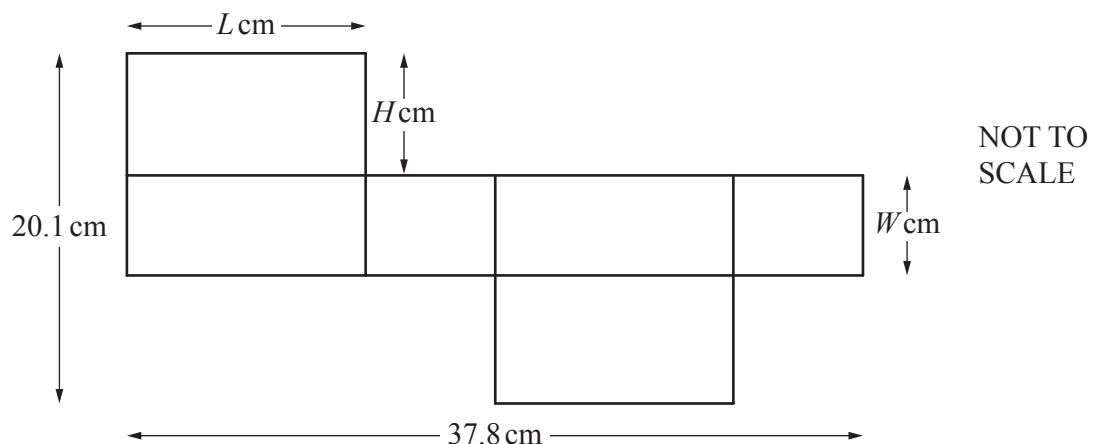
- (a) On the grid, draw the image of

- (i) triangle T after a translation by the vector $\begin{pmatrix} 2 \\ -1 \end{pmatrix}$, [2]
- (ii) triangle T after a rotation, 90° clockwise, about the origin, [2]
- (iii) triangle T after an enlargement, scale factor $-\frac{1}{2}$, centre $(-2, 3)$. [2]

- (b) Describe fully the **single** transformation that maps triangle T onto triangle A .

..... [2]

- 8 (a) A cuboid has length L cm, width W cm and height H cm.



The diagram shows the net of this cuboid.

The ratio $W:L = 1:2$.

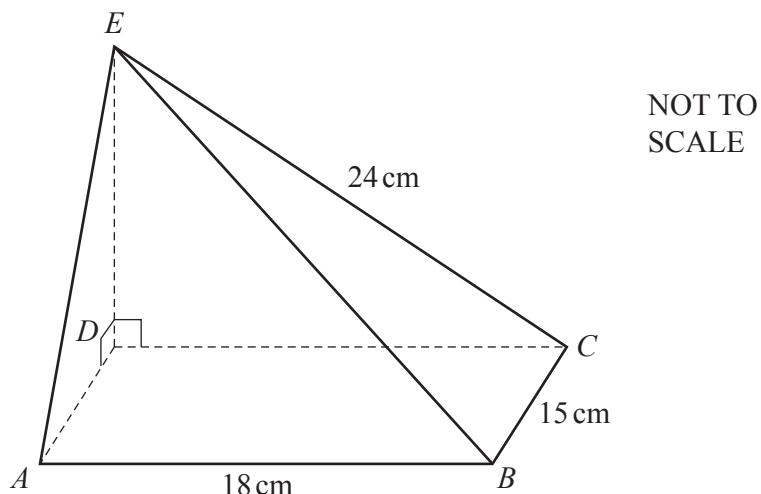
Find the value of L , the value of W and the value of H .

$$L = \dots$$

$$W = \dots$$

$$H = \dots [5]$$

(b)



The diagram shows a solid pyramid with a rectangular base $ABCD$.
 E is vertically above D .

Angle $EDC = \text{angle } EDA = 90^\circ$.
 $AB = 18 \text{ cm}$, $BC = 15 \text{ cm}$ and $EC = 24 \text{ cm}$.

- (i) The pyramid is made of wood and has a mass of 800 g.

Calculate the density of the wood.
 Give the units of your answer.

[The volume, V , of a pyramid is $V = \frac{1}{3} \times \text{area of base} \times \text{height}$.]
 [Density = mass \div volume]

..... [5]

- (ii) Calculate the angle between BE and the base of the pyramid.

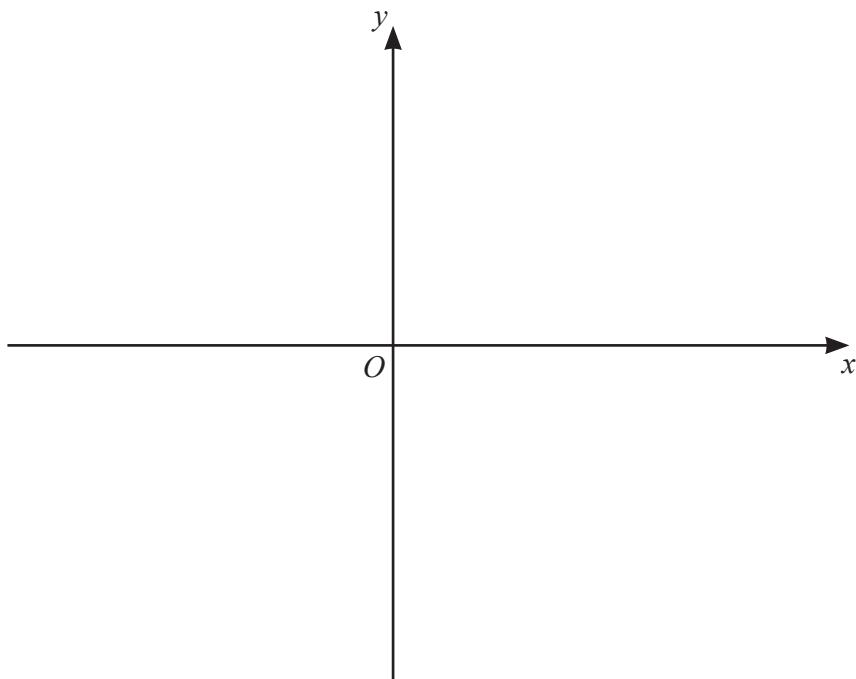
..... [4]
[Turn over]

- 9 (a) (i) The equation $y = x^3 - 4x^2 + 4x$ can be written as $y = x(x-a)^2$.

Find the value of a .

$$a = \dots \quad [2]$$

- (ii) On the axes, sketch the graph of $y = x^3 - 4x^2 + 4x$, indicating the values where the graph meets the axes.



[4]

- (b) Find the equation of the tangent to the graph of $y = x^3 - 4x^2 + 4x$ at $x = 4$.
Give your answer in the form $y = mx + c$.

$y = \dots$ [7]

Question 10 is printed on the next page.

- 10** The table shows four sequences A , B , C and D .

Sequence	1st term	2nd term	3rd term	4th term	5th term		n th term
A	1	8	27	64			
B	5	11	17	23			
C	0.25	0.5	1	2	4		
D	4.75	10.5	16	21			

Complete the table.

[9]

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Cambridge IGCSE™

MATHEMATICS

0580/22

Paper 2 (Extended)

May/June 2021

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of 7 printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

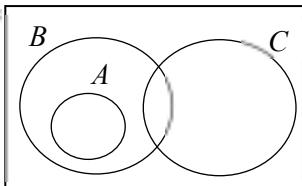
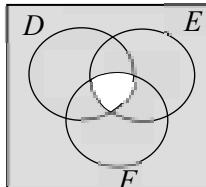
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Question	Answer	Marks	Partial Marks						
1(a)	$\frac{3}{10}$ oe	1							
1(b)	35	1							
2	0.4 or $\frac{2}{5}$	1							
3	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>Mode</td> <td>16</td> </tr> <tr> <td>Median</td> <td>11</td> </tr> <tr> <td>Range</td> <td>17</td> </tr> </table>	Mode	16	Median	11	Range	17	3	B1 for each
Mode	16								
Median	11								
Range	17								
4	$k - 1$	1							
5(a)	It is not possible to tell if there is correlation as there are not enough points.	1							
5(b)	C	1							
6	Accurate construction of rhombus with sides 6.5 cm and correct construction arcs.	2	B1 for accurate diagram with no/wrong arcs or for one triangle (6.5 cm, 6.5 cm, 8 cm) correctly constructed with correct arcs or for four correct arcs						
7(a)	$\frac{5}{97}$	2	B1 for each						
7(b)	$\sqrt{7}$	1							
8	$[\pm] 7.5$ oe	2	M1 for $5.625 = \frac{b^2}{2 \times 5}$ or better						
9	$\frac{2}{3} \times \frac{7}{10}$ or $\frac{14}{21} \div \frac{30}{21}$ oe with common denominator	M2	B1 for $\frac{10}{7}$ oe or M1 for $\frac{2}{3} \times \text{their } \frac{7}{10}$						
	$\frac{7}{15}$ cao		A1						
10(a)	6.54×10^{-3}	1							
10(b)	99	1							
11	$\frac{4}{99}$ cao	1							
12(a)(i)	Even square numbers oe	1							

Question	Answer	Marks	Partial Marks
12(a)(ii)		1	
12(b)		1	
13	68	3	M1 for correctly identifying 90° angle soi or $DAC / DCA = 68$ M1 for [obtuse angle] AOC identified as $2x$ soi or $x = \text{their } DAC / DCA$
14	456 or 456.4...	4	M2 for $\frac{18.2}{\tan 62}$ oe or M1 for $\tan 62 = \frac{18.2}{x}$ oe M1 for $\frac{1}{2}((\text{their trapezium base}) + 15.4) \times 18.2$ oe
15	Congruent SAS Congruent SSS Not congruent None	3	B1 for each correct row
16(a)	8.94 or 8.944...	3	M2 for $\sqrt{(9-5)^2 + (-1-7)^2}$ oe or M1 for $(9-5)^2 + (-1-7)^2$ oe
16(b)	$y = -2x + 17$ oe final answer	3	B2 for answer $-2x + 17$ OR M1 for $\frac{-1-7}{9-5}$ oe M1 for correct substitution of $(5, 7)$ or $(9, -1)$ into $y = \text{their } mx + c$ oe
17	$-\frac{3}{4}$ or -0.75	2	M1 for $y = \frac{4x-5}{3}$ or better or for $\frac{-1}{\text{their gradient}}$

Question	Answer	Marks	Partial Marks
18	$[x =] -2.1$ oe	4	M3 for $x^2 + 10x = x^2 - 21$ or better OR M1 for $(x + 1 + 4)^2 - 25$ or better M1 for $x^2 - 25 + 4$ or better If 0 scored SC1 for answer $-\frac{11}{6}$ oe
19(a)	77.3 or 77.32 to 77.33...	3	M2 for $\frac{360 - 60}{360} \times \pi \times 12.4 \times 2$ oe $[\pm n \times 12.4]$ or M1 for angle 60° or 300° soi or for $\frac{k}{360} \times \pi \times 12.4 \times 2$ oe $[\pm n \times 12.4]$
19(b)	5.17 or 5.172 to 5.173...	3	M2 for $\frac{74.5}{\pi} \times \frac{360}{360 - 41} = r^2$ oe or better or M1 for $74.5 = \frac{360 - 41}{360} \times \pi r^2$ oe or for $\sqrt{\frac{74.5}{\pi} \times \frac{360}{k}}$ oe
20	$2x^3 + 7x^2 - 7x - 30$ final answer	3	B2 for unsimplified expansion with at most one error or for simplified four-term expression of correct form with three terms correct or B1 for correct expansion of two brackets with at least three terms out of four correct
21(a)	$[F =] \frac{108}{d^2}$ final answer	2	M1 for $F = \frac{k}{d^2}$ oe or better
21(b)	$[n =] \frac{1}{4}$ or 0.25	1	
22	$\frac{2x+3}{3x}$ final answer	4	B2 for $(x - 4)(2x + 3)$ or B1 for $(x + a)(2x + b)$ where $ab = -12$ or $2a + b = -5$ or $x(2x + 3) - 4(2x + 3)$ or $2x(x - 4) + 3(x - 4)$ B1 for $3x(x - 4)$
23	48.6 or 48.59... and 131.4 or 131.4...	2	B1 for each If 0 scored SC1 for two answers with a sum of 180°

Question	Answer	Marks	Partial Marks
24	$x = 3, x = -3$ nfww	5	<p>M2 for $x + 9 + 9(x + 1) = (x + 1)(x + 9)$ oe or better or M1 for $x + 9 + 9(x + 1)$ or $(x + 1)(x + 9)$ oe or better</p> <p>B1 for $x^2 + x + 9x + 9$ seen</p> <p>M1 dep for $[0 =]x^2 - 9$ oe simplified or better</p>



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2021

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge International is publishing the mark schemes for the May/June 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **8** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

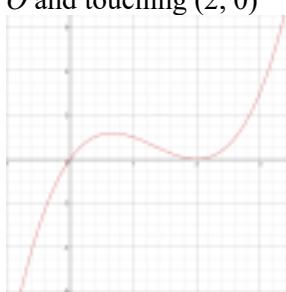
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	11.61 final answer	2	M1 for $13.5[0] \times \left(1 - \frac{14}{100}\right)$ oe or B1 for 1.89
1(a)(ii)	197.37 final answer	2	FT $17 \times$ their (a)(i) exact or correct to nearest cent M1 for $42.5 \div 2.5$
1(b)(i)	53.3 or 53.33...	1	
1(b)(ii)	7.5	2	M1 for $22.5 \div (2 + 8 + 5)$ oe soi
1(c)	20.55×2.45 oe	M2	M1 for $20.5 + 0.05$ oe seen or $2.4 + 0.05$ oe seen If 0 scored, SC1 here for 20.45×2.35 oe
	3 nfww	A2	M1 for their area $\div 10 \div 2.5$ oe
2(a)(i)	1, -0.5 oe	2	B1 for each
2(a)(ii)	Correct curve	4	B3FT for 6 or 7 correct plots or B2FT for 4 or 5 correct plots or B1FT for 2 or 3 correct plots
2(b)	$y = 2.5 - 2x$ ruled	B2	B1 for $y = k - 2x$ or $y = px + 2.5$ ruled ($p \neq 0$) or for $[y =]$ $2.5 - 2x$ oe identified
	1.3 to 1.4	B1	
2(c)	-1	B1	
	$y = -1$	B1	FT their k (must be negative)
3(a)(i)	7^{11} cao	1	
3(a)(ii)	7^{10} cao	1	
3(a)(iii)	7^2 cao	1	If answers 11, 10 and 2 in (a) then allow SC1 in this part
3(b)	$1000x^9y^{12}$ final answer	3	B2 for correct answer seen or answer of the form $1000x^9y^k$ or $1000x^ky^{12}$ or kx^9y^{12} or B1 for answer with one correct element in product or $(10x^3y^4)^{[3]}$ seen
3(c)(i)	108	2	M1 for $[540 =] 2^2 [\times] 3^3 [\times] 5$ or B1 for 108 oe not in prime factor form e.g. $2^2 \times 3 \times 9$

Question	Answer	Marks	Partial Marks
3(c)(ii)	30 240	2	M1 for $(540 \times 2^5 \times 3^3 \times 7) \div \text{their (c)(i)}$ oe or B1 for answer 30 240 oe not in prime factor form e.g. $2^5 \times 3^3 \times 35$
3(c)(iii)	98	2	B1 for 592 704 seen or $2^6 \times 3^3 \times 7^3$ seen or 2×7^2 oe seen
3(d)(i)	$(x - 7)(x + 4)$ final answer	2	M1 for $x(x - 7) + 4(x - 7)$ or $x(x + 4) - 7(x + 4)$ or better or for $(x + a)(x + b)$ where $ab = -28$ or $a + b = -3$
3(d)(ii)	$(a + 2b)(11a + 14b)$ final answer	2	M1 for $(a + 2b)(7(a + 2b) + 4a)$ or $(a + pb)(11a + qb)$ where $pq = 28$ or $11p + q = 36$ If 0 scored, SC1 for $a + 2b(11a + 14b)$
3(e)	$[y =] \frac{5x - 1}{2}$ oe final answer	4	B2 for $2x - 1 = -2x + 2y - x$ oe or B1 for $9^x = 3^{2x}$ or better M1dep for correct rearrangement of their 5 term ‘linear’ equation in y and x to make y the subject
4(a)(i)	Correct histogram	3	B1 for each correct block If 0 scored, SC1 for any two of fds 7.5, 3.33..., 0.8 oe soi
4(a)(ii)	3.7875 or 3.79 or 3.787 or 3.788	4	M1 for 0.75, 1.5, 3, 5.5, 9.5 soi M1 for Σfx M1 dep for their $\Sigma fx \div 40$
4(a)(iii)	$\frac{11}{40}$ oe	1	
4(a)(iv)	$\frac{30}{203}$ oe	3	M2 for $[2 \times] \frac{4}{29} \times \frac{15}{28}$ oe or M1 for $\frac{4}{29}$ or $\frac{15}{29}$ oe seen After 0 scored, SC1 for $[2 \times] \left(\frac{4}{40} \times \frac{26}{39} \right)$ oe or for answer $\frac{120}{841}$ oe
4(b)(i)	4.6	1	
4(b)(ii)	3.2	1	

Question	Answer	Marks	Partial Marks
4(b)(iii)	[median] remains the same oe and one is below [the median/middle] and one is above oe	2	B1 for each statement
5(a)(i)(a)	$\begin{pmatrix} 5 \\ -13 \end{pmatrix}$ final answer	1	
5(a)(i)(b)	$\begin{pmatrix} -4 \\ 11 \end{pmatrix}$ final answer	2	B1 for answer $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 11 \end{pmatrix}$ or $\begin{pmatrix} -6 \\ 16 \end{pmatrix}$ seen
5(a)(i)(c)	5.39 or 5.385...	2	M1 for $2^2 + (-5)^2$
5(a)(ii)	$[k =] 8$ $[m =] -32$	3	B2 for $k = 8$ or $m = -32$ or M1 for $-3 + 2k = 13$ oe or for $m = -5 \times$ their $k + 8$ correctly evaluated
5(b)(i)(a)	$\mathbf{p} + \mathbf{q}$ final answer	1	
5(b)(i)(b)	$\frac{1}{2}\mathbf{p} - \frac{1}{2}\mathbf{q}$ or $\frac{1}{2}(\mathbf{p} - \mathbf{q})$ or $\frac{\mathbf{p} - \mathbf{q}}{2}$ final answer	2	M1 for unsimplified answer or any correct vector route for \overrightarrow{CM} , e.g. $-\mathbf{q} + \frac{1}{2}$ their (b)(i)(a)
5(b)(i)(c)	$\frac{1}{2}\mathbf{p} + \frac{1}{10}\mathbf{q}$ or $\frac{5\mathbf{p} + \mathbf{q}}{10}$ final answer	2	M1 for unsimplified answer or any correct vector route for \overrightarrow{MN}
5(b)(ii)	$\frac{5}{3}\mathbf{p} + \mathbf{q}$ or $\frac{5\mathbf{p} + 3\mathbf{q}}{3}$ final answer	3	B2 for unsimplified correct answer OR M1 for $\mathbf{p} + \frac{3}{5}\mathbf{q}$ seen B1 for final answer of form $k\mathbf{p} + \mathbf{q}$ ($k > 1$) or final answer $\frac{5}{3}\mathbf{p} + j\mathbf{q}$ oe (any j)
6(a)	$\sqrt{16^2 + 19^2 - 2 \times 16 \times 19 \cos 57}$ oe	M2	or M1 for $16^2 + 19^2 - 2 \times 16 \times 19 \cos 57$ A1 for 285.8 to 285.9
	16.90 to 16.91	A1	

Question	Answer	Marks	Partial Marks
6(b)	74.3 or 74.30 to 74.33	4	M2 for $[\sin \dots =] \frac{16.9 \times \sin 75}{32}$ oe or M1 for $\frac{16.9}{\sin C} = \frac{32}{\sin 75}$ oe B1 for [angle $BCD =]$ 30.7 or 30.67 to 30.69... or M1dep for $105 - \text{their angle } BCD$
6(c)	388 or 387.7 to 387.9... nfww	3	M1 for $\frac{1}{2} \times 16 \times 19 \times \sin 57$ oe M1 for $\frac{1}{2} \times 16.9 \times 32 \times \sin \text{their (b)}$ oe
6(d)	13.4 or 13.41 to 13.42 nfww	3	M2 for $\frac{x}{16} = \sin 57$ oe or M1 for distance required is perpendicular to AD soi
7(a)(i)	Triangle at (4, 0) (4, 3) (6, 3)	2	B1 for translation by $\begin{pmatrix} 2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -1 \end{pmatrix}$ If 0 scored SC1 for triangle at (3, 0.5) (3, 3.5) (5, 3.5)
7(a)(ii)	Triangle at (1, -2) (4, -4) (4, -2)	2	B1 for rotation 90 clockwise wrong centre or for rotation 90 anticlockwise about the origin
7(a)(iii)	Triangle at (-4, 4) (-4, 2.5) (-5, 2.5)	2	B1 for enlargement SF $-\frac{1}{2}$ with wrong centre or for enlargement SF $\frac{1}{2}$ with centre (-2, 3)
7(b)	Reflection $y = -x$ oe	2	B1 for each
8(a)	$[L =] 11.8$ $[W =] 5.9$ $[H =] 7.1$	5	M1 for $L = 2W$ oe soi M1 for $W + 2H = 20.1$ oe M1 for $2L + 2H = 37.8$ oe B1 for at least one correct answer
8(b)(i)	0.559 to 0.56[0...]	B4	M2 for $\frac{1}{3} \times 18 \times 15 \times \sqrt{24^2 - 18^2}$ isw conversion or M1 for $h^2 + 18^2 = 24^2$ oe or better M1 for $\text{figs } 800 \div \text{figs their volume}$ isw
	g/cm ³ or g cm ⁻³ final answer	B1	

Question	Answer	Marks	Partial Marks
8(b)(ii)	34.1 or 34.11 to 34.12	4	M3 for $\tan [] = \frac{\sqrt{24^2 - 18^2}}{\sqrt{18^2 + 15^2}}$ oe or M2 for $\sqrt{18^2 + 15^2}$ isw or $\sqrt{24^2 + 15^2}$ isw or M1 for $18^2 + 15^2$ isw or $24^2 + 15^2$ isw or M1 for indicating required angle is EBD
9(a)(i)	2	2	M1 for $x(x^2 - 4x + 4)$ or $x(x - 2)^2$ or $(x^2 - 2x)(x - 2)$ or $x^3 - 2ax^2 + a^2x$
9(a)(ii)	Correct sketch with curve passing through O and touching $(2, 0)$ 	4	B1 for any positive cubic B1 for sketch through or touching O B1 for sketch with min or max touching x-axis once only but not at $(0, 0)$ B1FT their (a)(i) for sketch with min or max touching x-axis at (their 2, 0) and their 2 is labelled or clearly indicated
9(b)	$y = 20x - 64$ final answer nfww	7	B6 for equivalent correct equation OR B2 for $3x^2 - 8x + 4$ isw or B1 for $3x^2$ or $-8x$ seen M2dep for [grad =] 20 soi nfww or M1dep for substituting 4 into their derivative isw B1 for $(4, 16)$ soi M1dep for $16 = \text{their } 20 \times 4 + c$ oe
10	125 n^3 oe final ans	B2	B1 for 125 B1 for n^3
	29 $6n - 1$ oe final ans	B3	B1 for 29 B2 for $6n - 1$ oe or B1 for $6n + k$ or $an - 1$ ($a \neq 0$)
	2^{n-3} oe final ans	B2	B1 for $2^{n-[+k]}$ oe
	25 $6n - 1 - 2^{n-3}$ oe final ans OR 25.25 $-\frac{1}{24}n^3 + \frac{1}{8}n^2 + \frac{17}{3}n - 1$ oe final ans	B2	FT their 29 – 4 and their $6n - 1 - \text{their } 2^{n-3}$ B1FT for each OR B1 for each



Cambridge IGCSE™

MATHEMATICS

0580/22

Paper 22 (Extended)

March 2021

MARK SCHEME

Maximum Mark: 70

Published

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This document consists of 7 printed pages.

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GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
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- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

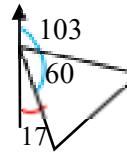
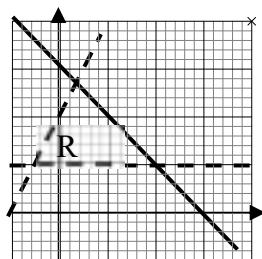
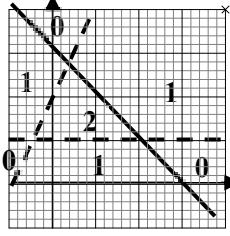
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks						
1(a)	2	1							
1(b)	2 correct lines	2	B1 for each						
2	30 48	2	M1 for $\frac{78}{5+8} \times k$ oe where $k = 1, 5$ or 8						
3(a)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>1</td> <td>5 7 8 9 9</td> </tr> <tr> <td>2</td> <td>2 4 4 5 9</td> </tr> <tr> <td>3</td> <td>1 5 6 8</td> </tr> </table>	1	5 7 8 9 9	2	2 4 4 5 9	3	1 5 6 8	2	B1 for two rows correct or for a fully correct unordered stem-and-leaf diagram or for a correct diagram with one leaf incorrect or omitted
1	5 7 8 9 9								
2	2 4 4 5 9								
3	1 5 6 8								
3(b)	24	1							
4	3, 80, 30 and 10 seen and answer 12	2	M1 for 3 out of 4 correct elements or for all correct but with any trailing zeros If 0 scored SC1 for answer 12						
5	Negative	1							
6	271.2[0]	2	M1 for $56.50 \div 5$ or 56.50×24 oe or better						
7	$\frac{9}{4}$ and $\frac{11}{3}$ oe improper fractions	M1							
	$\frac{99}{12}$ oe improper fraction	A1							
	$8\frac{1}{4}$ cao final answer	A1	dep on 1 st A1 If M0 scored SC1 for $\frac{9}{4}$ or $\frac{11}{3}$ oe improper fraction						
8	$\frac{37}{99}$ oe fraction	1							
9	4.18×10^7 cao	1							

Question	Answer	Marks	Partial Marks
10	343	2	B1 for 103 in correct position and 60 or 17 in correct position 
11	12	2	M1 for $2^2 \times 3^2$ and $2^2 \times 3 \times 7$ or for $2 \times 2 \times 3$ final answer or B1 for 2, 3, 4 or 6 as final answer
12	34.6 or 34.63 to 34.64	3	M2 for $\frac{1}{4} \times \pi \times 5^2 + \frac{1}{2} \times 5 \times 6$ oe or M1 for $\frac{1}{4} \times \pi \times 5^2$ oe or $\frac{1}{2} \times 5 \times 6$ oe
13	15.8 or 15.76 to 15.77	2	M1 for $125.9 \times \left(1 - \frac{34}{100}\right)^5$ oe
14(a)	1 – 6	2	B1 for each If 0 scored, SC1 for two terms with a difference of –7
14(b)	$n^2 + 3$ oe	2	M1 for any quadratic or second differences = 2
15	36	2	M1 for angle $EHG = 72$ or for angle $EHF = 47$ and $GHF = 25$
16	3 correct ruled lines and R clearly indicated 	5	B1 for each line $y = 1$ dashed $y = 2x + 2$ dashed $x + y = 3$ solid B2 for correct region or B1 for region satisfying 2 inequalities  or SC1 for shading of the wanted region only

Question	Answer	Marks	Partial Marks
17	13 nfww	3	M2 for $251 + 7x = 7.6(32 + x)$ or better or M1 for $\frac{5 \times 4 + 6 \times 5 + 7x + 8 \times 11 + 9 \times 7 + 10 \times 5}{32 + x} = 7.6$ oe
18	$49x^6$ final answer	2	B1 for $49x^k$ or nx^6 as final answer
19	$x^2 + x - 156 [=0]$ or $y^2 + 15y - 100 [=0]$	M2	M1 for $x^2 + x = 7 + 149$ or correct substitution
	$(x-12)(x+13) [=0]$ or $(y-5)(y+20) [=0]$	M1	or for correct factors for <i>their</i> quadratic equation or for correct use of quadratic formula or completing the square for <i>their</i> equation
	$[x =] 12 [y =] 5$ $[x =] -13 [y =] -20$	B2	B1 for $x = 12, x = -13$ or for $y = 5, y = -20$ or for a correct pair of x and y values If B0 scored and at least 2 method marks scored SC1 for correct substitution of both of <i>their</i> x values or <i>their</i> y values into $x - y = 7$ or $x^2 + y = 149$
20(a)	1.84	2	M1 for $\frac{1.61}{x} = \frac{2.8}{3.2}$ oe
20(b)	9.20 or 9.204 to 9.205	3	M2 for $11.5 \times \sqrt[3]{\frac{4}{7.8}}$ oe or M1 for $\sqrt[3]{\frac{4}{7.8}}$ or $\sqrt[3]{\frac{7.8}{4}}$ oe seen or for $\frac{11.5^3}{x^3} = \frac{7.8}{4}$ oe
21(a)	Correct sketch	2	B1 for one correct branch or attempt at correct shape
21(b)	Correct sketch	2	B1 for correct shape but crossing x -axis or correct shape but just in one quadrant

Question	Answer	Marks	Partial Marks
22(a)	245	1	
22(b)	69 cao nfww	3	M2 for $\frac{200+0.5}{3-0.1}$ oe or M1 for 200 ± 0.5 oe or 3 ± 0.1 oe seen
23	56.1 or 56.09...	4	$\mathbf{M3} \text{ for } \cos[\dots] = \frac{\frac{1}{2}\sqrt{10^2 + 12^2}}{14} \text{ oe}$ or M2 for $[MC =] \frac{1}{2}\sqrt{10^2 + 12^2}$ oe or M1 for $[AC^2 =] 10^2 + 12^2$ oe or B1 for indicating required angle
24	$(0, 5)$ $\left(\frac{4}{3}, \frac{103}{27}\right)$ oe	5	B2 for $3x^2 - 4x$ or B1 for $3x^2$ or $-4x$ M1 for <i>their</i> derivative = 0 oe or $\frac{dy}{dx} = 0$ B1 for $[x =] 0$ and $\frac{4}{3}$ or for 1 correct coordinate pair



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

March 2021

MARK SCHEME

Maximum Mark: 130

Published

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- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	245	1	
1(b)	8	2	M1 for $40 + 26.5x = 252$ oe or B1 for 212 seen
1(c)	6	2	M1 for $(224 - 2 \times 48) \div 32$ oe or $2 \times 48 + 32(x - 2) = 224$ soi
1(d)	35 : 36 : 32 final answer	2	B1 for <i>their</i> (a) : 252 : 224 or equivalent ratio
2(a)(i)	rotation 90 anticlockwise oe $(-3, 2)$	3	B1 for each
2(a)(ii)	enlargement $-\frac{1}{2}$ $(-2, -1)$	3	B1 for each
2(b)	Image at $(-3, -5)$ $(1, -5)$ $(1, 3)$	2	B1 for translation by $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -10 \end{pmatrix}$
2(c)	Image at $(2, 3)$ $(6, 3)$ $(6, -5)$	2	B1 for reflection in $y = k$ or $x = 4$
3(a)	126 54 117	3	B1 for each
3(b)	angle [in a] semicircle is 90	B1	Do not accept triangle for angle
	Allied, co-interior [add to 180] or Angles in triangle [= 180] and alternate oe	B1	
	32	B1	
3(c)	109	2	B1 for 218 or 71 in correct places or correctly labelled

Question	Answer	Marks	Partial Marks
4(a)	462	1	
4(b)(i)	$\frac{7}{15}$ oe	1	
4(b)(ii)	$\begin{aligned} & \frac{7}{15} \times \frac{6}{14} + \frac{6}{15} \times \frac{5}{14} + \frac{2}{15} \times \frac{1}{14} \\ &= \frac{37}{105} \end{aligned}$	3	M2 for addition of two of $\frac{7}{15} \times \frac{6}{14} + \frac{6}{15} \times \frac{5}{14} + \frac{2}{15} \times \frac{1}{14}$ or M1 for one of the products seen
4(b)(iii)	$\frac{29}{65}$ oe	4	M3 for $\frac{7}{15} \times \frac{6}{14} \times \frac{5}{13} + 3 \times \frac{7}{15} \times \frac{6}{14} \times \frac{6}{13} + 3 \times \frac{7}{15} \times \frac{6}{14} \times \frac{2}{13}$ oe or $1 - 3 \left(\frac{8}{15} \times \frac{7}{14} \times \frac{7}{13} \right) - \left(\frac{8}{15} \times \frac{7}{14} \times \frac{6}{13} \right)$ oe or M2 for the sum of at least two of $\frac{7}{15} \times \frac{6}{14} \times \frac{5}{13}$, $N \times \frac{7}{15} \times \frac{6}{14} \times \frac{6}{13}$, $N \times \frac{7}{15} \times \frac{6}{14} \times \frac{2}{13}$ seen or for $\frac{7}{15} \times \frac{6}{14} \times \frac{13}{13}$ or $\frac{7}{15} \times \frac{6}{14} + N \times \frac{7}{15} \times \frac{6}{14} \times \frac{k}{13}$ seen or M1 for $\frac{7}{15} \times \frac{6}{14} \times \frac{5}{13}$ or $N \times \frac{7}{15} \times \frac{6}{14} \times \frac{6}{13}$ or $N \times \frac{7}{15} \times \frac{6}{14} \times \frac{2}{13}$ seen If 0 scored SC1 for $\frac{1519}{3375}$ oe
5(a)	27[.0] or 26.97... nfww	3	M2 for $[\cos =] \frac{8.6^2 + 9.7^2 - 4.4^2}{2 \times 8.6 \times 9.7}$ or M1 for implicit form
5(b)	9.19 or 9.192 to 9.193	4	B1 for [angle $BCD =]$ 73 seen M2 for $\frac{9.7 \times \sin 65}{\sin (180 - 65 - 42)}$ oe or M1 for $\frac{\sin(180 - 65 - 42)}{9.7} = \frac{\sin 65}{DC}$ oe

Question	Answer	Marks	Partial Marks
5(c)	6.15 or 6.149 to 6.151...	3	M2 for $\frac{d}{\text{their } 9.19} = \sin 42$ oe or M1 for right angle between line from C to BD and BD soi
6(a)(i)	$[a =] 4$ $[b =] -3$ nfww	2	B1 for $[a =] 4$ B1 for $[b =] -3$ nfww
6(a)(ii)	$y = 4$ oe	1	
6(a)(iii)	$y = -6x + 7$ oe final answer	2	B1 for answer $-6x + 7$ or answers $y = -6x + c$ or $y = kx + 7$ ($k < 0$)
6(b)(i)	2.25 2.67 3.5	3	B1 for each
6(b)(ii)	correct curve	4	B3 FT for 7 or 8 points or B2 FT for 5 or 6 points or B1 FT for 3 or 4 points
6(c)(i)	-0.78 to -0.72 and 0.55 to 0.59	2	B1 for each
6(c)(ii)	$3x^3 - 9x^2 - 3x + 4 [= 0]$ final answer	4	B3FT for 3 out of 4 correct terms or for $bx^3 - 3bx^2 + (a - 1)x + 8 - 3a [= 0]$ oe or B2FT for 2 out of 4 correct terms or for 3 out of 4 terms from $bx^3 - 3bx^2 + (a - 1)x + 8 - 3a [= 0]$ or M1 for $1 + \frac{5}{3-x} = \text{their } 4 + (\text{their } (-3))x^2$ oe
7(a)(i)	70	1	
7(a)(ii)	78	1	
7(a)(iii)	Value in range $86 < V \leq 90$	1	

Question	Answer	Marks	Partial Marks
7(a)(iv)	One <u>general</u> comment <u>interpreting</u> the median comparison nfw e.g. Students did better on second test oe OR One <u>general</u> comment <u>interpreting</u> IQR/range comparison nfw e.g. Students marks were more consistent on the 2nd test oe	1	
7(b)	31.2	4	M1 for mid-values soi M1 for Σfm where m is any value in interval including boundaries M1 (dep on second M1) for <i>their</i> $\Sigma fm \div 50$
7(c)(i)	38	1	
7(c)(ii)	Blocks of heights 4.4 and 3.4 with correct widths	2	B1 for each correct block If B0 scored, SC1 for both correct frequency densities soi

Question	Answer	Marks	Partial Marks
8(a)(i)	$\frac{53}{360} \times \pi \times 9.5^2$	M1	
	41.74 to 41.75	A1	
8(a)(ii)	5.9[0] or 5.899 to 5.903..	4	<p>M3 for $[OA^2 =] \frac{\frac{1}{3} \times 41.7}{\frac{1}{2} \sin 53}$ oe</p> <p>M2 for $\frac{1}{2} \times OA^2 \times \sin 53 = \frac{1}{3} \times 41.7$ oe</p> <p>M1 for $\frac{1}{2} \times OA \times OB \times \sin 53 = \frac{1}{3} \times 41.7$ seen or better</p>
8(b)	396 or 397 or 396.4 to 396.6	6	<p>M2 for $[r =] \left(\frac{60}{360} \times 2 \times \pi \times 24 \right) \div 2\pi$ oe or better</p> <p>or M1 for $2\pi r = \frac{60}{360} \times 2 \times \pi \times 24$ oe</p> <p>M2 for $\sqrt{24^2 - a^2}$</p> <p>or M1 for $h^2 + a^2 = 24^2$</p> <p>M1 for $\frac{1}{3}\pi \times \text{their } r^2 \times \text{their } h$</p>
9(a)(i)	$(5a - b)(m + 2p)$ final answer	2	<p>M1 for $5a(m + 2p) - b(m + 2p)$</p> <p>or $m(5a - b) + 2p(5a - b)$</p> <p>or B1 for correct answer seen</p>
9(a)(ii)	$5(k + g)(3k + 3g - 4)$ final answer	2	<p>M1 for correct partial factorisation by 5 or $(k + g)$ isw</p> <p>eg $5(3k^2 + 6kg + 3g^2 - 4k - 4g)$</p> <p>or $5(3(k + g)^2 - 4(k + g))$ or $(k + g)(15(k + g) - 20)$</p> <p>or $(5k + 5g)(3k + 3g - 4)$</p> <p>or B1 for correct answer seen</p>
9(a)(iii)	$(2x - y^2)(2x + y^2)$ final answer	2	<p>M1 for answer in form $(a + b)(a - b)$</p> <p>or B1 for correct answer seen</p>
9(b)	$3x^3 - 10x^2 - x + 12$ final answer	3	<p>B2 for correct unsimplified expansion</p> <p>or simplified expression with 3 terms correct in a 4-term expression of required form</p> <p>or B1 for correct expansion of two of the brackets with at least 3 terms correct</p>
9(c)	$[a =] 11$ $[b =] 121$	2	B1 for each

Question	Answer	Marks	Partial Marks
10(a)	1600	3	B2 for answer figs 16 or M2 for $90.72 \div (\text{figs}45 \times \text{figs}3 \times \text{figs}42)$ or M1 for volume = figs 45 × figs 3 × figs 42 isw
10(b)	62.8 or 62.83 to 62.84	3	M2 for $\frac{\pi \times 10^2 \times 30}{15000} \times 100$ or M1 for $\pi \times 10^2 \times 30$
10(c)	12.9[0]	3	B2 for 86 OR M2 for $\frac{98.9}{1 + \frac{15}{100}} \times 0.15 \text{ oe}$ or $98.9 - \frac{98.9}{1 + \frac{15}{100}}$ oe or M1 for $\left(1 + \frac{15}{100}\right)a = 98.9$ oe isw
10(d)	50	2	M1 for $3540 \div 70.8$
11(a)	$\frac{48}{x}$ final answer	1	Accept $48 \div x$
11(b)	$\text{their}(a) - \frac{60}{x+2} = 4$ oe	M1	FT <i>their</i> (a) provided expression in x
	$48(x+2) - 60x = 4x(x+2)$ oe	M2	FT <i>their</i> 3 term eqn with algebraic denominators, x and $x+2$, for M2 or M1 M1 for common denominator $x(x+2)$ oe seen or any two terms in a 3 term equation from $\pm 48(x+2)$, $\pm 60x$, $\pm 4x(x+2)$ oe seen
	$48x + 96 - 60x = 4x^2 + 8x$ oe leading to $x^2 + 5x - 24 = 0$	A1	With brackets expanded and no errors or omissions seen
11(c)	$(x-3)(x+8)$	B2	B1 for $x(x+8) - 3(x+8)$ or $x(x-3) + 8(x-3)$ or $(x+a)(x+b) [= 0]$ where $ab = -24$ or $a+b = 5$ [a, b integers]
	3 and -8	B1	
11(d)	12	1	
12(a)	17	3	M2 for $3 \times 2x^2 - 7$ or better isw or M1 for $3 \times 2x^2$ oe or $kx^2 - 7$ seen

Question	Answer	Marks	Partial Marks
12(b)(i)	13.4 or 13.41 to 13.42	3	M2 for $\sqrt{(-5-7)^2 + (8-2)^2}$ oe or M1 for $(-5-7)^2 + (8-2)^2$ oe
12(b)(ii)	$[y =] 2x + 5$ final answer	4	M1 for [gradient of $AB = \frac{8-2}{-5-7}$] oe M1dep for gradient $p = -1 \div \text{their } -\frac{1}{2}$ oe M1dep on previous M1 for substituting $(-1, 3)$ into $y = \text{their } px + c$ oe where $\text{their } p \neq 0$
12(b)(iii)	$(5, 0)$	4	B3 for $\overrightarrow{AD} = \begin{pmatrix} -2 \\ -2 \end{pmatrix}$ or $\overrightarrow{DA} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$ or coordinates of $C (-7, 6)$ and $[\overrightarrow{CD}] = \begin{pmatrix} 12 \\ -6 \end{pmatrix}$ oe seen or B2 for $a = b = 2$ soi or coordinates of $C (-7, 6)$ or M1 for $a = b$ oe soi or for $a^2 + b^2 = (\sqrt{8})^2$ oe or $\cos 45^\circ = \frac{a}{\sqrt{8}}$ oe or for $[\overrightarrow{DC}] = \begin{pmatrix} -12 \\ 6 \end{pmatrix}$ or $[\overrightarrow{CD}] = \begin{pmatrix} 12 \\ -6 \end{pmatrix}$ seen or $\frac{y-8}{x-5} = 1$ oe or $\frac{y-2}{x-7} = 1$



Cambridge IGCSE™

MATHEMATICS

0580/22

Paper 2 (Extended)

October/November 2020

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge International is publishing the mark schemes for the October/November 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **6** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	200 017	1	
2	$7 - (5 - 3) + 4$	1	
3	1.2 or $1\frac{1}{5}$ or $\frac{6}{5}$	2	M1 for $6 = 2x + 3x$ or better
4	$[x =] 60$ $[y =] 80$	3	B1 for $[x =] 60$ B2 for $[y =] 80$ or B1 for 40 in a correct place on diagram If 0 scored SC1 for <i>their x + their y = 140</i>
5	48.72	2	M1 for $\frac{16}{100} \times 42$ oe or better
6	$4(1 - 2x)$	1	
7	9	2	M1 for $\frac{1}{2} \times 6 \times h = 27$ oe
8	171	2	M1 for $180 - (360 \div 40)$ oe or $\frac{(40 - 2) \times 180}{40}$ oe
9	$[x =] 3$ $[y =] 1$	2	B1 for each
10	$\frac{5}{6} \times \frac{3}{4}$ or $\frac{5}{6} \div \frac{8}{6}$ oe $\frac{5}{8}$ cao	M2	M1 for $\frac{4}{3}$ seen or for $\frac{5}{6} \times \text{their } \frac{3}{4}$ or for $\frac{5}{6} \div \frac{\text{their } 8}{6}$ A1 dep on M2
11	$10x^7$ final answer	2	B1 for kx^7 or $10x^k$ final answer or for correct answer then spoilt
12	15	2	M1 for 4 [parts] = 20 soi or a correct equation e.g. $\frac{x+20}{7} = \frac{x}{3}$ oe
13	60	3	M2 for $12 \times \sqrt{13^2 - 12^2}$ or M1 for $13^2 - 12^2$ or for $12 \times \text{their } 5$ from Pythagoras or trig
14	2.03×10^{201}	2	B1 for figs 203 or [0].03 $\times 10^{201}$ or 200×10^{199}

Question	Answer	Marks	Partial Marks
15	29.5 or 29.45 to 29.46	2	M1 for $\frac{60}{360} \times \pi \times 7.5^2$ oe
16	25	2	M1 for $x \times \left(1 + \frac{6}{100}\right) = 26.50$ oe or better
17(a)	0.1 or $\frac{1}{10}$	1	
17(b)	90	3	M2 for $\frac{1}{2} \times 10 \times 2 + 10 \times 2 + \frac{1}{2}(2+4) \times 20$ oe or M1 for one area calculation or indicated on diagram
18	27.15 cao	3	M2 for $(9.4 + 0.05) \times 2 + 8.2 + 0.05$ or better or M1 for $8.2 + 0.05$ or $9.4 + 0.05$ or better seen OR SC2 for answer 25.95 or SC1 for answer 26.85
19(a)	61.1 or 61.08 to 61.09...	3	M2 for $[\sin x =] \frac{8 \sin 100}{9}$ oe or better or M1 for $\frac{9}{\sin 100} = \frac{8}{\sin x}$ oe
19(b)	11.7 or 11.66 to 11.67	3	M2 for $\frac{1}{2} \times 9 \times 8 \times \sin(180 - 100 - \text{their (a)})$ oe or M1 for $180 - 100 - \text{their (a)}$
20	60	3	M2 for $4 \times \sqrt[3]{\frac{40500}{12}}$ oe or M1 for $\left(\frac{4}{l}\right)^3 = \frac{12}{40500}$ oe or $\sqrt[3]{\frac{40500}{12}}$ oe or $\sqrt[3]{\frac{12}{40500}}$ oe
21(a)	$4 - 2x$	2	B1 for 4 or $-2x$
21(b)	(2, 10)	2	B1 for x -coordinate of 2 or M1 for $4 - 2x = 0$
22(a)	$-\mathbf{a} + \mathbf{b}$	1	

Question	Answer	Marks	Partial Marks
22(b)	$2\mathbf{a} - \frac{1}{2}\mathbf{b}$	3	B2 for answer $2\mathbf{a} + p\mathbf{b}$ or $q\mathbf{a} - \frac{1}{2}\mathbf{b}$ $q \neq \frac{1}{2}$ or correct unsimplified answer in terms of \mathbf{a} and \mathbf{b} M1 for $\overrightarrow{AC} = \frac{3}{2}\mathbf{a}$ or $\overrightarrow{OC} = \frac{5}{2}\mathbf{a}$ or correct route If 0 scored SC1 for answer $\mathbf{a} + \frac{1}{2}\mathbf{b}$
23	$\frac{3}{x+1}$ final answer	3	B1 for $2(x+1) - (2x-1)$ oe B1 for common denominator $x + 1$
24	(2.4, 1.8) oe	5	M1 for [gradient =] $-1 \div \frac{1}{3}$ oe M1 for substituting (2, 3) into $y = (\text{their } m)x + c$ oe M1 for $\frac{1}{3}x + 1 = \text{their}(mx + c)$ with $\text{their } m \neq \frac{1}{3}$ M1 for substituting <i>their</i> x -coord into either equation to find y or for substituting <i>their</i> y -coord into either equation to find x
25	63.4 or 63.43... 243.4 or 243.4...	2	B1 for each If 0 scored SC1 for two answers with a difference of 180
26	$\frac{x-2}{u+1}$ oe final answer	4	B2 for $(x-2)(u-1)$ or B1 for $u(x-2) - (x-2)$ or $x(u-1) - 2(u-1)$ B1 for $(u-1)(u+1)$



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

October/November 2020

MARK SCHEME

Maximum Mark: 130

Published

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oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	9080 cao	3	B2 for 9078 to 9081... or M1 for $813 \times \text{their } 11\text{h } 10\text{min}$
1(b)(i)	654 or 653.5...	2	M1 for $10260 \div 15 \text{ h } 42 \text{ min oe}$
1(b)(ii)(a)	21.8 or 21.82 to 21.83	1	
1(b)(ii)(b)	4.58 or 4.59 cao	2	M1 for $470 \div (10260 \div 100) \text{ oe}$ or $100 \div \text{their (b)(ii)(a)}$
1(c)	12.97	1	
2(a)	Translation $\begin{pmatrix} 1 \\ -6 \end{pmatrix}$	2	B1 for each
2(b)(i)	Image at $(0, 1), (-3, 1), (-3, 2)$	2	B1 for reflection in $x = k$ or $y = 1$
2(b)(ii)	Image at $(5, -4), (5, -1), (4, -1)$	2	B1 for rotation 90° anticlockwise with other centre or for rotation 90° clockwise about $(6, 0)$
2(b)(iii)	Image at $(-1, -2), (-7, -2), (-7, -4)$	2	B1 for enlargement, factor -2 with other centre
3(a)(i)	2210 or 2208 or 2208.2, or 2208.16...	2	M1 for $2000 \times \left(1 + \frac{2}{100}\right)^5 \text{ oe}$
3(a)(ii)	10.4 or 10.5 or 10.40 to 10.41	2	M1 for $\frac{\text{their (a)(i)} - 2000}{2000} [\times 100]$ or $\frac{\text{their (a)(i)}}{2000} \times 100$ or $\left(1 + \frac{2}{100}\right)^5 - 1$ or $\left(1 + \frac{2}{100}\right)^5 \times 100 \text{ oe}$
3(a)(iii)	12	3	B2 for 11.3 or 11.26 to 11.27 OR M2 for $[2000 \times] \left(1 + \frac{2}{100}\right)^{11} \text{ oe}$ or $[2000 \times] \left(1 + \frac{2}{100}\right)^{12} \text{ oe seen}$ or M1 for $[2000 \times] \left(1 + \frac{2}{100}\right)^n \text{ oe}, n > 5 \text{ oe}$ or for $2000 \times \left(1 + \frac{2}{100}\right)^n = \text{or} > \text{or} \geq 2500 \text{ oe}$

Question	Answer	Marks	Partial Marks
3(b)	490 cao	3	M2 for $p \times \left(1 - \frac{4}{100}\right)^{16} = 255$ oe soi by 490.0... or M1 for $p \times \left(1 - \frac{4}{100}\right)^n = 255$ oe, $n > 1$ oe
4(a)(i)	25	1	
4(a)(ii)	10 nfww	2	B1 for [$lq =$] 22 or [$uq =$] 32
4(a)(iii)	27	1	
4(a)(iv)	6	2	B1 for 114 written
4(b)(i)	27.9 or 27.91 to 27.92 nfww	4	M1 for mid-values M1 for $\sum fx$ where x lies within or on boundary of correct interval M1 dep $\sum fx \div 120$ dep on second M1
4(b)(ii)	7.6	2	M1 for $\frac{18}{10}$ oe or $\frac{38}{20}$ oe or B1 for [multiplier] 4 or $\frac{1}{4}$
5(a)	1.48	3	B2 for $7x + 2 = 12.36$ or better or M1 for $3x + 2(2x + 1) [= 12.36]$ or better
5(b)	1.75 or $1\frac{3}{4}$	3	B2 for $18x - 14x = 7$ or better or M1 for $18x = 7(2x + 1)$
5(c)	[0].8 oe	3	B2 for $4(2x + 1) = 13x$ or M1 for $\frac{4}{x} = \frac{13}{2x+1}$ oe or correct equation to find number of cakes

Question	Answer	Marks	Partial Marks
5(d)	$\frac{20}{x} + \frac{10}{2x+1} = 45$ oe	M2	B1 for $\frac{20}{x}$ seen or $\frac{10}{2x+1}$ seen
	$90x^2 - 5x - 20 [= 0]$ oe	B2	B1 for $\frac{20(2x+1)+10x}{x(2x+1)} = 45$ or better
	$(9x+4)(2x-1) [= 0]$ or for $\frac{-1 \pm \sqrt{(-1)^2 - 4(18)(-4)}}{2(18)}$ oe	M2	FT their 3-term quadratic M1 for factors that give two correct terms when expanded or for correct discriminant or correct $\frac{-b}{2a}$ provided quadratic formula is in correct form
	[0].5 or $\frac{1}{2}$ final answer	B1	
6(a)(i)	$\frac{1}{3}$ oe	1	
6(a)(ii)	0	1	
6(a)(iii)	$\frac{1}{6}$ oe	1	
6(b)(i)	$\frac{1}{15}$ oe	2	M1 for $\frac{2}{6} \times \frac{1}{5}$ or equivalent method
6(b)(ii)	$\frac{4}{15}$ oe	3	M2 for $\frac{2}{6} \times \frac{1}{5} + \frac{3}{6} \times \frac{2}{5}$ or equivalent method or M1 for $\frac{2}{6} \times \frac{1}{5}$ oe seen or $\frac{3}{6} \times \frac{2}{5}$ oe seen
6(c)	$\frac{7}{18}$ oe	3	M2 for $\left(\frac{1}{6}\right)^2 + \left(\frac{2}{6}\right)^2 + \left(\frac{3}{6}\right)^2$ oe or M1 for one correct product seen or sample space with 14 correct pairs identified
7(a)	2, 4.5	2	B1 for each
7(b)	Correct graph	4	B3 FT for 6 or 7 correct points FT their table or B2 FT for 4 or 5 correct points FT their table or B1 FT for 2 or 3 correct points FT their table

Question	Answer	Marks	Partial Marks
7(c)(i)	-0.5 to -0.4	1	
7(c)(ii)	$y = 1 - x$ ruled and -1.9 to -1.75	2	M1 for $[y =] 1 - x$ or $\left[x^2 + \frac{1}{x} = \right] 1 - x$ soi or B1 for -1.9 to -1.75
7(d)	Any integer ≥ 2	1	
8(a)	$[v =] 40$ $[w =] 80$ $[x =] 40$ $[y =] 100$ $[z =] 60$	5	B1 for each FT angle z as $140 - \text{their } w$
8(b)	24	3	M2 for $360 - 11x = 2 \times 2x$ oe or M1 for $360 - 11x$ seen or obtuse angle $KOL = 2 \times 2x$ oe
8(c)(i)	angle $ADX = \text{angle } BCX$ oe same segment oe	M2	Accept in any order M1 for one correct pair with reason
	angle $DAX = \text{angle } CBX$ oe same segment oe		If 0 scored, SC1 for two correct pairs of equal angles identified with incorrect/no reasons
8(c)(ii)(a)	angle $AXD = BXC$ oe [vertically] opposite oe	A1	
	corresponding angles are equal oe		
	8.75 or $8\frac{3}{4}$		M1 for $\frac{8}{10} = \frac{7}{DX}$ oe
8(c)(ii)(b)	81.8 or 81.78 to 81.79	4	M2 for $[\cos[BXC] =] \frac{5^2 + 7^2 - 8^2}{2 \times 5 \times 7}$ oe or M1 for $8^2 = 5^2 + 7^2 - 2 \times 5 \times 7 \times \cos(\dots)$ oe A1 for $\frac{10}{70}$ oe

Question	Answer	Marks	Partial Marks
9(a)	315 or 314.5 to 315.0	6	<p>M1 for $\tan 70 = \frac{\text{height}}{\frac{1}{2}(8-5)}$ oe or better seen</p> <p>M1dep for $\frac{1}{2}(8+5) \times \text{their height}$ or better seen dep on trig attempt for height</p> <p>M2 for $12 \times \frac{\frac{1}{2}(8-5)}{\cos 70}$ oe or better seen</p> <p>or M1 for $\frac{\frac{1}{2}(8-5)}{\cos 70}$ oe or better seen</p> <p>M1 for 8×12 oe isw and 5×12 oe isw</p>
9(b)(i)	$8 - \frac{1}{2}(8-5)$ or $5 + \frac{1}{2}(8-5)$	1	M1
9(b)(ii)	13.6 or 13.64 to 13.65	2	M1 for $12^2 + (6.5)^2$ oe
9(b)(iii)	16.8 or 16.9 or 16.79 to 16.91... nfww	2	M1 for identifying angle GAX from a diagram or from working or better
10(a)(i)	10	1	
10(a)(ii)	-19	1	FT 1 – 2 <i>their (a)(i)</i>
10(b)	$\frac{1-x}{2}$ oe final answer	2	M1 for $x = 1 - 2y$ or $y + 2x = 1$ or $\frac{y}{2} = \frac{1}{2} - x$ or $y - 1 = -2x$ or better
10(c)	$\frac{1}{2}$ oe	1	
10(d)	$4x^2 - 8x + 2$ final answer	4	<p>M1 for $(1 - 2x)(1 - 2x) - (1 - 2(1 - 2x))$ or better</p> <p>B1 for $1 - 2x - 2x + 4x^2$</p> <p>B1 for $-(1 - 2 + 4x)$ or better or $[+] 1 - 4x$ or for correct answer seen then spoiled</p>
10(e)	x final answer	1	
10(f)	3125	1	
10(g)	25	1	
10(h)	-2	2	B1 for $\frac{1}{25}$ or 0.04
11(a)	A : -3 $17 - 4n$ oe	3	<p>B1 for -3</p> <p>B2 for $17 - 4n$ oe</p> <p>or B1 for $k - 4n$ oe or $17 - pn$ oe, $p \neq 0$</p>

Question	Answer	Marks	Partial Marks
	B : 124 $n^3 - 1$ oe	3	B1 for 124 B2 for $n^3 - 1$ oe or B1 for any cubic
	C : $\frac{11}{128}$ $\frac{n+6}{2^{n+2}}$ oe	4	B1 for $\frac{11}{128}$ B3 for $\frac{n+6}{2^{n+2}}$ oe or B2 for 2^{n+2} oe seen or B1 for 2^k oe or $n + 6$ seen
11(b)	$\frac{p+1}{2q}$ oe	2	B1 for $p + 1$ or $2q$ oe



Cambridge IGCSE™

MATHEMATICS

0580/22

Paper 2 (Extended)

May/June 2020

MARK SCHEME

Maximum Mark: 70

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

This document consists of **6** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

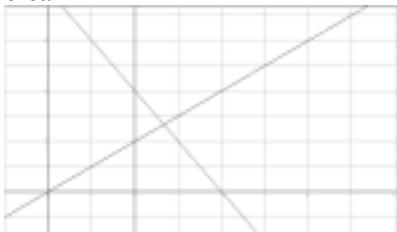
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer		Marks	Partial Marks
1	2		1	
2	-5		1	
3	25		2	B1 for 130 seen or M1 for $50 \div 2$
4(a)	Any square number greater than 10		1	
4(b)	Any irrational number		1	
5	-2		2	M1 for $(-3)(-2) + (-8)$
6	45		2	M1 for $\frac{11+7}{2} \times 5$ oe
7	Intersection shaded		1	
8	0.0625		1	
9	285		2	M1 for $180 + 105$ or 75 or 105 seen in correct position at <i>B</i>
10	$\frac{2p^2}{t}$		2	B1 for correct unsimplified answer
11	$\frac{7}{4}$	$\frac{9}{12}$	B1	
	$\frac{21}{12}$	$1 - \frac{2}{12}$	M1	
	$\frac{5}{6}$	$\frac{5}{6}$	A1	
12	8		2	M1 for $\frac{5-4.60}{5} [\times 100]$ or $\frac{4.60}{5} \times 100$
13	$2t^4$		2	B1 for $2t^n$ or kt^4 ($n,k \neq 0$)

Question	Answer	Marks	Partial Marks
14	-14	2	M1 for $1 - x = 3 \times 5$ or better or $\frac{x}{3} = 5 - \frac{1}{3}$ or better
15	177.5	1	
16	2.7×10^{-8}	1	
17	108	3	M1 for $(105 + 225) \div 11$ M1 for <i>their</i> speed $\times \frac{60 \times 60}{1000}$
18	Enlargement [scale factor] $-\frac{1}{2}$ [centre] (3, 4)	3	B1 for each
19	$[\pm] \sqrt{\frac{h^2 - x^2}{2}}$	3	M1 for correct rearrangement for y or y^2 term M1 for correct square root M1 for correct division by 2 or $\sqrt{2}$
20(a)	49	1	
20(b)	98	1	FT $2 \times \text{their (a)}$
20(c)	20	1	
20(d)	70	1	FT $90 - \text{their (c)}$
21(a)	$125x^{12}$	2	B1 for $125x^k$ or kx^{12}
21(b)	$8x^{96}$	2	B1 for $8x^k$ or kx^{96}
22	16	3	M1 for $p = k(q+2)^2$ M1 for $p = (\text{their } k)(10+2)^2$ OR M2 for $\frac{p}{(10+2)^2} = \frac{1}{(1+2)^2}$ oe
23(a)	Correct lines and correct region clear 	5	B2 for $2x + y = 8$ correctly ruled or B1 for ruled line with negative gradient B1 for $y = x$ correctly ruled B1 for $x = 2$ correctly ruled
23(b)	6	1	

Question	Answer	Marks	Partial Marks
24	25.6 or 25.59 to 25.60...	4	M3 for $\frac{6.4}{2 \times \pi \times 8} \times \pi \times 8^2$ or M2 for $\frac{x}{360} = \frac{6.4}{2 \times \pi \times 8}$ oe or M1 for $\frac{x}{360} \times 2 \times \pi \times 8 = 6.4$ oe
25	$\frac{2x-5}{a-2b}$ final answer	5	B2 for $(2x-5)(x+3)$ or B1 for $(2x+p)(x+q)$ where $pq = -15$ or $p + 2q = 1$ B2 for $(x+3)(a-2b)$ or B1 for $x(a-2b) + 3(a-2b)$ or $a(x+3) - 2b(x+3)$
26	4	2	M1 for $y^{\frac{2}{3}} = x^{\frac{1}{6}}$ or $y^2 = \sqrt{x}$ or $y^4 = x$
27	64.9 or 64.89 to 64.90	6	B5 for $[\cos =] \frac{100 + 72 - 100}{2 \times 10 \times \sqrt{72}}$ OR M1 for $8^2 + 6^2$ M1 for $6^2 + 6^2$ M2 for $\frac{(theirAF)^2 + (theirAH)^2 - (theirHF)^2}{2 \times (theirAF) \times (theirAH)}$ or M1 for $(theirHF)^2 = (theirAF)^2 + (their AH)^2$ $- 2 \times (theirAF) \times (their AH) \cos(HAF)$ AF, AH etc from correct method



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2020

MARK SCHEME

Maximum Mark: 130

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

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This document consists of **8** printed pages.

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GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

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Maths-Specific Marking Principles	
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3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
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5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

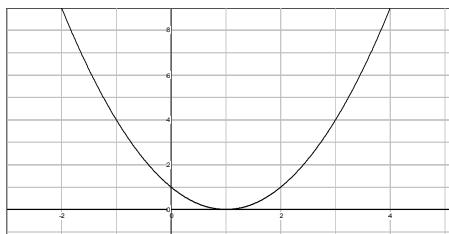
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	14, 10	2	M1 for $24 \div (7 + 5)$
1(a)(ii)	$\frac{3}{350}$	2	B1 for correct fraction not in lowest terms
1(a)(iii)	120	1	
1(b)(i)	10.2[0]	2	M1 for $\frac{15}{100} \times 12$ oe or better
1(b)(ii)	45	2	M1 for $\frac{38.25}{1 - \frac{15}{100}}$ oe
1(c)(i)	85	2	M1 for $\frac{500 \times 1.7 \times 10}{100}$ oe
1(c)(ii)	203 or 202.5 to 202.6	2	M1 for $200 \times \left(1 + \frac{0.0035}{100}\right)^{365}$
1(c)(iii)	1.9	3	M2 for $\sqrt[6]{\frac{559.78}{500}}$ or M1 for $500 \left(1 + \frac{r}{100}\right)^6 = 559.78$
2(a)(i)	$\begin{pmatrix} 6 \\ 17 \end{pmatrix}$	2	B1 for each
2(a)(ii)	6.4[0] or 6.403...	2	M1 for $4^2 + 5^2$
2(b)	(1, 2)	1	
2(c)	(0, -2)	1	

Question	Answer	Marks	Partial Marks
2(d)	$\frac{1}{2}\mathbf{c} + \frac{1}{3}\mathbf{d}$	3	B2 for correct unsimplified answer or M1 for $\overrightarrow{CT} = -\mathbf{c} + \frac{2}{3}\mathbf{d}$ oe or $\overrightarrow{TC} = \mathbf{c} - \frac{2}{3}\mathbf{d}$ oe or for correct route
3(a)	41.4	4	M1 for 10, 30, 42.5, 47.5, 55, 70 M1 for $\sum fx$ where x lies in or on the boundary of each interval. M1 dep for $\frac{\sum fx}{200}$ dep on second M1
3(b)(i)	112, 170	1	
3(b)(ii)	Correct diagram	3	B1 for correct horizontal plot B1FT for correct vertical plots B1 FT dep on at least B1 earned for reasonable increasing curve or polygon through their 6 points If 0 scored SC1FT for 5 out of 6 points plotted correctly
3(b)(iii)(a)	48	1	
3(b)(iii)(b)	160	2	M1 for 40 seen
3(c)	$\frac{87}{3980}$ oe	2	M1 for $\frac{30}{200} \times \frac{29}{199}$ oe
3(d)	Correct histogram	3	B1 for each column If 0 scored SC1 for correct frequency densities soi 1.25, 12, 1
4(a)	65.4 or 65.36 to 65.37	3	M1 for $150^2 + 120^2 - 2 \times 150 \times 120 \cos 25$ A1 for 4270 or 4272 to 4273
4(b)	125 or 124.7 to 124.8	4	B1 for [angle S =] 80 M2 for $\frac{150 \sin 55}{\sin \text{their } 80}$ or M1 for $\frac{\sin \text{their } 80}{150} = \frac{\sin 55}{RS}$ oe
4(c)	10 400 or 10 410 to 10 440 nfww	3	M1 for $\frac{1}{2} \times 120 \times 150 \sin 25$ oe M1 for $\frac{1}{2} \times 150 \times \text{their (b)} \sin 45$ oe

Question	Answer	Marks	Partial Marks
5(a)	[0]38 or [0]37.9 or [0]37.87...	2	M1 for $\tan = \frac{350}{450}$ oe If 0 scored, SC1 for answer [0]52 or [0]52.1 or [0]52.12 to [0]52.13
5(b)	624 or 623.8 to 623.9	6	M2 for $450 - 400 \sin 50$ or M1 for $\sin 50 = \frac{\dots}{400}$ M2 for $350 + 400 \cos 50$ or M1 for $\cos 50 = \frac{\dots}{400}$ M1 for $(\text{their } (450 - 400 \sin 50))^2 + (\text{their } (350 + 400 \cos 50))^2$
5(c)	10 min 8 s	4	B3 for 10.1 or 10.13... or M2 for $(400 + 350 + 450 + \text{their DA}) \div 3 [\div 60]$ oe or M1 for any distance $\div 3$ M1 for rounding <i>their</i> minutes into minutes and seconds to nearest second if clearly seen
6(a)	256	1	
6(b)	8	2	M1 for $3(x^2 + 1) + 2$ or for $3(2) + 2$
6(c)	$9x^2 + 12x + 5$	3	M1 for $(3x + 2)^2 + 1$ B1 for $[(3x + 2)^2] = 9x^2 + 6x + 4$ oe
6(d)	16	2	M1 for $3x + 2 = 7^2 + 1$ or better
6(e)	$\frac{x-2}{3}$ oe final answer	2	M1 for $x = 3y + 2$ or for $y - 2 = 3x$ or for $\frac{y}{3} = x + \frac{2}{3}$
6(f)	$\frac{4x^2 + 2x + 1}{3x + 2}$ final answer	3	B1 for $x^2 + 1 + x(3x + 2)$ or better seen M1 for common denominator $3x + 2$
6(g)	16	1	
7(a)	0.1	1	
7(b)(i)	0.2 oe 0.6, 0.3, 0.1 oe	2	B1 for 0.2 B1 for 0.6, 0.3, 0.1
7(b)(ii)	0.48 oe	2	FT <i>their</i> 0.6 from tree diagram M1 for $0.8 \times \text{their } 0.6$

Question	Answer	Marks	Partial Marks
7(b)(iii)	0.28 oe	3	M2 for $0.2 + 0.8 \times 0.1$ oe or M1 for 0.2 or 0.8×0.1 or $0.8 \times (0.6 + 0.3)$
7(c)	0.32 oe	3	M2 for $0.8 \times 0.2 + 0.2 \times 0.8$ oe M1 for one of these products
8(a)(i)	36	2	M1 for $\left(\frac{8}{12}\right)^2$ or $\left(\frac{12}{8}\right)^2$ oe
8(a)(ii)	30	3	M2 for $320 \div 16 \times \frac{12}{8}$ oe or M1 for $320 \div 16$
8(b)	3.375 cao	3	$\frac{4}{3}\pi \times 4.5^3$ M2 for $\frac{3}{\pi \times 6^2}$ or better or M1 for $\pi \times 6^2 \times h = \frac{4}{3} \times \pi \times 4.5^3$
8(c)	3.63 or 3.627 to 3.628	3	M2 for $\frac{20^3}{40 \times \frac{4}{3}\pi}$ or M1 for $40 \times \frac{4}{3} \times \pi \times r^3 = 20^3$
8(d)	$\frac{3x}{2}$ or $1.5x$ or $1\frac{1}{2}x$	3	B2 for $4R^2 = 9x^2$ oe or better or M1 for $4\pi R^2 = 2\pi x^2 + \pi \times 2x \times \frac{7x}{2}$
9(a)(i)	$(x+4)^2 - 25$	2	B1 for $(x+k)^2 - 9 - (\text{their } k)^2$ or $(x+4)^2 - h$ or $k = 4$
9(a)(ii)	$x + 4 = [\pm] 5$	M1	FT their (a)(i)
	-9 and 1	A1	
9(b)	$[b =] 7$ $[c =] -3$	3	B1 for $[b =] 7$ M1 for $b^2 - 4c = 61$
9(c)(i)(a)	Correct sketch	2	B2 for correct quadratic curve with min touching x-axis or B1 for parabola vertex downwards



Question	Answer	Marks	Partial Marks
9(c)(i)(b)	Correct sketch	2	B2 for correct straight line intersecting curve on y -axis or B1 for straight line with positive gradient and positive y -intercept
9(c)(ii)	2.8[0] or 2.795...	7	B3 for $x^2 - \frac{5}{2}x = 0$ oe or M1 for $(x-1)^2 = \frac{1}{2}x+1$ B1 for $[(x-1)^2 =] x^2 - x - x + 1$ AND B2 for $(0, 1)$ and $\left(\frac{5}{2}, \frac{9}{4}\right)$ oe or B1 $[x =] 0$ and $\frac{5}{2}$ oe AND M1 for (difference in x) 2 + (difference in y) 2
10(a)(i)	5	2	M1 for $(-1)^4 - 4(-1)^3$
10(a)(ii)	$(0, 0)$ and $(3, -27)$	6	B2 for $4x^3 - 12x^2 [= 0]$ or B1 for $4x^3$ or $12x^2$ AND M1 for derivative $= 0$ or <i>their</i> derivative $= 0$ M1 for $4x^2(x-3)[= 0]$ B1 for $[x =] 0$ and $[x =] 3$ or $[y =] 0$ and $[y =] -27$ or for one correct coordinate pair
10(b)	$[p =] 11$ $[q =] 5$	2	B1 for each or M1 for $\frac{dy}{dx} = px^{p-1} + 2qx^{q-1}$



Cambridge IGCSE™

MATHEMATICS

0580/22

Paper 2 (Extended)

March 2020

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge International is publishing the mark schemes for the March 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of 7 printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks																	
1(a)	12	1																		
1(b)	8	1																		
1(c)	5	1																		
1(d)	$\sqrt{7}$	1																		
2(a)	<table style="margin-left: auto; margin-right: auto;"> <tr> <td>1</td><td>3</td><td>5</td><td>8</td></tr> <tr> <td>2</td><td>1</td><td>4</td><td>6</td><td>8</td></tr> <tr> <td>3</td><td>6</td><td>8</td><td>8</td></tr> <tr> <td>4</td><td>5</td><td>8</td><td></td></tr> </table>	1	3	5	8	2	1	4	6	8	3	6	8	8	4	5	8		2	M1 for correct but not ordered or for two correct rows ordered
1	3	5	8																	
2	1	4	6	8																
3	6	8	8																	
4	5	8																		
2(b)	27	1																		
3	$\begin{pmatrix} -4 \\ 3 \end{pmatrix}$	1																		
4	165	2	M1 for $\frac{(24-2) \times 180}{24}$ or $180 - \frac{360}{24}$																	
5	$\frac{15}{28} \times \frac{7}{4}$ or $\frac{15}{28} \div \frac{16}{28}$ oe	M1																		
	$\frac{15}{16}$ cao	A2	A1 for $\frac{105}{112}$ oe																	
6	7.2	3	M1 for $5 \times 8 + 6 \times 5 + 7 \times 11 + 8 \times 7 + 9 \times 5 + 10 \times 4$ M1dep for $\div 40$																	
7(a)	45.9	2	M1 for $0.5 \times 8.5 \times 10.8$ oe																	
7(b)	33[.] or 33.04...	3	M2 for $8.5 + 10.8 + \sqrt{8.5^2 + 10.8^2}$ oe or M1 for $8.5^2 + 10.8^2$ oe																	
8	2.98×10^{-3}	1																		
9(a)	$3x(x-4y)$ final answer	2	B1 for $3(x^2 - 4xy)$ or $x(3x - 12y)$																	

Question	Answer	Marks	Partial Marks
9(b)	$m^2 - m - 6$ final answer	2	M1 for 3 terms from $m^2, -3m, +2m, -6$
10(a)	Correct sketch	1	Line with positive gradient and negative y intercept
10(b)	Correct sketch	2	B1 for only one branch or attempt at correct shape
11(a)	Rotation 90° clockwise oe (0, 2)	3	B1 for each
11(b)	Reflection $y = x$	2	B1 for each
11(c)	Enlargement [sf] $\frac{1}{2}$ (4, 6)	3	B1 for each
12	229 500 cao	3	B2 for 229 460... OR M1 for $250\ 000 \times \left(1 - \frac{1.7}{100}\right)^5$ oe B1 for <i>their</i> more accurate answer correctly rounded to the nearest 100
13	$2.\dot{6} - 0.2\dot{6}$ oe	M1	
	$\frac{4}{15}$ oe fraction nfww	A1	If M0 scored SC1 for $\frac{k}{90}$
14(a)	11.5	1	
14(b)(i)	12	1	
14(b)(ii)	8.5	1	

Question	Answer	Marks	Partial Marks
15	116°	B1	
	alternate segment theorem	B1	
	angles in opposite segments are supplementary or cyclic quadrilateral or angles at a point on a straight line	B1	
16	$8y^2 - 42y + 10 [= 0]$ or $8x^2 + 14x - 400 [= 0]$	M3	M1 for $(7 - 3y)^2 - y^2 = 39$ oe or $x^2 - \left(\frac{7 - x}{3}\right)^2 = 39$ oe M1 for $49 - 21y - 21y + 9y^2$ or better or $49 - 7x - 7x + x^2$ or better or for correct expansion of their quadratic binomial
	$(8y - 2)(y - 5) [= 0]$ oe $(8x - 50)(x + 8) [= 0]$ oe	M1	M1 for correct method to solve <i>their</i> quadratic equation e.g. factors, quadratic formula, completing the square
	$x = 6.25$ oe $y = 0.25$ oe $x = -8$ $y = 5$	B2	B1 for $x = 6.25$, $x = -8$ or for $y = 0.25$, $y = 5$ or for a correct pair of x and y values
17	$[y =] -\frac{1}{6}x + \frac{11}{2}$ oe	4	M1 for [gradient of AB] $\frac{5 - -7}{3 - 1}$ oe M1 for [gradient of perpendicular] $-\frac{1}{\text{their grad } AB}$ M1 for substituting (3, 5) in <i>their</i> linear equation
18	22.5 nfww	3	M2 for $\frac{146.2 + 0.05}{7 - 0.5}$ or M1 for $146.2 + 0.05$ or $7 - 0.5$ or better seen
19(a)	Correct sketch	2	Needs all three features for 2 marks: <ul style="list-style-type: none">• Correct curve shape• Maximum at (0, 1) and at (360, 1) and minimum at (180, -1)• Passing through (90, 0) and (270, 0) only B1 for two correct features

Question	Answer	Marks	Partial Marks
19(b)	75.5 or 75.52... and 284.4 to 284.5	3	B2 for one correct or M1 for $\cos x = \frac{1}{4}$ oe If 0 scored, SC1 for two answers with a sum of 360
20	[$a =$] 36 [$b =$] – 6	2	B1 for each or SC1 for correct answers reversed
21	X, Y and Z are collinear oe	1	Allow in a straight line
	X is the midpoint of ZY oe	1	Allow e.g. $ZY = 2XY, ZX = XY$ oe



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

March 2020

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

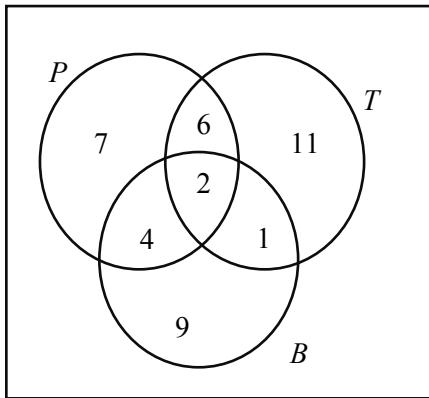
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	295	2	M1 for $[87 +] 4 \times 52$ oe
1(a)(ii)	29.5 or 29.49...	1	FT $\frac{87}{\text{their(a)(i)}} \times 100$
1(b)	11	2	M1 for $18 \times 4 [\pm 61]$ oe
1(c)	4160 cao nfww	2	M1 for $64 \div 0.0154$ or B1 for rounding <i>their</i> answer to nearest 10
1(d)	2.4[0] nfww	2	M1 for $\left(1 + \frac{12.5}{100}\right)x = 2.7[0]$ oe
1(e)	53 : 36	3	M2 for $265 : 180$ oe or for answer 36 : 53 or 53 min: 36 min or M1 for 4h 25 [mins] or 265 [mins] seen
1(f)	6[.00] or 5.999...	3	M2 for $\sqrt[5]{\frac{736}{550}}$ or M1 for $736 = 550 \times (x)^5$
2(a)(i)	3 2.25 1	3	B1 for each
2(a)(ii)	Fully correct smooth curve	4	B3FT for 7 or 6 correct plots B2FT for 5 or 4 correct plots B1FT for 3 correct plots
2(a)(iii)	-0.6 to -0.51, 0.75 to 0.85, 1.7 to 1.85	3	B1 for each If 0 scored, SC1 for $y = 1.5$ drawn
2(a)(iv)	-3 or -2 or -1 or 0	1	
2(b)(i)	Tangent ruled at $x = 1$	1	
2(b)(ii)	4.4 to 5.6	2	Dep on tangent at $x = 1$ or close attempt M1 for rise/run for <i>their</i> line

Question	Answer	Marks	Partial Marks
2(b)(iii)	$y = (4.4 \text{ to } 5.6)x - (1.8 \text{ to } 2.2)$ or [$y =]$ their (b)(ii) $x + \text{their}(y\text{-intercept})$	2	FT for any line but not horizontal or vertical line for 2 marks or B1 B1FT for [$m =]$ their 5 or for <i>their</i> y -intercept
3(a)	187	2	M1 for $220 \times \left(1 - \frac{15}{100}\right)$ oe or B1 for 33 seen
3(b)	19.8	3	M2 for $29.7 \times \sqrt[3]{\frac{0.4}{1.35}}$ oe or M1 for $\sqrt[3]{\frac{0.4}{1.35}}$ or $\sqrt[3]{\frac{1.35}{0.4}}$ oe seen or for $\frac{29.7^3}{x^3} = \frac{1.35}{0.4}$ oe
3(c)	12.4 or 12.44...	3	M1 for $90 \times 75 \times h = 7 \times \text{figs } 12$ B1 for $1000 \text{ cm}^3 = 1 \text{ litre}$ soi
4(a)	32.9 or 32.91 to 32.92...	2	M1 for $\pi \times 1.65 \times 4.7 + \pi \times 1.65^2$
4(b)	69.4 or 69.44 to 69.45	2	M1 for $\cos = 1.65 \div 4.7$ oe
4(c)(i)	12.5 or 12.54 to 12.55	4	M3 for $\frac{1}{3} \times \pi \times 1.65^2 \times \sqrt{4.7^2 - 1.65^2}$ oe or M2 for $\sqrt{4.7^2 - 1.65^2}$ oe or for $4.7 \times \sin(\text{their (b)})$ oe or M1 for $1.65^2 + h^2 = 4.7^2$ oe or for $\frac{h}{4.7} = \sin(\text{their (b)})$ oe
4(c)(ii)	41 nfww	4	B3 for 41.7... to 41.9 or M2 for $\frac{4}{3} \times \pi \times 5^3 \div \text{their } 12.5$ or M1 for $\frac{4}{3} \times \pi \times 5^3$ After M2 scored, M1 for truncating <i>their</i> decimal number of cones seen to an integer answer
5(a)	$\frac{10x}{(x-3)(x+2)}$ or $\frac{10x}{x^2 - x - 6}$ final answer	4	M1 for common denominator $(x-3)(x+2)$ isw M1 for $(x+3)(x+2) - (x-2)(x-3)$ isw B1 for correct numerator in terms of x only

Question	Answer	Marks	Partial Marks
5(b)	14	2	M1 for $12 - \frac{k}{2} = 5$ or $2^{\frac{k}{2}} = \frac{2^{12}}{2^5}$ oe or $\frac{4096}{32}$ or $12 - 5$ or $2^{12} \div 2^2 [= 32]$ seen
5(c)	$2y^3 - 3y^2 - 23y + 12$ final answer	3	B2 for correct unsimplified expanded expression or for simplified four-term expression of correct form with 3 terms correct or B1 for correct expansion of 2 of the brackets with at least 3 terms correct
5(d)	$[x =] \frac{3}{y-1}$ final answer	3	M1 for $xy = 3 + x$ M1 for $xy - x = 3$ or $x - \frac{x}{y} = \frac{3}{y}$ M1 for factorising and dividing
6(a)(i)	$\frac{1}{3}$ oe	1	
6(a)(ii)	100	1	FT their (a)(i) $\times 300$ to at least 3 sf or rounded to the nearest integer
6(b)(i)	$\frac{2}{15}$ oe	3	M2 for $4 \times \frac{1}{6} \times \frac{1}{5}$ oe or M1 for $k \left(\frac{1}{6} \times \frac{1}{5} \right)$ oe or list or indication of 4 correct pairs
6(b)(ii)	$\frac{3}{5}$ oe	3	M2 for $1 - \frac{4}{6} \times \frac{3}{5}$ or $2 \left(\frac{2}{6} \times \frac{4}{5} \right) + \frac{2}{6} \times \frac{1}{5}$ oe or $\frac{2}{6} + \left(\frac{4}{6} \times \frac{2}{5} \right)$ oe or $\frac{4}{6} \times \frac{3}{5}$ oe seen or $\frac{2}{6} \times \frac{4}{5} [\times 2]$ oe seen or $\frac{2}{6} \times \frac{1}{5}$ oe seen or correct identification of 18 pairs or space diagram oe
7(a)	$n - 5 + 3n + 10 > 105$ or better	B1	
	$n > 25$ final answer	B2	M1 for $4n > 100$

Question	Answer	Marks	Partial Marks
7(b)	4.8	3	M1 for $y = \frac{k}{x^2}$ or better M1 for $[y =] \frac{\text{their } k}{5^2}$ OR M2 for $y \times 5^2 = 7.5 \times 4^2$
7(c)(i)	$6 - 2n$ oe final answer	2	B1 for answer $6 - kn$ ($k \neq 0$) oe or answer $j - 2n$ oe or for correct expression shown in working and then spoilt
7(c)(ii)	$2n^2 - 1$ oe final answer	2	B1 for 2nd diff = 4 or a quadratic expression or for correct expression shown in working and then spoilt
8(a)(i)	2.67 or 2.666...	3	M2 for $\frac{6 \times \sin 25}{\sin 72}$ or M1 for implicit version
8(a)(ii)	4.14 or 4.140...	3	M1 for $6^2 + 7.4^2 - 2 \times 6 \times 7.4 \times \cos 34$ A1 for 17.1 to 17.2
8(a)(iii)	20.4 or 20.35 to 20.36...	4	B1 for angle $SQR = 83$ M1 for $\frac{1}{2} \times 6 \times \text{their (a)(i)} \times \sin \text{their } (180 - 72 - 25)$ oe M1 for $\frac{1}{2} \times 6 \times 7.4 \times \sin 34$ oe
8(b)(i)	8.7[0] or 8.695...	4	B3 for $\sqrt{980}$ oe or 31.3 or 31.30... or M3 for $40 - \sqrt{20^2 + 18^2 + 16^2}$ oe or M2 for $20^2 + 18^2 + 16^2$ oe or M1 for any correct attempt at 2-dimensional Pythagoras' e.g. $18^2 + 16^2$
8(b)(ii)	30.7 or 30.73 to 30.74...	3	M2 for $[\sin =] \frac{16}{\sqrt{20^2 + 18^2 + 16^2}}$ oe or B1 for identifying angle GAC

Question	Answer	Marks	Partial Marks
9(a)		3	B2 for 5 correct entries including '2' correctly placed at the intersection of the 3 sets or M1 for $k + 8 - k + 3 - k + 6 - k = 40 - (7 + 9 + 11)$ oe or for $k, 8 - k, 3 - k, 6 - k$, seen correctly placed on diagram with 7, 11 and 9 correctly placed
9(b)	11	1	
9(c)	\emptyset or { }	1	
9(d)	$\frac{7}{260}$ oe	2	M1 for $\frac{7}{40} \times \frac{6}{39}$ oe
9(e)	$\frac{14}{95}$ oe	2	FT their Venn diagram M1 for $\frac{8}{20} \times \frac{7}{19}$
10(a)(i)	$4x - 13$ final answer	1	
10(a)(ii)	$25x^2$ final answer	1	
10(b)	$\frac{x+1}{4}$ or $\frac{x}{4} + \frac{1}{4}$	2	M1 for correct first step $x = 4y - 1$ or $y + 1 = 4x$ or $\frac{y}{4} = x - \frac{1}{4}$
10(c)	0.6934 final answer	3	B2 for 0.69336... or $3^{-\frac{1}{3}}$ oe or 0.693 or M1 for $3^{-3^{-x}}$ oe
10(d)(i)	$(3x-2)^2 - 3^{(-3)}$	M1	
	$9x^2 - 6x - 6x + 4 - 27$ or $9x^2 - 12x + 4 - 27$ leading to $9x^2 - 12x - 23$	A1	with no errors seen

Question	Answer	Marks	Partial Marks
10(d)(ii)	$\frac{-(-12) \pm \sqrt{(-12)^2 - 4(9)(-23)}}{2 \times 9}$ or better	B2	B1 for $\sqrt{(-12)^2 - 4(9)(-23)}$ oe or $\frac{-(-12) + \sqrt{q}}{2 \times 9}$ oe or $\frac{-(-12) - \sqrt{q}}{2 \times 9}$ oe or both
	– 1.07, 2.40 final answers		B1 for each If B0 , SC1 for answers – 1.1 or –1.06 or –1.065... to –1.065 and 2.4 or 2.39 or 2.398 to 2.398... or – 1.07 and 2.40 seen in working or for –2.40 and 1.07 as final answer
10(e)	–5 final answer	2	M1 for $243 = 3^{-x}$
11(a)	(1, 2) (–1, 6)	5	B2 for [derivative oe =] $3x^2 - 3$ or B1 for [derivative oe =] $3x^2$ or $f(x) - 3$ M1 for <i>their</i> derivative = 0 or recognition of $\frac{dy}{dx} = 0$ oe B1 for $[x =] -1, 1$ or for one coordinate pair
11(b)	(1, 2) minimum with reason (–1, 6) maximum with reason	3	Reasons could be e.g. a reasonable sketch correct use of 2 nd derivative = $6x = 6$, $6 > 0$, so (1, 2) minimum oe 2 nd derivative = $6x = -6$, $-6 < 0$ so (–1, 6) maximum oe, or finds gradient on each side of both correct stationary points with correct conclusion B2 for 1 correct with reason or M1 for showing [2 nd derivative =] $6x$ or gradients for one value on either side of one correct stationary point or for reasonable sketch of cubic

MATHEMATICS

0580/22

Paper 2 (Extended)

October/November 2019

MARK SCHEME

Maximum Mark: 70

Published

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This document consists of **6** printed pages.

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
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GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

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- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
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GENERIC MARKING PRINCIPLE 4:

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GENERIC MARKING PRINCIPLE 5:

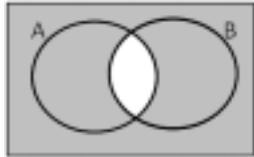
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	6.8	1	
2	7.6[0] or 7.604 to 7.605	1	
3	$a^4 + 3a$ final answer	1	
4		1	
5(a)	23	1	
5(b)	One extreme value oe	1	
6	135	2	M1 for $\frac{12}{12+7+9+4} [\times 360]$ or $\frac{360}{12+7+9+4} [\times 12]$ oe
7	440 or 440.2 to 440.3	2	M1 for $30000 \div 68.14$
8	282	2	M1 for $180 + 102$ or $360 - (180 - 102)$
9	$x < -10$ final answer	2	M1 for $-12 - 13 > 3x - \frac{x}{2}$ oe
10	$67.\dot{7} - 6.\dot{7}$ oe	M1	
	$\frac{61}{90}$	A1	If 0 scored, SC1 for $\frac{k}{90}$

Question	Answer		Marks	Partial Marks
11	$\frac{29}{8}$ or $\frac{5}{3}$	$2\frac{5}{8} - \frac{2}{3}$	M1	Allow $\frac{29k}{8k}$ or $\frac{5k}{3k}$ Correct step for dealing with mixed numbers
	$\frac{87}{24}$ and $\frac{40}{24}$	[2] $\frac{15}{24}$ and $\frac{16}{24}$	M1	Correct method to find common denominator e.g. $3\frac{15}{24}$ and $1\frac{16}{24}$
	$1\frac{23}{24}$ cao		A1	
12	90		3	M2 for $360 \div (180 - 176)$ oe or M1 for $180(n - 2) = 176n$ oe or $180 - 176$
13	352		3	B2 for figs 352 or M1 for $\left(\frac{75}{30}\right)^3$ oe or $\left(\frac{30}{75}\right)^3$ oe OR M2 for $5.5 \times \left(\frac{30}{75}\right)^3 \times 1000$
14	Gradient = $\frac{5}{4}$ oe		M1	M marks can be in any order
	$y = k - \frac{4}{5}x$ oe and gradient = $-\frac{4}{5}$ oe		M1	
	Use of product of gradients is -1 oe		M1	
15(a)	$2.45x + 3.15y$ final answer		2	B1 for one correct term in final answer If 0 scored, SC1 for $245x + 315y$
15(b)	13		2	M1 for $60.55 - 2.45 \times 8$ oe
16	$y = 5$ ruled $y = x + 1$ ruled Correct region indicated		4	B2 for two correct lines or B1 for one correct line B2 for indication of correct region or B1 for shading that satisfies two of the inequalities

Question	Answer	Marks	Partial Marks
17	Bisector of angle Q accurate with two pairs of correct arcs and Arc centre R , radius 6.5 cm With bird table correctly indicated or implied by correct intersecting constructions	4	M2 for bisector of angle Q accurate with two pairs of correct arcs or M1 for accurate bisector with no/wrong arcs M2 for arc centre R , radius 6.5 cm or M1 for arc centre R Maximum 3 marks if incorrect position/region is labelled, or there is no label and a region is shaded, or <i>their</i> constructions do not intersect
18(a)	0.3 oe	2	M1 for 0.4×0.75
18(b)	0.975 oe	2	M1 for $1 - 0.4 \times 0.25 \times 0.25$ oe or $0.6 + 0.4 \times 0.75 + 0.4 \times 0.25 \times 0.75$ or $0.6 + \text{their (a)} + 0.4 \times 0.25 \times 0.75$
19(a)	$180 - 4x$	1	
19(b)	$90 - 2x$	1	FT <i>their (a)</i> $\div 2$ in its simplest form dep on expression in x in (a)
19(c)	$90 + x$	2	FT $180 - \text{their (b)} - x$ oe dep on expression in x in (b) then fully simplified M1 for $180 - (90 - 2x + x)$ oe or $180 - \text{their (b)} - x$ oe dep on expression in x in (b)
20(a)	$(3y + 2x)(6 - a)$ oe final answer	2	M1 for $3y(6 - a) + 2x(6 - a)$ oe or $6(2x + 3y) - a(2x + 3y)$ oe
20(b)	$3(x + 4y)(x - 4y)$ final answer	3	M2 for $(3x + 12y)(x - 4y)$ or $(3x - 12y)(x + 4y)$ or M1 for $3(x^2 - 16y^2)$ or for $(x + 4y)(x - 4y)$
21(a)	6	2	B1 for 3^4 or 3^{x-2} or M1 for $3^x = 81 \times 3^2$ or better
21(b)	8	3	M2 for $x^{\frac{5}{3}} = 32$ or better or M1 for $\frac{1}{\frac{1}{x^3}} = \frac{32}{x^2}$ or better or $x^{-\frac{1}{3}-2} = 32$ or better
22(a)	$\begin{pmatrix} 2 & 17 \\ 10 & -25 \end{pmatrix}$	2	B1 for 2 correct elements

Question	Answer	Marks	Partial Marks
22(b)	2	2	M1 for $-3 - 5k = -13$ oe
22(c)	$\frac{1}{10} \begin{pmatrix} 0 & -2 \\ 5 & 3 \end{pmatrix}$ oe isw	2	M1 for $k \begin{pmatrix} 0 & -2 \\ 5 & 3 \end{pmatrix}$ or for det = 10 or soi
23(a)	Tangent ruled at $t = 24$	B1	
	– 0.7 to – 0.3	B2	B2 dep on correct tangent or close attempt at tangent M1 for rise/run also dep on correct tangent drawn or close attempt at tangent. Must see correct or implied calculation from a drawn tangent.
23(b)	acceleration or deceleration oe	1	
23(c)	68	2	M1 for $(22 - 5) \times 4$

MATHEMATICS

0580/42

Paper 4 (Extended)

October/November 2019

MARK SCHEME

Maximum Mark: 130

Published

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Abbreviations

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dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	5 : 6	1	
1(a)(ii)	$2.0736[0] \times 10^5$ final answer	3	B2 for 207360 oe or M1 for $16 \times 18 \times 720$
1(b)(i)	26780	2	M1 for $18540 \div 9$ soi
1(b)(ii)	1.36	2	M1 for 0.85×1.6 oe or B1 for 0.51 or 51
1(c)	66.7 or 66.66 to 66.67	5	<p>M4 for $\frac{(2.3 - 1.5 \times 0.92)}{1.5 \times 0.92} \times 100$ oe or $\frac{2.3 \times 100}{1.5 \times 0.92}$ oe</p> <p>OR</p> <p>Working in euros</p> <p>B2 for [€]1.38 or M1 for $1.5[0] \times 0.92$ M2dep on B2 or M1 for $\frac{2.3 - \text{their } 1.38}{\text{their } 1.38} \times 100$ oe or $\frac{2.3 - \text{their } 1.38}{\text{their } 1.38} \times 100$ oe</p> <p>or M1 for $2.3 - \text{their } 1.38$ or $\frac{2.3}{\text{their } 1.38}$</p> <p>OR</p> <p>Working in dollars</p> <p>B2 for [\$]2.50 or M1 for $2.3[0] \div 0.92$ M2dep on B2 or M1 for $\frac{\text{their } 2.5 - 1.5}{1.5} \times 100$ oe or $\frac{\text{their } 2.5}{1.5} \times 100$ or M1 for $\text{their } 2.5 - 1.5$ or $\frac{\text{their } 2.5}{1.5}$</p>

Question	Answer	Marks	Partial Marks
1(d)	219 000 or 218814[.3....] rounded to 4 sf or more	3	B2 for 414000 or 414414[.3....] rounded to 4 sf or more or M2 for $195600 \times \left(1 + \frac{8.7}{100}\right)^9$ [- 195600] or M1 for $195600 \times \left(1 + \frac{8.7}{100}\right)^k$ or better ($k > 1$ and an integer)
2(a)(i)	54	1	
2(a)(ii)	29	2	M1 for [UQ =] 65 or [LQ =] 36
2(a)(iii)	32	1	
2(a)(iv)	17, 18 or 19	2	M1 for 61 to 63 written or for decimal answer in range 17 to 19
2(b)(i)	18, 26, 26	2	B1 for 1 or 2 correct
2(b)(ii)	51 nfww	4	M1 for 10 , 30 , 50 , 70 , 90 soi M1 for $\sum fx$ M1 dep for their $\sum fx \div \sum f$
2(c)(i)	75	1	
2(c)(ii)	IQR is bigger for the girls with [boys =] 20 seen oe	2	FT their IQR from (a)(ii) M1 for IQR for boys = 20 isw or for girls IQR is bigger than boys IQR oe isw FT their IQR from (a)(iii)
3(a)(i)	(3, 5.5)	2	B1 for either value correct
3(a)(ii)	$\frac{5}{4}x + \frac{7}{4}$ final answer	3	B2 for answer $\frac{5}{4}x + c$ oe or for correct equation in different form or M1 for $\frac{8-3}{5-1}$ oe and M1 for correct substitution shown of (1, 3) or (5, 8) or their (a)(i) into $y = (\text{their } m)x + c$ oe
3(b)(i)	(6, 1) (10, 6)	2	B1 for 2 or 3 values correct
3(b)(ii)	(-3, 1) (-8, 5)	2	B1 for 2 or 3 values correct If 0 scored, SC1 for (3, -1) and (8, -5)
3(b)(iii)	(3, 3) (-1, 8)	2	B1 for 2 or 3 values correct but not for (1, 3) and (5, 8)

Question	Answer	Marks	Partial Marks
3(b)(iv)	(5, -3) (11, -8)	2	B1 for either or M1 for $\begin{pmatrix} -1 & 2 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ or $\begin{pmatrix} -1 & 2 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} 5 \\ 8 \end{pmatrix}$
3(c)	Enlargement -2 Origin oe	3	B1 for each
4(a)	452 or 452.2 to 452.4...	2	M1 for $\left[\frac{1}{2} \times \right] \frac{4}{3} \times \pi \times 6^3$
	cm ³	1	
4(b)(i)(a)	400 or 399.6 to 399.9	6	B3 for $[CD =] \sqrt{72.96}$ or $[\text{angle } CBD =] 58.7$ or 58.66 to 58.67 or M2 for $\sqrt{10^2 - 5.2^2}$ oe or $[CBD =] \cos^{-1}\left(\frac{5.2}{10}\right)$ oe or M1 for $(CD)^2 + 5.2^2 = 10^2$ oe or $\cos [CBD] = \frac{5.2}{10}$ oe or $\sin [CDB] = \frac{5.2}{10}$ oe M1dep for $\frac{5.2 \times \text{their } CD}{2}$ oe or $\frac{1}{2} \times 5.2 \times 10 \times \sin(\text{their } CBD)$ oe M1 for <i>their area</i> $\times 18$ oe
4(b)(i)(b)	14.6 or 14.62 to 14.63...	4	M3 for $\sin BEC = \frac{5.2}{\sqrt{10^2 + 18^2}}$ oe or M2 for $[BE =] \sqrt{10^2 + 18^2}$ oe seen or $[EC =] \sqrt{18^2 + 10^2 - 5.2^2}$ oe seen or M1 for $[BE^2 =] 10^2 + 18^2$ oe seen or $[EC^2 =] 18^2 + 10^2 - 5.2^2$ seen
4(b)(ii)	125 or 124.9 to 125.0...	3	B2 for 55[.0...] seen or M2 for $180 - \tan^{-1}\left(\frac{10}{7}\right)$ oe or $\cos EGB = \frac{11^2 + (10^2 + 7^2) - (10^2 + 18^2)}{2 \times 11 \times \sqrt{10^2 + 7^2}}$ oe or M1 for $\tan[\quad] = \left(\frac{10}{7}\right)$ oe or for $(10^2 + 18^2) = 11^2 + (10^2 + 7^2) - 2 \times 11 \times \sqrt{10^2 + 7^2}$ $\cos EGB$ oe

Question	Answer	Marks	Partial Marks
5(a)	3.5, 15, 3.9	3	B1 for each
5(b)	Correct graph	5	B4 for correct curves but branches joined or touching y -axis or B3FT 10 or 11 points or B2FT for 8 or 9 points or B1FT for 6 or 7 points B1indep two separate branches not touching or crossing y -axis
5(c)	0.5 to 0.6 and 1.3 to 1.6	2	B1 for each or both correct but in reverse order
5(d)	1	1	
5(e)(i)	$y = 3x + 1$ ruled and 0.3 to 0.49	3	B2 for correct ruled line that crosses <i>their</i> curve or B1 for $y = 3x + 1$ soi or freehand line or ruled line with gradient 3 or with y -intercept at 1 (but not $y = 1$)
5(e)(ii)	$[a =] -6$ $[b =] -2$ $[c =] -4$	3	M2 for $x^4 + 2 - 4x = 6x^3 + 2x^2$ or better seen or B1 for each correct value to a maximum of 2 marks If 0 scored, SC1 for answer $[a =] 6, [b =] 2$ and $[c =] 4$ or for $x^5 + 2x - 4x^2 = 6x^4 + 2x^3$ or better
6(a)(i)	13.9[0...] from cosine rule	4	M2 for $8^2 + 13^2 - 2 \times 8 \times 13 \cos 79$ or M1 for $\cos 79 = \frac{13^2 + 8^2 - BC^2}{2 \times 8 \times 13}$ A1 for 193
6(a)(ii)	66.6 or 66.60... to 66.65 from sine rule	3	M2 for $[\sin ACB =] \frac{13 \times \sin 79}{\text{their}(a)(i)}$ or M1 for $\frac{\sin ACB}{13} = \frac{\sin 79}{\text{their}(a)(i)}$ oe
6(b)(i)	$\frac{1}{2}(x+4)(4x-5)\sin 30 = 70$	M1	
	$4x^2 + 16x - 5x - 20 = 280$	M2	Dep on M1 B1 for $4x^2 + 16x - 5x - 20$ or better
	Leading to $4x^2 + 11x - 300 = 0$	A1	with no errors or omissions seen

Question	Answer	Marks	Partial Marks
6(b)(ii)	$\frac{-11 \pm \sqrt{11^2 - 4 \times 4 \times -300}}{2 \times 4}$	B2	B1 for $\sqrt{11^2 - 4(4)(-300)}$ or better or for $\frac{-11 + \sqrt{q}}{2 \times 4}$ or $\frac{-11 - \sqrt{q}}{2 \times 4}$
	-10.14 and 7.39		B1 for each or SC1 for final answers -10.1 or -10.144 to -10.143 and 7.4 or 7.393 to 7.394 or -10.14 and 7.39 seen in working or for -7.39 and 10.14 as final answer
6(b)(iii)	11.4 or 11.39...	1	FT <i>their</i> positive root + 4
7(a)(i)	13	1	
7(a)(ii)	3	2	M1 for $h\left(\frac{10}{30}\right)$ oe soi or $27^{\frac{10}{x}}$
7(a)(iii)	$\frac{7-x}{2}$ oe final answer	2	M1 for $x = 7 - 2y$ or $y - 7 = -2x$ or $7 - y = 2x$ or $-\frac{y}{2} = -\frac{7}{2} + x$ oe
7(b)	0.75 oe final answer	3	M1 for $\frac{10}{2x+1} = 4$ M1 for $10 = 8x + 4$ or better
7(c)	$\frac{70-19x}{x(7-2x)}$ or $\frac{70-19x}{7x-2x^2}$ final answer	3	M1 for $x + 10(7 - 2x)$ or better isw B1 for common denominator $x(7 - 2x)$ oe isw
7(d)	3 final answer	1	
8(a)(i)	$\frac{m-7}{5}$ oe final answer	2	M1 for $5p = m - 7$ or $p + \frac{7}{5} = \frac{m}{5}$
8(a)(ii)	$[\pm]\sqrt{\frac{y^2 - h}{2}}$ or $[\pm]\sqrt{\frac{h - y^2}{-2}}$ oe final answer	3	M1 for first correct step isolate term in p or divide by ± 2 M1 for second correct step FT <i>their</i> first step
8(b)(i)	$\begin{pmatrix} 0 \\ 5 \end{pmatrix}$	1	
8(b)(ii)	$\begin{pmatrix} -3 \\ -1 \end{pmatrix}$	1	

Question	Answer	Marks	Partial Marks
8(b)(iii)	3.22 or 3.216... to 3.220...	6	<p>B3 for [angle $AOB =]$ 36.8 or 36.9 or 36.84 to 36.87 or M2 for $\tan[AOB] = \frac{3}{4}$ oe or for $[AOB =]2 \times \sin^{-1} \left(\frac{\sqrt{(5-4)^2 + (0-3)^2}}{10} \right)$ oe or for $\cos [AOB =]$ $\frac{5^2 + 5^2 - \left(\sqrt{(5-4)^2 + (0-3)^2} \right)^2}{2 \times 5 \times 5}$ oe or M1 for recognition of right-angle with perpendicular from B to OA or x-axis or for $[AB^2 =](5-4)^2 + (0-3)^2$ or better oe or $(their AB)^2 = 5^2 + 5^2 - 2 \times 5 \times 5 \times \cos OAB$ oe M2 for $\frac{their \ angle \ AOB}{360} \times 2 \times \pi \times 5$ oe or M1 for radius = 5 soi</p>
9(a)	171 or 171.0...	3	<p>M2 for $\frac{7.6}{160} \times 60 \times 60$ oe or M1 for $\frac{7.6}{160}$ or $\frac{7.6}{2\frac{2}{3}}$ or $\frac{7.6}{2 \text{ min } 40 \text{ sec}}$ If 0 scored, SC1 for answer 189 or 188.6 to 188.7</p>
9(b)(i)	77 [min] 20 [s]	4	<p>M3 for $\frac{32}{12} \times 29$ oe or B2 for 4640 or 1.29 or 1.288 to 1.289, $\frac{58}{45}$ oe or 32 laps or 29 laps or M2 for $2^5 \times 5 \times 29$ oe or M1 for $2 \text{ m } 40 \text{ sec} \div (2 \text{ m } 40 \text{ sec} - 2 \text{ m } 25 \text{ sec})$ soi for $2 \text{ m } 25 \text{ sec} \div (2 \text{ m } 40 \text{ sec} - 2 \text{ m } 25 \text{ sec})$ soi or for an attempt to find LCM or 23 200 seen or correctly find prime factors of 145 or 160 or for $\frac{7.6}{145}$ or $\frac{7.6}{2\frac{5}{12}}$ or $\frac{7.6}{2 \text{ min } 25 \text{ sec}}$ oe, provided SC1 not earned in part (a)</p>
9(b)(ii)	220.4	2	<p>M1 for $their (b)(i) \div 2 \text{ min } 40 \text{ sec} [\times 7.6]$ oe or $their (a) \times their (b)(i) \div 60$ oe</p>

MATHEMATICS

0580/22

Paper 2 (Extended)

May/June 2019

MARK SCHEME

Maximum Mark: 70

Published

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GENERIC MARKING PRINCIPLE 6:

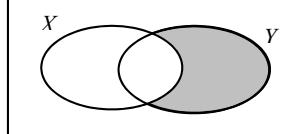
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	53 or 59	1	
2	0.839 or 0.8386 to 0.8387	1	
3	$\frac{7}{9}$	1	
4(a)	Trapezium	1	
4(b)	Obtuse	1	
5	56.4 or 56.44...	2	M1 for $\frac{254}{\text{their } 4.5}$ or $\frac{254}{\text{their } 270} [\times 60]$
6	2	2	M1 for $9f - 3f \text{ oe}$ or $23 - 11 \text{ oe}$
7	14.7	2	M1 for $\frac{1}{2} \times 8.4 \times 3.5 \text{ oe}$
8(a)	0.048 cao	1	
8(b)	5.27×10^{-3}	1	
9	6	2	M1 for $2 \times 3^2 \times 5$ or $2^4 \times 3$ or for 2×3 as final answer or B1 for 2 or 3 as final answer
10	2.1	2	M1 for $\frac{33.6 \times 25000^2}{100000^2} \text{ oe}$ or answer figs 21
11	$\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$	2	B1 for one row or one column correct in a 2 by 2 matrix in the final answer or SC1 for $\begin{pmatrix} 0 & 3 \\ 3 & 0 \end{pmatrix}$
12(a)	$10m^5$ final answer	2	B1 for $10m^k$ or km^5 as final answer
12(b)	x^{24} final answer	1	

Question	Answer	Marks	Partial Marks
13	$\frac{9}{4} \times \frac{7}{3}$ or $\frac{63}{28} \div \frac{12}{28}$ oe with common denominator $5\frac{1}{4}$ cao	M2	B1 for $\frac{9}{4}$ oe seen or M1 for <i>their</i> $\frac{9}{4} \times \frac{7}{3}$
			A1
14	Correctly eliminating one variable	M1	
	$[x =] -4$ $[y =] 3$		A2 A1 for one correct If M0 scored, SC1 for 2 values satisfying one of the original equations
15	495	3	M2 for $435.6 \div \frac{100-12}{100}$ oe or B1 for recognising 435.6 as 88[%]
16(a)	R identified correctly	2	B marks
16(b)	7	1	
17	$\frac{3x^2 - 4x + 9}{(x+3)(x-5)}$ final answer	3	B1 for common denominator $(x+3)(x-5)$ oe isw M1 for $2x(x-5) + (x+3)(x+3)$ or better
18	12.8 4.4 0.8	3	B2 for 2 correct heights or 3 correct freq densities or B1 for 1 correct height or 2 correct freq densities

Question	Answer	Marks	Partial Marks
19	$m = \frac{k}{P-1}$ final answer	4	<p>B3 for final answer $\frac{k}{P-1}$</p> <p>OR</p> <p>M1 for multiplying or dividing by m correctly</p> <p>M1 for term(s) in m on one side correctly and terms not in m on the other side correctly</p> <p>M1 for correctly factorising m with a 2-term bracket oe</p> <p>M1 for correct division by <i>their</i> 2-term bracket with m as the subject To a maximum of M3 for an incorrect answer</p>
20	$\frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-10)}}{2 \times 3}$	B2	<p>B1 for $\sqrt{(-2)^2 - 4(3)(-10)}$ or better</p> <p>and if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ then</p> <p>B1 for $p = -(-2)$ and $r = 2(3)$</p>
	-1.52 and 2.19 final ans cao	B1B1	<p>If B0B0, SC1 for -1.5 and 2.2 or -1.523 to -1.522... and 2.189.... or 1.52 and -2.19 or -1.52 and 2.19 seen in working</p>
21(a)		1	
21(b)(i)	$\frac{9}{16}$ oe	2	B1 for $\frac{9}{k}$ or $\frac{k}{16}$ provided fraction is less than 1
21(b)(ii)	46	1	
22(a)	$\begin{pmatrix} 6 & 15 \\ 3 & 7 \end{pmatrix}$	2	B1 for 2 correct elements
22(b)	$\begin{pmatrix} -3 & 7 \\ 1 & -2 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} 3 & -7 \\ -1 & 2 \end{pmatrix}$ soi or $\det = -1$ soi

Question	Answer	Marks	Partial Marks
23(a)	$\frac{5}{3} \mathbf{p} - 2\mathbf{q}$ oe simplified	2	M1 for correct unsimplified answer or $c\mathbf{p} - 2\mathbf{q}$ or $\frac{5}{3} \mathbf{p} + c\mathbf{q}$ $c \neq 0$ or for a correct route
23(b)	$\frac{5}{6}$	2	B2FT for $\frac{their\ c}{2}$ if <i>their (a)</i> is $c\mathbf{p} - 2\mathbf{q}$ oe M1 for $\overrightarrow{MX} = \frac{5}{6} \mathbf{p} - \mathbf{q}$ or $\overrightarrow{MX} = \frac{1}{2} \text{ their (a)}$ or $\overrightarrow{BX} = \frac{1}{2} \overrightarrow{AN}$ or $\mathbf{q} + \frac{1}{2} \text{ their (a)}$ or $\mathbf{q} + \overrightarrow{MX} - k\mathbf{p} = 0$ oe
24	31.9 or 31.85...	4	M3 for $\tan = \frac{12}{\sqrt{18^2 + 7^2}}$ oe or M2 for $\sqrt{18^2 + 7^2}$ or M1 for $18^2 + 7^2$ or B1 for identifying correct angle <i>CAG</i>
25(a)	Rotation 90° clockwise oe (1, 0)	3	B1 for each
25(b)	Enlargement – 2 (0, 2)	3	B1 for each

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2019

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **9** printed pages.

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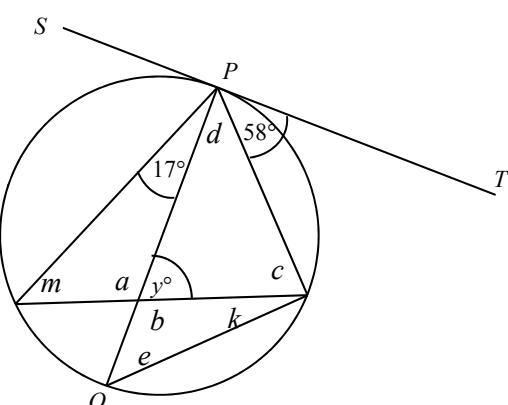
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nfww	not from wrong working
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Question	Answer	Marks	Partial Marks
1(a)	16.5 or 16.49...	3	M2 for $\frac{1.13 - 0.97}{0.97} \times 100$ oe or $\frac{1.13}{0.97} \times 100$ oe or M1 for $\frac{1.13}{0.97}$ oe
1(b)(i)	35	2	M1 for $60 \div (5 + 7)$
1(b)(ii)	140	1	
1(c)	\$1.26 final answer	3	B2 for 1.259... or 1.26 but not as final answer or M1 for $2.25 \div 0.9416$ If 0 scored, SC1 for 1.13×0.9416
1(d)	15[.0...]	3	M2 for $\sqrt[21]{\frac{58000}{1763000}}$ oe or M1 for $58000 = 1763000 (k)^{21}$
1(e)	1239.75	2	B1 for $43 + 0.5$ or $28 + 0.5$ oe seen
2(a)	103	3	M1 for angle ABC or angle $ACB = \frac{1}{2}(180 - 26)$ oe M1 for angle $ABF = 26$ or angle CBD or angle $FBE = 77$ or exterior angle $ACB = 103$ correctly identified or in correct position

Question	Answer	Marks	Partial Marks
2(b)	75	5	<p>B4 for 105 at a or b or 73 at c and 32 at d</p> <p>or B3 for 58 at m or 58 at e and 17 at k</p> <p>or B2 for 32 at d and 90 soi at $(c+k)$ or 32 at d and 17 at k or 73 at c</p> <p>or B1 for 90 soi at $(c + k)$ or between tangent and radius or 32 at d or 17 at k</p>
			
3(a)	$1 - r$	1	
3(b)(i)	$(1 - r)(1.3 - r) [= 0.4]$	1	FT their(a) dep on (a) being an expression in r
3(b)(ii)	$1.3 - 1.3r - r + r^2$ or better nfww	M1	FT their (b)(i)
	$0.9 - 2.3r + r^2 [= 0]$ OR $13 - 13r - 10r + 10r^2 = 4$ oe	M1	Strict FT their expansion to a quadratic then equating to 0.4 and then collecting to 3 terms on ‘one side’ OR Strict FT their expansion to a quadratic = 0.4 all multiplied by 10
	$10r^2 - 23r + 9 = 0$	A1	no errors or omissions seen

Question	Answer	Marks	Partial Marks
3(b)(iii)	$(5r - 9)(2r - 1) [= 0]$	B2	or B2 for e.g. $5r(2r - 1) - 9(2r - 1)$ and then $5r - 9 = 0$ and $2r - 1 = 0$ or B1 for $5r(2r - 1) - 9(2r - 1) [= 0]$ or $2r(5r - 9) - 1(5r - 9) [= 0]$ or $(5r + a)(2r + b) [= 0]$ where a, b are integers and $ab = +9$ or $2a + 5b = -23$ If 0 scored, SC1 for $5r - 9$ and $2r - 1$ seen but not in factorised form
	$[r =] \frac{9}{5}$ oe $[r =] \frac{1}{2}$ oe		B1
3(b)(iv)	0.8 or $\frac{4}{5}$ oe	1	
4(a)(i)	1.5 oe	1	
4(a)(ii)	(0, 2)	1	
4(b)(i)	$y = -2x + 6$ oe final answer	3	B2 for $y = -2x + c$ oe or $y = mx + 6$ oe $m \neq 0$ or for answer $-2x + 6$ or B1 for [gradient =] $-\frac{6}{3}$ oe or $c = +6$ soi
4(b)(ii)	$y = 0.5x - 1.5$ oe final answer	3	B1 for [gradient =] –1 divided by their gradient from (b)(i) evaluated soi M1 for substitution of (9, 3) into $y = (their m)x + c$ seen in working
4(c)(i)	12.6 or 12.64 to 12.65	3	M2 for $\sqrt{(8 - -4)^2 + (5 - 1)^2}$ oe or M1 for $(8 - -4)^2 + (5 - 1)^2$ oe
4(c)(ii)	(2, 3)	2	B1 for each
5(a)	2.45, 0.25, –0.25	3	B1 for each
5(b)	Fully correct smooth curve	4	B3FT for 6 or 7 points or B2 FT for 4 or 5 points or B1 FT for 2 or 3 points
5(c)	0.7 to 0.8	1	FT their curve
5(d)(i)	Correct ruled line	2	M1 for good freehand, or ruled line with gradient –1.05 to –0.95 or ruled line through (0, 2) but not line $y = 2$

Question	Answer	Marks	Partial Marks
5(d)(ii)	Both intersections of <i>their (b)</i> and <i>their (d)(i)</i>	2	Strict FT intersection of <i>their (b)</i> and <i>their (d)(i)</i> B1FT for one correct OR B2 for 0.27 to 0.28 and 2.38 to 2.39
5(e)	Substitutes $x = \sqrt{2}$ into $\frac{1}{2x} - \frac{x}{4}$ OR Identifies $y = 0$ oe OR Correctly manipulates to a single fraction e.g. $\frac{2-x^2}{4x}$ oe seen	M1	
	Concludes ‘read the graph at $y = 0$ ’ oe OR Manipulates $0 = \frac{1}{2x} - \frac{x}{4}$ oe leading to $x^2 = 2$ OR States $\frac{2-x^2}{4x} = 0$ leading to $x^2 = 2$	A1	
6(a)	$x^2 + 4x - 21$ final answer	2	B1 for three of x^2 , $+7x$, $-3x$, -21
6(b)(i)	$5q(3p^2 - 5q)$ final answer	2	B1 for $5(3p^2q^2 - 5q^3)$ or $q^2(15p^2 - 25q)$ or $q(15p^2q - 25q^2)$ or $5q(3p^2q - 5q^2)$ or for correct answer seen
6(b)(ii)	$(2g + 5k)(2f + 3h)$ final answer	2	B1 for $2g(2f + 3h) + 5k(2f + 3h)$ or $2f(2g + 5k) + 3h(2g + 5k)$ or for correct answer seen
6(b)(iii)	$(9k + m)(9k - m)$ final answer	2	M1 for $(9 + m)(9 - m)$ or for correct answer seen

Question	Answer	Marks	Partial Marks
6(c)	5.5	4	<p>M1 for $5 \times 3(x-4) + x + 2 = 5 \times 6$</p> <p>M1 for $15x - 60 + x + 2 = 30$ FT <i>their</i> first step or $3x - 12 + \frac{x+2}{5} = 6$</p> <p>If M0M0, SC1 for $3x - 12 + x + 2 = 30$ oe</p> <p>M1dep for $16x = 88$ FT <i>their</i> previous steps</p>
7(a)	$180 - \frac{360}{5}$ or $\frac{(5-2) \times 180}{5}$ or $\frac{(2 \times 5 - 4) \times 90}{5}$ or $\frac{5 \times 180 - 360}{5}$	M2	<p>or M1 for $\frac{360}{5}$ or $(5-2) \times 180$ or $90(2 \times 5 - 4)$ or $3 \times 180 \div 5$ or $6 \times 90 \div 5$ or $5 \times 180 - 360$</p> <p>If 0 scored, SC1 for $\frac{5-2 \times 180}{5}$</p>
7(b)(i)	7.05 or 7.053...	3	<p>M2 for $12 \times \cos 54$ oe or M1 for implicit form or B1 for length of edge of pentagon = 14.1 to 14.11 If 0 scored, SC1 for right angle at M</p>
7(b)(ii)(a)	22.8 or 22.81 to 22.83... nfww	3	<p>M2 for $\frac{\text{their (b)(i)}}{\cos 72}$ oe or M1 for implicit form oe or B1 for $AX = 36.9$ or 36.93 to 36.94</p>
7(b)(ii)(b)	179 or 179.1 to 179.3...	3	<p>M2 for $\frac{1}{2} \times 12 \times \text{their } AX \times \sin 54$ oe or $\frac{1}{2} \times 12 \times \text{their } OX \times \sin 108$ oe or $\frac{1}{2} \times \text{their } AX \times \text{their } OX \times \sin 18$ or $\frac{1}{2} \times 12^2 \times \sin 72 + \text{area } OBX$ oe or $\frac{1}{2} \times 12^2 \times \sin 72 + \text{area } OMB + \text{area } MBX$ oe</p> <p>or M1 for a correct method to find area of one relevant triangle AOB, OMB, MBX, OBX or ONX seen</p>
8(a)(i)	15.7 or 15.70...	4	<p>M2 for $16.5^2 + 12.4^2 - 2 \times 16.5 \times 12.4 \times \cos 64$ or M1 for implicit form</p> <p>A1 for 246 to 247</p>

Question	Answer	Marks	Partial Marks
8(a)(ii)	18.7 or 18.68 to 18.69	4	B1 for 32 or angle $DBM = 37$ or angle $CBM = 58$ M2 for $\frac{12.4 \times \sin 53}{\sin 32}$ oe or M1 for implicit form oe
8(b)(i)	116.1 or 116.08 to 116.09...	2	M1 for $\frac{y}{360} \times 2 \times \pi \times 3.8 = 7.7$ oe
8(b)(ii)	14.6 or 14.61 to 14.63...	2	M1 for $\frac{\text{their(b)(i)}}{360} \times \pi \times 3.8^2$ oe
9(a)	12.8[0]	4	M1 for midpoints soi M1 for use of $\sum fm$ with m in correct interval including both boundaries M1 (dep on 2nd M1) for $\sum fm \div 100$
9(b)	54 84 93	2	B1 for 2 correct or 1 error and 2 correct or FT
9(c)	correct diagram with all points correctly plotted	3	B1FT <i>their (b)</i> for plots at 5 correct heights B1 for 5 points at upper ends of intervals on correct vertical line B1FT (dep on at least B1) for increasing curve or polygon through 5 points After 0 scored, SC1FT for 4 correct points plotted
9(d)(i)	9 to 9.8 final answer	1	
9(d)(ii)	8.5 to 11.5	2	B1 for [UQ =] 15.5 to 17.5 or [LQ =] 6 to 7 seen
9(d)(iii)	10, 11 or 12	2	B1 for 88 to 90 seen or for answer between 10 and 12
10(a)(i)	18[.0] or 17.99 to 18.00...	3	M2 for $\sqrt[3]{\frac{24430 \times 3}{4\pi}}$ oe or M1 for $\frac{4}{3}\pi r^3 = 24430$
10(a)(ii)	447 or 446.8 to 446.9...	3	M2 for $\pi \times 50^2 \times 60 - 24430$ oe or M1 for $\pi \times 50^2 \times 60$ oe

Question	Answer	Marks	Partial Marks
10(b)	4 [hours] 30 [mins] nfww	4	B3 for 16200 or 4.5 or 270 or M2 for $\frac{\text{figs } 18 \times \text{figs } 15 \times \text{figs } 12}{\text{figs } 2}$ oe or M1 for $\text{figs } 18 \times \text{figs } 15 \times \text{figs } 12$ oe
10(c)	12.5 or 12.50...	3	M2 for $17 \times \sqrt{\frac{159.5}{295}}$ oe or M1 for $\sqrt{\frac{159.5}{295}}$ or $\sqrt{\frac{295}{159.5}}$ seen or for $\frac{159.5}{295} = \frac{x^2}{17^2}$ oe
11(a)	40 54 26 34	4	B1 for each
11(b)	$n^2 + 3n$ or $n(n+3)$ oe	2	B1 for a quadratic expression or for 2nd common difference 2 (at least 2 shown) or for 2 correct equations seen or for subtracting n^2
11(c)	100	2	M1 for <i>their (b)</i> = 10300 seen
11(d)	$[a =] \frac{1}{2}$ oe and $[b =] \frac{5}{2}$ oe	2	B1 for each or M1 for one correct equation or for 2nd difference = 1 soi (at least 2 shown)

MATHEMATICS

0580/22

Paper 2 (Extended)

March 2019

MARK SCHEME

Maximum Mark: 70

Published

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2	330	1	
3	$\frac{23}{99}$	1	
4(a)	0.047	1	
4(b)	2.76×10^6	1	
5	467.42 or 467	2	M1 for $500 \div 1.0697$
6	70	2	M1 for $25\,000 \times 0.0028$ oe
7	308	2	M1 for $180 + 128$ oe or 52 seen
8	$x + 7y$	2	M1 for a correct route
9	$[y =] \frac{1}{4}(x - 4)$ oe final answer	2	M1 for $y = k(x - 4)$
10	375	3	M2 for $2(12 \times 5 + 12 \times 7.5 + 5 \times 7.5)$ oe or M1 for 12×5 or 12×7.5 or 5×7.5
11	$22\frac{2}{9}$ or 22.2 or 22.22...	3	M2 for $\frac{77 - 63}{63} [\times 100]$ oe or $\frac{77}{63} \times 100 [- 100]$ oe or M1 for $\frac{77}{63}$ oe
12	4.21 or 4.212....	3	M2 for $\sqrt{\frac{275 \times 3}{14.8 \times \pi}}$ oe or M1 for $275 = \frac{1}{3} \times \pi \times r^2 \times 14.8$ oe

Question	Answer	Marks	Partial Marks
13(a)	$k(7k - 15)$ final answer	1	
13(b)	$4(m + p)(3 + 2m + 2p)$ final answer	2	B1 for $(m + p)(12 + 8(m + p))$ or $(m + p)(12 + 8m + 8p)$ or $(4m + 4p)(3 + 2m + 2p)$ or $(2m + 2p)(6 + 4m + 4p)$ or $2(2m + 2p)(3 + 2m + 2p)$ or $2(m + p)(6 + 4m + 4p)$
14	6290[.0...]	3	M2 for $\frac{6999.31}{\left(1 + \frac{2.16}{100}\right)^5}$ or M1 for $[A]\left(1 + \frac{2.16}{100}\right)^5$
15	73	3	B1 for angle $PBC = 52$ B1 for APO or $BPC = 55$ or APC or $OPB = 125$
16	tangent ruled at $x = 2$	B1	
	-0.7 to -0.3	B2	dep on B1 or a close attempt at tangent at $x = 2$ or M1 for rise/run for their tangent at $x = 2$ must see correct or implied calculation from a drawn tangent
17(a)	-3	1	
17(b)	$\frac{m}{4}$ or $0.25m$ final answer	2	B1 for $\frac{1}{4}$ or 0.25 or 4^{-1} or m correct in final answer
18	917 or 918 or 917.4 to 917.6	3	M2 for $\pi \times 2.6^2 \times 12 \times 60 \times 60 \div 1000$ or M1 for $\pi \times 2.6^2$ isw or $12 \times 60 \times 60 \div 1000$ isw If 0 scored SC1 for figs 917 to 918
19	$\frac{b}{a+b}$ final answer	3	B1 for $b(a-b)$ B1 for $(a+b)(a-b)$
20(a)	$\begin{pmatrix} 7 & 8 \\ -11 & 36 \end{pmatrix}$	2	B1 for 2 correct elements
20(b)	4	2	M1 for $3x - (-1) \times (-7) = 5$ or better

Question	Answer	Marks	Partial Marks
21	$\frac{25}{8}$	B1	or $\frac{75}{24}$
	<i>their</i> $\frac{25}{8} \times \frac{12}{5}$ or <i>their</i> $\frac{75}{24} \div \frac{10}{24}$ oe	M1	$\frac{75}{24} \times \frac{24}{10}$
	<i>their</i> $\frac{300}{40}$ oe	M1	oe e.g. $\frac{1800}{240}$, $\frac{75}{10}$, $\frac{60}{8}$, $\frac{30}{4}$, $\frac{15}{2}$
	$7\frac{1}{2}$ cao	A1	
22(a)	$1\frac{2}{3}$ or 1.67 or 1.666 to 1.667	1	
22(b)	1062.5	3	M2 for $\frac{25}{2}(50+35)$ oe or M1 for one area
23(a)	(4.5, -1)	2	B1 for each
23(b)	$[y =] \frac{5}{8}x + \frac{7}{4}$	4	M1 for $\frac{-5-3}{7-2}$ oe M1 for -1 / <i>their</i> $-\frac{8}{5}$ M1 for $3 = 2 \times$ <i>their</i> gradient + c oe
24(a)	5.95 or 5.954...	3	M2 for $\frac{7.4}{\sin 97} \times \sin 53$ or M1 for $\frac{\sin 97}{7.4} = \frac{\sin 53}{SR}$ oe
24(b)	3.73 or 3.733 to 3.734	4	M2 for $8.5^2 + 7.4^2 - 2 \times 8.5 \times 7.4 \times \cos 26$ or M1 for implicit form A1 for 13.9[4...]

MATHEMATICS

0580/42

Paper 4 (Extended)

March 2019

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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GENERIC MARKING PRINCIPLE 2:

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- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
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- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

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GENERIC MARKING PRINCIPLE 6:

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Abbreviations

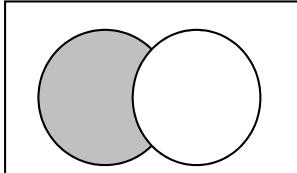
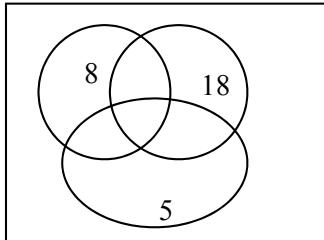
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soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	473	2	M1 for $645 \div (11 + 4)$
1(b)	212.5	2	M1 for 50×4.25
1(c)	31.5 or 31.45 to 31.46	3	M2 for $54 \div 1\frac{43}{60}$ oe or M1 for time = 1h 43min or 103 [mins] or $54 \div$ their time
1(d)	875	1	
1(e)	10.4 or 10.38 to 10.39	1	
1(f)(i)	30 [\times] 70 and 2100	1	
1(f)(ii)	both numbers rounded up oe	1	
2(a)(i)	Reflection $x = 1.5$	2	B1 for each
2(a)(ii)	Rotation $(0, -1)$ 90° [anticlockwise] oe	3	B1 for each
2(b)(i)	Image at $(5, -1)$ $(6, -1)$ $(6, -3)$	2	B1 for correct size and orientation but wrong position If 0 scored, SC1 for enlargement SF $\frac{1}{2}$ with centre $(3, 0)$
2(b)(ii)	Image at $(-6, 3)$ $(-4, 3)$ $(-6, 7)$	2	B1 for translation $\begin{pmatrix} -3 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 1 \end{pmatrix}$
2(b)(iii)	Image at $(2, -1)$ $(2, -3)$ $(6, -3)$	3	M2 for 3 correct coordinates soi or M1 for $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} -1 & -3 & -3 \\ 2 & 2 & 6 \end{pmatrix}$ or B1 for stating reflection in $y = x$

Question	Answer	Marks	Partial Marks
3(a)	$\frac{5}{9}$ oe	1	
3(b)	$\frac{80}{153}$ oe	3	M2 for $2 \times \frac{10}{18} \times \frac{8}{17}$ oe or M1 for $\frac{10}{18} \times \frac{8}{17}$ oe If 0 scored, SC1 for $\frac{160}{324}$ oe
3(c)	$\frac{11}{51}$ oe	4	M3 for $\frac{10}{18} \times \frac{9}{17} \times \frac{8}{16} + \frac{8}{18} \times \frac{7}{17} \times \frac{6}{16}$ oe or M2 for $\frac{10}{18} \times \frac{9}{17} \times \frac{8}{16}$ oe or $\frac{8}{18} \times \frac{7}{17} \times \frac{6}{16}$ oe or M1 for $\frac{10}{18}, \frac{9}{17}, \frac{8}{16}$ or $\frac{8}{18}, \frac{7}{17}, \frac{6}{16}$ If 0 scored, SC1 for $\frac{1512}{5832}$ oe
4(a)	Correct ruled line with D marked	2	B1 for correct ruled line or short line
4(b)	47.5	2	B1 for 9.5 or 95 mm seen or for answer figs 465 to figs 485
4(c)	Correct arc radius 7 cm	2	B1 for complete arc other radius, centre A or correct but short arc
	Correct ruled perpendicular bisector of BC with correct pairs of arcs	2	B1 for correct perpendicular bisector without correct arcs or for correct arcs, no/incorrect line
	Correct ruled bisector of angle BCD with correct pairs of arcs	2	B1 for correct angle bisector without correct arcs or for correct arcs, no/incorrect line
	correct region shaded	1	Dep on at least B1B1B1 and five boundaries one of which is an arc
4(d)	[1 :] 500	1	

Question	Answer	Marks	Partial Marks
5(a)	-2.1, 1.6, -1.7, 2.1	3	B2 for 3 correct or B1 for 2 correct
5(b)	Fully correct curve	4	B3FT for 8 or 9 correct plots or B2FT for 6 or 7 correct plots or B1FT for 4 or 5 correct plots
5(c)	line $y = \frac{1}{2}(1-x)$ ruled	M2	M1 for line with gradient $-\frac{1}{2}$ M1 for line through $(0, \frac{1}{2})$ but not $y = \frac{1}{2}$
	-2.15 to -2.01 -0.45 to -0.2 2.25 to 2.45		B2 B1 for two correct
5(d)	number of intersections of <i>their</i> curve and the line $y = 1$	1	strict FT for <i>their</i> curve
6(a)	5.83 or 5.832 to 5.833	5	B2 for sector angle = 210 soi or M1 for $[\cos DOE =] \frac{0.25}{0.5}$ oe M2 for $\frac{\text{their } 210}{360} \times 2 \times \pi \times 0.5 + 2 \times 1.5 + 2 \times 0.5$ oe or M1 for $\frac{\text{their } 210}{360} \times 2 \times \pi \times 0.5$ oe isw
6(b)	1.21 or 1.208...	3	M2 for $\frac{\text{their } 210}{360} \times \pi \times 0.5 \times 0.5 + 1.5 \times 0.5$ oe or M1 for $\frac{\text{their } 210}{360} \times \pi \times 0.5 \times 0.5$ oe isw
6(c)(i)	4[.00...]	3	M2 for $0.5 \times \sqrt{\frac{77.44}{\text{their(b)}}}$ oe or M1 for $\sqrt{\frac{77.44}{\text{their(b)}}}$ or $\sqrt{\frac{\text{their(b)}}{77.44}}$ or for $\frac{\text{their(b)}}{77.44} = \frac{0.5^2}{r^2}$ oe
6(c)(ii)	2.20704	3	M2 for $77.44 \times 1.5 \times 19 \div 1000$ oe or M1 for figs 2207[04] or figs 221 seen or [vol =] 77.44×1.5

Question	Answer	Marks	Partial Marks
7(a)(i)	111.25	4	M1 for midpoints soi (25, 75, 112.5, 137.5, 175) M1 for $\sum fx$ with x in correct interval including both boundaries M1 (dep on 2nd M1) for $\sum fx \div 20$
7(a)(ii)	2 7 11 17	2	B1 for three correct
7(a)(iii)	$\frac{3}{20}$ oe	1	
7(b)	20 6	2	B1 for one correct value or [SF =] 5 or $\frac{1}{5}$ oe
7(c)(i)	5 nfww	3	M2 for $\sum fx \div \sum f = 4.28$ oe or M1 for $179 + 7x$ oe or $4.28 \times (45 + x)$ oe seen
7(c)(ii)	3	1	
7(c)(iii)	4	1	
8(a)	-3	1	
8(b)	$\frac{12}{11}$ oe	2	M1 for $\frac{3}{x+2}$ soi
8(c)	$64x - 45$ final answer	2	M1 for $8(8x - 5) - 5$ isw
8(d)	$\frac{x+5}{8}$ oe final answer	2	M1 for a correct first step $y + 5 = 8x$, $\frac{y}{8} = x - \frac{5}{8}$ or $x = 8y - 5$
8(e)	$\frac{8x^2 + 11x - 13}{x+2}$ final answer	3	M1 for $(8x - 5)(x + 2) - 3$ oe isw B1 for common denominator $(x + 2)$

Question	Answer	Marks	Partial Marks
8(f)(i)	$(8x - 5)^2 + 6 = 19$	M1	
	$64x^2 - 40x - 40x + 25$	B1	
	$64x^2 - 40x - 40x + 25 + 6 = 19$ oe leading to $16x^2 - 20x + 3 = 0$	A1	with no errors and must show $(8x - 5)^2 + 6 = 19$ with no omissions after this
8(f)(ii)	$\frac{[-]20 \pm \sqrt{([-]20)^2 - 4(16)(3)}}{2 \times 16}$ oe	2	B1 for $\sqrt{([-]20)^2 - 4(16)(3)}$ or better or B1 for $\frac{[-]20 + \sqrt{q}}{2(16)}$ oe or $\frac{[-]20 - \sqrt{q}}{2(16)}$
	0.17 and 1.08 final ans	2	B1 for each If 0 scored, SC1 for answer 0.2 and 1.1 or answer –0.17 and –1.08 or 0.174... and 1.075 to 1.076 seen or 0.17 and 1.08 seen in working
9(a)(i)(a)	\in	1	
9(a)(i)(b)	$A \cap B$	1	
9(a)(ii)	B or A'	1	
9(b)		1	
9(c)(i)	$3x + 7 = 19$ oe	M1	must see 19 and 7
	$3x = 19 - 7$ or better leading to $x = 4$	A1	with no errors seen
9(c)(ii)		2	B1 for 2 correct
9(c)(iii)	\emptyset or { }	1	
9(c)(iv)	15	1	

Question	Answer	Marks	Partial Marks
10(a)	correctly equating one set of coefficients	M1	or making x or y the subject of one equation correctly
	correct method to eliminate one variable	M1	or substitution for x or y for <i>their</i> rearranged formula
	$x = 7$ $y = -3$	A2	A1 for one correct value If A0 scored, SC1 for 2 values satisfying one of the original equations or if no working shown, but 2 correct answers given
10(b)	2	3	M1 for $y = \frac{k}{(x+3)^2}$ oe M1 for $y = \frac{\text{their } k}{(7+3)^2}$ oe OR M2 for $8(2+3)^2 = y(7+3)^2$ oe
10(c)	$x > -5$ final answer	3	M1 for $3x - 6 < 7x + 14$ M1 for <i>their</i> (-6) – <i>their</i> 14 < $7x - 3x$ oe
11(a)(i)	77 243	2	B1 for each
11(a)(ii)(a)	$2n^2 + 5$ oe	2	M1 for a quadratic expression as the answer or B1 for common 2nd difference of 4
11(a)(ii)(b)	3^{n-1} oe	2	B1 for 3^k oe where k is a linear function of n
11(b)(i)	21	1	
11(b)(ii)	11	3	B2 for $(4n + 45)(n - 11)$ seen or B1 for $4n^2 + n + 3 = 498$ oe

MATHEMATICS

0580/22

Paper 2 (Extended)

October/November 2018

MARK SCHEME

Maximum Mark: 70

Published

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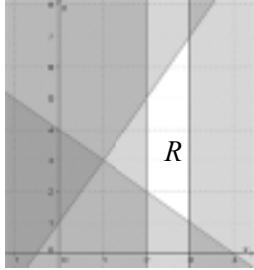
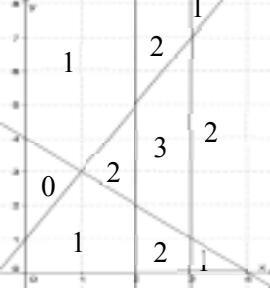
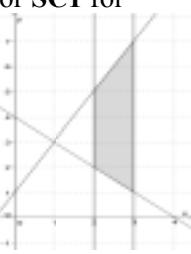
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soi	seen or implied

Question	Answer	Marks	Partial Marks
1	2.3×10^4	1	
2	5	1	
3	4	1	
4	$6x - 2x^3$ final answer	2	B1 for $6x$ or $-2x^3$
5	$\left[\frac{1}{15} + \right] \frac{2 \times 3}{5 \times 3}$	M1	or better e.g. $\left[\frac{1}{15} + \right] \frac{6}{15}$ Allow any correct common denominator $15k$
	$\frac{7}{15}$ cao		A1
6	$m \geq 3$ final answer	2	M1 for correct first step e.g. $7m \geq 19 + 2$
7(a)	$C \cap D = \{10\}$	1	
7(b)	7	1	
8	$(x + 5)(y + 2)$ final answer	2	B1 for $y(x + 5) + 2(x + 5)$ or $x(y + 2) + 5(y + 2)$
9	26 600 cao	2	M1 for $30000 \times \left(1 - \frac{2}{100}\right)^6$ oe
10	$\left(2w, \frac{r+t}{2}\right)$ final answer	2	B1 for $2w$ oe nfww or $\frac{r+t}{2}$ oe
11	34.5 and 37.5 final answers	2	B1 for 11.5 or 12.5 seen or M1 for $(12 - 0.5) \times 3$ or $(12 + 0.5) \times 3$
12	154.5 or 154.5...	2	B1 for 25.5 or 25.46 to 25.47 or M1 for $180 - \sin^{-1}(0.43)$ oe
13	$6n - 10$ oe	2	B1 for $6n + c$ or $kn - 10$ ($k \neq 0$)

Question	Answer	Marks	Partial Marks
14	Correct region identified 	3	B marks  or SC1 for 
15(a)	$\begin{pmatrix} 15 & -9 \\ -3 & 6 \end{pmatrix}$	1	
15(b)	$\frac{1}{7} \begin{pmatrix} 2 & 3 \\ 1 & 5 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} 2 & 3 \\ 1 & 5 \end{pmatrix}$ soi or $\det = 7$ soi
16	$(a =) 36$ $(b =) -6$	3	B2 for $a = 36$ or M1 for $b = -6$ or $x^2 + bx + bx + b^2$ or better or $b^2 = a$
17	$-2x + 5$	4	M1 for $\frac{7-2}{9-1}$ oe M1 for gradient of perpendicular = $\frac{-1}{\text{their } 0.5}$ M1 for (1, 3) correctly substituted into <i>their</i> $y = -2x + c$
18	Correct pie chart e.g. 	4	B3 for correct chart no labels or for 2 correct sectors with or without labels or B2 for 3 correct angles seen (171° , 135° and 54°) or 3 correct percentages (47.5%, 37.5% and 15%) or M1 for method e.g. $\frac{57}{120} \times 360$, 57×3 or $\frac{57}{120} \times 100$ oe or one correct sector on the pie chart
19(a)	Correct ruled bisector with two pairs of arcs	2	B1 for correct ruled bisector with no/wrong arcs
19(b)	Correct arc centre E radius 3 cm inside pentagon	1	
19(c)	Correct region shaded	1	Dependent on at least B1 in part (a) and 1 mark in part (b) and a closed region

Question	Answer	Marks	Partial Marks
20	$\frac{2x}{3+x}$ oe final answer	4	<p>M1 for correctly clearing the denominator and expanding bracket</p> <p>M1 for correctly collecting terms in m on one side and terms not in m on the other</p> <p>M1 for correct factorising</p> <p>M1 for correct division dependent on m appearing only once in a factorised expression</p>
21	30.2 or 30.20 to 30.21...	4	<p>M3 for $\frac{1}{2} \times 10 \times 10 \times \sin 60 - \frac{60}{360} \times \pi \times \left(\frac{10}{2}\right)^2$</p> <p>or M1 for $\frac{k}{360} \times \pi \times \left(\frac{10}{2}\right)^2$ oe</p> <p>and M1 for $\frac{1}{2} \times 10 \times 10 \times \sin c$ oe</p>
22	25.1 or 25.06...	4	<p>M3 for $\tan = \frac{8}{\sqrt{16.2^2 + 5.5^2}}$ oe</p> <p>or M2 for $\sqrt{16.2^2 + 5.5^2}$</p> <p>or M1 for $16.2^2 + 5.5^2$</p> <p>or B1 for identifying correct angle</p>
23(a)	$2^3 \times 7$ or $2 \times 2 \times 2 \times 7$	2	B1 for identifying 2 and 7 as the only prime factors
23(b)	168	2	B1 for $168k$ or $2 \times 2 \times 2 \times 3 \times 7$ oe or for listing multiples of each up to 168
24(a)	25	1	
24(b)	12	2	B1 for 16 or 28
24(c)	5	2	B1 for 75
25(a)(i)	$5x^3 + 2$ final answer	1	
25(a)(ii)	$\frac{x-2}{5}$ final answer	2	<p>M1 for correct first step e.g. $y - 2 = 5x$, $x = 5y + 2$, $\frac{y}{5} = x + \frac{2}{5}$</p>
25(b)	5	2	M1 for $a \times (-2)^2 + 1 = 21$

MATHEMATICS

0580/42

Paper 4 (Extended)

October/November 2018

MARK SCHEME

Maximum Mark: 130

Published

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soi	seen or implied

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1(a)(i)	1200	2	M1 for $1962 \div 1.635$
1(a)(ii)	1667.7[0] final answer	2	M1 for $1962 \times (1 - \frac{15}{100})$ oe or B1 for 294.3[0] If 0 scored, SC1 for answer 1020
1(a)(iii)	275	2	M1 for $220 \div \text{their } (5 - 1)$ soi
1b(i)	165	3	M2 for $\frac{9752 - 3680}{3680} [\times 100]$ oe or $\frac{9752}{3680} \times 100$ oe or M1 for $\frac{9752}{3680}$ or $9752 - 3680$
1b(ii)	51200	3	M2 for $\frac{74240}{100 + 45} [\times 100]$ oe or M1 for 74 240 associated with 145[%] oe
2(a)	-1.5	3	M1 for $30 + 2x = 9 - 12x$ or $10 + \frac{2}{3}x = 3 - 4x$ M1 for collecting <i>their</i> terms correctly to reach $ax = b$
2(b)	$6ab^2(2b + 3a^2)$ final answer	2	M1 for any correct partial factorisation seen or for correct answer seen
2(c)(i)	$10a^5c^9$ final answer	2	B1 for final answer with $10a^k c^9$ or $10a^5 c^k$ or $ka^5 c^9$
2(c)(ii)	$\frac{8a^6}{c^9}$ or $8a^6 c^{-9}$ final answer	2	B1 for final answer with $\frac{8a^6}{c^k}$ or $\frac{8a^k}{c^9}$ or $\frac{ka^6}{c^9}$ [$k \neq 0$] or for correct answer seen

Question	Answer	Marks	Partial Marks
2(d)	0.5 or $\frac{1}{2}$	3	M1 for $y = \frac{k}{(x+2)^2}$ oe B1 for $k = 50$ or M2 for $2(3+2)^2 = y(8+2)^2$ oe
2(e)	$\frac{7x-x^2}{2(x-2)}$ or $\frac{7x-x^2}{2x-4}$ oe final answer	3	M1 for $5 \times 2 - (x-5)(x-2)$ oe seen M1 for common denominator $2(x-2)$ oe isw
3(a)	Rotation 90° clockwise oe Origin oe	3	B1 for each
3(b)(i)	Image at $(-4, -1) (-4, -4) (-2, -4)$	1	
3(b)(ii)	Image at $(3, -1) (5, -1) (3, -4)$	2	B1 for translation by $\begin{pmatrix} 7 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$ or for 3 correct points not joined
3(b)(iii)	Image at $(-2, \frac{1}{2}) (-2, 2) (-1, 2)$	3	B2 for 3 correct co-ordinates soi in working or correct size and orientation in wrong position or M1 for $\begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix} \begin{pmatrix} -4 & -4 & -2 \\ 1 & 4 & 4 \end{pmatrix}$ shown or for statement: enlargement, sf 0.5, $(0, 0)$
4(a)	$\frac{1}{2} \times 4(x-1) \times (2x+5)[\sin 90] = 30$ oe	M1	
	$8x^2 - 8x + 20x - 20$ or better	B1	correct expansion of brackets
	Completion to $2x^2 + 3x - 20 = 0$	A1	with no errors or omissions seen
4(b)	$(2x-5)(x+4)$	M2	Allow M2 for e.g. $2x(x+4) - 5(x+4)$ then $2x-5 [= 0]$ and $x+4 [= 0]$ M1 for $2x(x+4) - 5(x+4)$ or $x(2x-5) + 4(2x-5)$ or $(2x+a)(x+b) [= 0]$ where $ab = -20$ or $a+2b = 3$ [a, b integers]
	2.5 and -4 cao	B1	

Question	Answer	Marks	Partial Marks
4(c)	11.7 or 11.66 ... or 11.67	3	M2dep for $(4(\text{their } 2.5 - 1))^2 + (2 \times \text{their } 2.5 + 5)^2$ or M1dep for $4(\text{their } 2.5 - 1)$ or $2 \times \text{their } 2.5 + 5$ OR B1 for $\sqrt{20x^2 - 12x + 41}$ and M1dep for substituting $x = \text{their } 2.5$ into $\sqrt{20x^2 - 12x + 41}$ at any stage
5(a)	-3, 17	2	B1 for each
5(b)	Fully correct curve	4	B3 FT for 10 or 11 points or B2 FT for 8 or 9 points or B1 FT for 6 or 7 points
5(c)(i)	Correct ruled tangent for <i>their</i> curve through $(0, -17)$	1	
5(c)(ii)	(1.7 to 2.2, -1 to 2.5)	1	
5(c)(iii)	$[y =] 9x - 17$ final answer	3	M2dep for answer $[y =] 9x[+] - c$ OR M1dep for gradient = $\frac{\text{rise}}{\text{run}}$ for <i>their</i> tangent at any point B1 for answer $[y =] kx[+] - 17$ ($k \neq 0$)
5(d)	$y = 3x + 2$ ruled correctly and -2.2 ... to -2.1 -0.6 to -0.4 2.6 to 2.8	4	B2 for $y = 3x + 2$ ruled or B1 for $[y =] 3x + 2$ soi or $y = 3x + k$ ruled or $y = kx + 2$ but not $y = 2$ B2 for all 3 values or B1 for 2 values
6(a)	0.6	1	
6(b)	50.7	3	M2 for $1.2 \times 19 + \frac{1}{2}(19 + 12) \times 1.8$ oe or M1 for method for finding any relevant area
6(c)	17.9	3	M2 for <i>their</i> $50.7 - 1.2 \times 19$ [-10] oe or M1 for 1.2×19 oe seen isw
7(a)	29	1	
7(b)	128	2	FT $180 - 2(55 - \text{their (a)})$ M1 for angle OCA or angle $OAC = 55 - \text{their (a)}$ soi

Question	Answer	Marks	Partial Marks
7(c)	64	1	FT <i>their (b) ÷ 2</i>
7(d)	116	1	FT $180 - \text{their (c)}$
8(a)	370 or 370.2 to 370.3	2	M1 for $864 \div \text{their time}$
8(b)	991 or 990.5 ...	4	M2 for $864^2 + 928^2 - 2 \times 864 \times 928 \cos 67$ or M1 for correct implicit version A1 for 981100 to 981110
8(c)(i)	313	2	M1 for $180 + 133$ or $360 - 47$
8(c)(ii)	[0]79.5 to [0]79.6 ...	4	M2 for $\frac{928 \times \sin 67}{\text{their } 991}$ or $\frac{864 \times \sin 67}{\text{their } 991}$ oe or M1 for implicit form of either A1 for [angle $HGB =]$ 59.5 to 59.6 ... or [angle $HBG =]$ 53.4 or 53.37 to 53.42 M1 dep for <i>their angle HGB + 20</i> leading to answer or for $133 - \text{their angle } HBG$ leading to answer
9(a)(i)	42.8 or 42.79 ... nfww	4	M1 for mid-values soi M1 for Σfm where m is any value in interval including boundaries M1 (dep on second M1) for <i>their $\Sigma fm \div 120$</i>
9(a)(ii)	Blocks of height 1.8 4.4 8 2.1 with correct widths	4	B1 for each correct block If B0 , SC1 for correct frequency densities seen
9(b)	Valid general comment about distributions	1	e.g. [On average], shoppers spend less time shopping on Wednesday oe
10(a)(i)	$75000 \times 60 \times 20$ oe	M1	Allow $\times 1200$ for $\times 60 \times 20$
10(a)(ii)	16.4 or 16.36 ...	3	M2 for $\frac{9 \times 10^7 \times 100}{1000 \times 55 \times 10^4}$ oe or B2 for answer 0.164 or 0.1636 ... or B1 for answer figs 164 or 1636 ... or M1 for figs 9 ÷ figs 55
10(a)(iii)	28.3 or 28.27 to 28.28	3	M2 for $\frac{76}{360} \times 2\pi \times 8.5 + 2 \times 8.5$ oe or M1 for $\frac{76}{360} \times 2\pi \times 8.5$ oe

Question	Answer	Marks	Partial Marks
10(b)(i)	3770 or 3769 to 3770. ...	2	M1 for $\frac{1}{3} \times \pi \times 10^2 \times 36$
10(b)(ii)	3.68 or 3.683 to 3.684 ...	4	M3 for $[r^3 =] \frac{1}{2} \times \text{their (b)(i)} \times \frac{3}{4\pi \times 9}$ oe or M2 for $\frac{4\pi r^3}{3} + \frac{4\pi(2r)^3}{3} = \frac{1}{2} \times \text{their (b)(i)}$ or for $\frac{4\pi r^3}{3} = \frac{1}{1+8} \times \frac{1}{2} \times \text{their (b)(i)}$ or M1 for $\frac{4\pi r^3}{3} + \frac{4\pi(2r)^3}{3}$ or $\frac{1}{2} \times \frac{\pi \times 10^2 \times 36}{3}$ or $\frac{1}{2} \text{ their (b)(i)}$ seen or ratio of vols = $1 : 2^3$ oe seen
11(a)(i)	$\begin{pmatrix} -19 \\ -2 \end{pmatrix}$	2	B1 for answer $\begin{pmatrix} -19 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$ or for $\begin{pmatrix} -9 \\ 6 \end{pmatrix}$ or $\pm \begin{pmatrix} 10 \\ 8 \end{pmatrix}$ seen
11(a)(ii)	3.61 or 3.605 to 3.606	2	M1 for $\sqrt{(-3)^2 + 2^2}$ oe
11(a)(iii)	$-3m + 5n = 14$ and $2m + 4n = 9$	B1	Accept equivalents
	$[m =] -\frac{1}{2}$ or -0.5 and $[n =] 2\frac{1}{2}$ or 2.5 or $\frac{5}{2}$ with evidence of a correct algebraic method	4	M1 for correctly equating one set of coefficients of <i>their</i> equations or rearranges one of <i>their</i> equations to make <i>m</i> or <i>n</i> the subject e.g. $[m =] \frac{1}{2}(9 - 4n)$ oe M1 for correct method to eliminate one variable for <i>their</i> equations or correctly substitutes <i>their m</i> or <i>their n</i> into the other equation e.g. $-\frac{3(9 - 4n)}{2} + 5n = 14$ oe B1 for one correct answer
11(b)(i)(a)	$-\mathbf{a} + 2\mathbf{c}$	1	
11(b)(i)(b)	$\frac{3}{8}(-\mathbf{a} + 2\mathbf{c})$ or $-\frac{3}{8}\mathbf{a} + \frac{3}{4}\mathbf{c}$ oe	1	FT $\frac{3}{8}$ (<i>their (b)(i)(a)</i>) in simplest form

Question	Answer	Marks	Partial Marks
11(b)(i)(c)	$\frac{1}{2}(5\mathbf{a} - 2\mathbf{c})$ or $\frac{5}{2}\mathbf{a} - \mathbf{c}$ oe	1	
11(b)(i)(d)	$\frac{1}{8}(5\mathbf{a} - 2\mathbf{c})$ or $\frac{5}{8}\mathbf{a} - \frac{1}{4}\mathbf{c}$ oe	2	M1 for a correct unsimplified route
11(b)(ii)	4	1	
12(a)(i)	$\frac{10}{20} \times \frac{9}{19}$ oe	M2	B1 for $\frac{9}{19}$ oe seen
12(a)(ii)	$\frac{62}{95}$ oe	4	M3 for $\frac{6}{20} \times \frac{14}{19} + \frac{10}{20} \times \frac{10}{19} + \frac{4}{20} \times \frac{16}{19}$ oe or $1 - \frac{6}{20} \times \frac{5}{19} - \frac{10}{20} \times \frac{9}{19} - \frac{4}{20} \times \frac{3}{19}$ oe or M2 for the sum of two products of different flavours isw or M1 for one correct product of different flavours isw
12(b)	$\frac{5}{57}$ oe	3	M2 for $N \times \left(\frac{4}{20} \times \frac{3}{19} \times \frac{16}{18} \right) + \frac{4}{20} \times \frac{3}{19} \times \frac{2}{18}$ oe or for $3 \left(\frac{4}{20} \times \frac{3}{19} \times \frac{16}{18} \right)$ oe or $1 - \{N \times \left(\frac{4}{20} \times \frac{16}{19} \times \frac{15}{18} \right) + \frac{16}{20} \times \frac{15}{19} \times \frac{14}{18}\}$ oe or M1 for $\frac{4}{20} \times \frac{3}{19} \times \frac{k}{18}$ oe seen

MATHEMATICS

0580/22

Paper 2 (Extended)

May/June 2018

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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This document consists of 5 printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

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GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	2 [h] 55 [min]	1	
2	$7x - 56$ final answer	1	
3	[$a =$] 15 [$b =$] -27	2	B1 for each or SC1 for reversed answers
4(a)	[$w =$] 7	1	
4(b)	[$12x =$] 36	1	
5	24	2	B1 for 17 or 41 identified
6	$\frac{8}{12}$ and $\frac{1}{12}$ oe $\frac{7}{12}$ cao	M1 A1	For correct fractions with a common denominator $12k$
7	320	2	M1 for $180 + 140$ oe
8(a)	1.36×10^6 oe	1	
8(b)	5.21×10^{-3} oe	1	
9	Correct perpendicular bisector of AB with 2 pairs of correct arcs	2	B1 for correct perpendicular bisector of AB with no or wrong arcs or for 2 pairs of correct arcs
10	$(x + 2)(y + 3)$ final answer	2	B1 for $y(x + 2) + 3(x + 2)$ or $x(y + 3) + 2(y + 3)$
11	80	2	M1 for $\left(\frac{12}{3}\right)^2$ or $\left(\frac{3}{12}\right)^2$ oe or $\frac{3^2}{5} = \frac{12^2}{A}$ oe
12	7 cao nfww	2	B1 for $31 + 0.5$ or $5 - 0.5$ or 31.5 or 4.5 seen
13	15 and 22	2	M1 for 1.5×10 or 1.1×20
14	62	3	M1 for [height =] $21 \div 7$ M1 for $2(1 \times \text{their}3 + \text{their}3 \times 7 + 1 \times 7)$ oe

Question	Answer	Marks	Partial Marks
15	628 or 628.3 to 628.4 cm^3	3	B2 for 628 or 628.3 to 628.4 or M1 for $5^2 \times 8 \times \pi$ B1 for cm^3
16	7.5 nfww	3	M2 for $[OB^2 =] \left(\frac{12}{2}\right)^2 + 4.5^2$ oe or B1 for recognition of right angle
17	30	3	M2 for $\frac{1}{2}(8+2) \times v [= 150]$ oe or M1 for $\frac{1}{2} \times 6 \times v$ or $2 \times v$ oe
18(a)	$d = 4.9t^2$	2	M1 for $d = kt^2$
18(b)	19.6	1	FT their 4.9×4
19	$y > 2$ oe final answer $y \geq 3 - x$ oe final answer	3	B1 for $y > 2$ oe final answer B2 for $y \geq 3 - x$ oe final answer or B1 for $y = 3 - x$ oe soi or SC2 for $y \geq 2$ oe and $y > 3 - x$ oe final answer
20(a)	\mathbf{C}^2	2	B1 for any correct matrix calculation evaluated
20(b)	-9	1	
20(c)	The determinant is 0 oe	1	e.g. it is singular.
21(a)	140 000	1	
21(b)	Points correctly plotted at (40, 80) and (80, 150)	1	
21(c)	Correct ruled line of best fit	1	
21(d)	80 000 to 110 000	1	FT their straight line provided it has positive gradient
22(a)	$6\mathbf{a} - 2\mathbf{b}$ or $2(3\mathbf{a} - \mathbf{b})$	2	M1 for $4\mathbf{a} + \mathbf{b} - (-2\mathbf{a} + 3\mathbf{b})$ or better
22(b)	$5\mathbf{a} - \mathbf{b}$	2	M1 for a correct route e.g. $\overrightarrow{OD} + \overrightarrow{DE}$, $4\mathbf{a} + \mathbf{b} + \mathbf{a} - 2\mathbf{b}$, \overrightarrow{OE}
23(a)	5	3	M2 for $20 - x + x + 8 - x = 23$ or better or B1 for identifying the correct region $A \cup B$
23(b)	$\frac{7}{30}$ oe	2	B1 for $\frac{7}{c}$ or $\frac{k}{30}$

Question	Answer	Marks	Partial Marks
24(a)	$\frac{4}{5}$ oe	2	M1 for $\frac{2}{3} \times p = \frac{8}{15}$ or better
24(b)	$\frac{1}{15}$ oe	3	3FT $(1 - \text{their } \frac{4}{5}) \times \frac{1}{3}$ correctly evaluated M2 for $(1 - \text{their } \frac{4}{5}) \times (1 - \frac{2}{3})$ oe or M1 for $1 - \text{their } \frac{4}{5}$ or $1 - \frac{2}{3}$
25(a)	$[y =] -\frac{2}{5}x + 3$ or $[y =] -0.4x + 3$ final answer	4	B2 for [gradient of perpendicular =] $-\frac{2}{5}$ oe or M1 for [gradient =] $\frac{24-9}{22-16}$ or $-\frac{22-16}{24-9}$ M1 for substituting (5, 1) into $y = \text{their } mx + c$
25(b)	(20, 19)	2	M1 for $\frac{2}{3}(22-16)+16$ or $\frac{2}{3}(24-9)+9$ oe or SC1 for answer (18, 14)

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2018

MARK SCHEME

Maximum Mark: 130

Published

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isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	85	1	
1(a)(ii)	455	2	M1 for $260 \div 20 \times 35$ oe
1(a)(iii)	61	3	B2 for 61.5... seen or M1 for $2000 \div 650$ soi or for $\frac{x}{2000} = \frac{20}{650}$ oe or other attempt at scaling up with 650 or for $650 \div 20$ oe
1(b)(i)	40	3	M2 for $\frac{1.89 - 1.35}{1.35} [\times 100]$ oe or $\frac{1.89}{1.35} \times 100$ oe or M1 for oe $\frac{1.89}{1.35} [\times 100]$ soi
1(b)(ii)	1.75 nfww	3	M2 for $1.89 \div \left(\frac{100 + 8}{100} \right)$ or better or M1 for 1.89 associated with 108 [%]
1(c)	10.1 or 10.06...	3	M2 for $\sqrt[3]{\frac{20.8}{15.6}}$ oe or M1 for $15.6 \times k^3 = 20.8$ oe
1(d)(i)	14:15	3	B2 for correct unsimplified 3 term ratio A: B: C or correct unsimplified two term ratio A : C or M1 for attempt to find common multiple of 4 and 10 or other common value for B or for $7 \times \frac{4}{10}$ oe or $3 \times \frac{10}{4}$ oe

Question	Answer	Marks	Partial Marks
1(d)(ii)	147	3	M2 for $\frac{45}{15}(14 + 20 [+15])$ oe or $45 \div 3 \times 4 + (45 \div 3 \times 4) \div 10 \times 7 [+ 45]$ or M1 for $45 \div 3$ oe or $45 \div$ their (d)(i) value for C shown
2(a)(i)	$20 [< t \leqslant] 25$	1	
2(a)(ii)	$25 [< t \leqslant] 30$	1	
2(a)(iii)	28.3 or 28.33..	4	M1 for 22.5, 27.5, 32.5, 37.5, 42.5 soi M1 for $\sum fx$ where x is in the correct interval including boundaries M1dep for $\sum fx \div 120$ or $\sum fx \div (44 + 32 + 28 + 12 + 4)$
2(a)(iv)	$\frac{4}{120}$ oe isw	1	
2(b)(i)	76, 104, 116, 120	2	B1 for one error FT other values or for 3 correct
2(b)(ii)	Correct curve	3	B1 for correct horizontal placement for 6 plots B1FT for correct vertical placement for 6 plots B1FT dep on at least B1 for reasonable increasing curve or polygon through their 6 points If 0 scored SC1FT for 5 out of 6 points correctly plotted
2(b)(iii)	27 to 27.5	1	
2(b)(iv)	8.5 to 9.5	2	B1 for $[UQ=] 32$ to 32.5 or $[LQ=] 23$ to 23.5
2(b)(v)	8, 9, 10, 11 or 12	2	B1 for 108 to 112 seen or B1FT their graph reading at 37 mins seen
3(a)(i)	Image at $(3, -3), (7, -3), (7, -5)$	2	B1 for reflection in any $x = k$ or if 3 correct points not joined
3(a)(ii)	Image at $(-5, 1), (-1, 1), (-5, -1)$	2	B1 for translation by $\begin{pmatrix} -2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 4 \end{pmatrix}$ or if 3 correct points not joined

Question	Answer	Marks	Partial Marks
3(a)(iii)	Image at (6, 3), (6, 4), (4, 3)	3	B2 for correct size and orientation but wrong position or if 3 correct points not joined B1 for enlargement SF $\frac{1}{2}$ with centre (3, 1)
3(b)	Rotation 90° [anticlockwise] oe (-6, -2)	3	B1 for each
3(c)	Reflection $y = -x$ oe	2	B1 for each
4(a)(i)	$243p^{10}$ final answer	2	B1 for answer $243p^k$ or kp^{10} ($k \neq 0$)
4(a)(ii)	$9xy^4$ final answer	2	B1 for answer with two correct elements in correct form of expression
4(a)(iii)	$\frac{m^2}{25}$ final answer	1	
4(b)	10	4	B2 for $x = 8$ or for [length of rectangle =] 31 or M1 for $5x - 9 = 3x + 7$ oe or better M1 for $\frac{310}{(3 \times \text{their } x + 7)}$ or $\frac{310}{(5 \times \text{their } x - 9)}$ <u>Alt method using simultaneous eqns</u> M1 for $5xw - 9w = 310$ and $3xw + 7w = 310$ M1 for equating coefficients of xw M1 for subtraction to eliminate term in xw
5(a)	$8^2 + 7^2 - 2 \times 7 \times 8 \times \cos 78$ oe	M2	M1 for correct implicit version
	9.471.. to 9.472	A2	A1 for 89.7...
5(b)	46.3 or 46.29 to 46.30...	3	M2 for $[\sin OAC =] \frac{7 \sin 78}{9.47}$ or M1 for $\frac{\sin OAC}{7} = \frac{\sin 78}{9.47}$

Question	Answer	Marks	Partial Marks
5(c)	$29.5 - (7 + 8 + 9.47)$	M1	
	$\frac{360 \times (29.5 - (7 + 8 + 9.47))}{2 \times \pi \times 7}$	M3	M2 for $\frac{x}{360} \times 2 \times \pi \times 7 = \text{their arc length}$ oe or M1 for $\frac{x}{360} \times 2 \times \pi \times 7$ oe
	41.15 to 41.171..	B1	
5(d)	45[.]0 or 44.98 to 45.01 nfww	4	M3 for $\frac{1}{2} \times 8 \times 7 \times \sin 78$ oe + $\frac{41.2}{360} \times \pi \times 7^2$ oe OR M1 for $\frac{1}{2} \times 8 \times 7 \times \sin 78$ oe or $\frac{1}{2} \times 8 \times 9.47 \times \sin \text{their (b)}$ oe M1 for $\frac{41.2}{360} \times \pi \times 7^2$ oe
6(a)	-2[.]0, -0.2, 2.5	3	B1 for each
6(b)	Fully correct curve	5	B4 for correct curve, but branches joined or B3FT for 9 or 10 correct plots or B2FT for 7 or 8 correct plots or B1FT for 5 or 6 correct plots and B1 indep two separate branches not touching or cutting y-axis
6(c)(i)	Correct tangent and $3 \leq \text{grad} \leq 5$	3	B2 for close attempt at tangent to curve at $x = -2$ and answer in range OR B1 for ruled tangent at $x = -2$, no daylight at $x = -2$ and M1dep (dep on B1 or close attempt at tangent) [at $x = -2$] for $\frac{\text{rise}}{\text{run}}$
6(c)(ii)	[y =] their(c)(i) $x + \text{their } y\text{-intercept}$ final answer	2	Strict FT their y -intercept for their line M1 for $y = \text{their(c)(i)} x + \text{any value}$ or ' c ' oe seen or for $y = \text{any value (non-zero)} x$ or ' mx ' + their y -intercept seen oe
6(d)(i)	1.05 to 1.25	1	
6(d)(ii)	-2.3 to -2.2 -0.4 to -0.3 0.3 to 0.4	3	B1 for each After 0 scored B1 for $y = -4$ ruled

Question	Answer	Marks	Partial Marks
6(e)	[$a =$] 2 [$b =$] 24 [$n =$] 5	3	B2 for 2 correct or for $2x^5 + 24x^2 [-3 = 0]$ or B1 for 1 correct or for $\frac{2x^5 - 3 + 4(6x^2)}{6x^2} [= 0]$ oe If 0 scored SC1 for $2x^5$ seen in final line of algebra
7(a)	$x^2 + (2x - 3)^2 = 6^2$ oe or $x^2 + 4x^2 - 6x - 6x + 9 = 36$	M1	
	$4x^2 - 6x - 6x + 9$ or better	B1	
	$5x^2 - 12x - 27 = 0$	A1	Dep on M1B1 with no errors or omissions
7(b)	$\frac{-(-12) \pm \sqrt{(-12)^2 - 4(5)(-27)}}{2 \times 5}$ or better or $\frac{12}{10} \pm \sqrt{\left(\frac{12}{10}\right)^2 + \frac{27}{5}}$	B2	B1 for $\sqrt{(-12)^2 - 4(5)(-27)}$ or for $\left(x - \frac{12}{10}\right)^2$ oe or $\frac{-(-12) + \sqrt{q}}{2 \times 5}$ oe or $\frac{-(-12) - \sqrt{q}}{2 \times 5}$ oe or both
	- 1.42, 3.82 final answers	B2	B1 for each If B0 , SC1 for answers - 1.4 or - 1.415... to - 1.415 and 3.8 or 3.815 to 3.815... or answers - 1.41 and 3.81 or - 1.42 and 3.82 seen in working or for - 3.82 and 1.42 as final ans
7(c)	14.4 or 14.5 or 14.44 to 14.46	2	2FT for $3 \times$ their positive root + 3 evaluated to 3sf or better M1 for $3 \times$ their positive root + 3 oe
7(d)	39.5 or 39.46 to 39.54...	2	M1 for trig statement seen to find either angle $\sin = \frac{\text{their } x}{6}$ oe or $\sin = \frac{\text{their } (2x - 3)}{6}$ oe
8(a)(i)	1	2	M1 for $h(0)$ or for 2^{8-3x}
8(a)(ii)	8	2	M1 for $g(\frac{1}{4})$ or for $\frac{10}{2^x + 1}$

Question	Answer	Marks	Partial Marks
8(a)(iii)	$\frac{10-x}{x}$ or $\frac{10}{x}-1$ final answer	3	M2 for $x = \frac{10-y}{y}$ or better or $xy = 10 - x$ or better or $y + 1 = \frac{10}{x}$ or M1 for $x(y+1) = 10$ or $y(x+1) = 10$ or $x = \frac{10}{y+1}$ or $x+1 = \frac{10}{y}$
8(a)(iv)	5	1	
8(b)	$\frac{-3x^2 + 5x + 18}{x+1}$ final answer	3	M1 for $\frac{(8-3x)(x+1)+10}{x+1}$ B1 for $-3x^2 - 3x + 8x + 8$ [+10]
9(a)(i)(a)	62 and Isosceles [triangle] and Angle at centre is twice angle at circumference oe	3	B2 for 62 and one correct reason or B1 for 62 with no/wrong reason or for angle $EOD = 124$ soi or for no/wrong angle with correct reason
9(a)(i)(b)	62 and [Angles in] same segment oe or angle at centre is twice angle at circumference oe	2	2FT their (a)(i)(a) and correct reason B1FT for their (a)(i)(a) with no/wrong reason or for no/wrong angle with correct reason
9(a)(ii)	8	3	M2 for $(180 - 109) - 28 - 35$ oe or M1 for [angle $AED =] 180 - 109$ oe
9(b)(i)	24	3	$x = \text{ext angle}$ B2 for $[x =] 15$ isw or M1 for $x + 11x = 180$ oe or for $\frac{180(n-2)}{n} = \frac{360}{n} \times 11$
9(b)(ii)	3960	2	FT (their $24 - 2$) $\times 180$ dep on (b)(i) an integer and > 6 M1 for (their $24 - 2$) $\times 180$ oe or their $24 \times 11 \times$ their 15 oe or 11×360

MATHEMATICS

0580/22

Paper 22 (Extended)

March 2018

MARK SCHEME

Maximum Mark: 70

Published

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This document consists of **6** printed pages.

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GENERIC MARKING PRINCIPLE 5:

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	Positive	1	
2	5.23×10^{-5}	1	
3	2.29 or 2.292...	1	
4	$\frac{8}{9}$ oe, must be fraction	1	
5(a)	5	1	
5(b)	1	1	
6	$5m(3k^2 - 4m^3)$ final answer	2	B1 for $5(3k^2 m - 4m^4)$ or $m(15k^2 - 20m^3)$ or for $5m(3k^2 - 4m^3)$ with one error in a number
7	$2\mathbf{q} + \mathbf{p}$	2	B1 for $CF = 2(\mathbf{q} + \mathbf{p})$ or $BA = \mathbf{q} + \mathbf{p}$ or $DE = \mathbf{q} + \mathbf{p}$ or $DA = 2\mathbf{q}$ or for correct route
8	21400 or 21430 or 21434.[...]	2	M1 for $23000 \times \left(1 - \frac{1.4}{100}\right)^5$ oe
9	-12	2	B1 for 2^3 , 2^{-3} , 2^{12} or 2^{-12}
10	12	3	M2 for $9 \times 8 = 6y$ oe OR M1 for $y = \frac{k}{x}$ oe M1 for $[y =] \text{their } \frac{k}{6}$
11	92	3	M2 for $[600 -](0.18 \times 600 + \frac{2}{3} \times 600)$ or M1 for 108 or 400 seen

Question	Answer	Marks	Partial Marks
12	common denominator 24	B1	accept $24k$
	$\frac{21}{24}$ and $\frac{4}{24}$ oe	M1	
	$1\frac{1}{24}$	A1	
13	correctly eliminating one variable	M1	
	[$x =$] 7 [$y =$] -2	A2	A1 for each If M0 scored SC1 for 2 values satisfying one of the original equations or SC1 if no working shown, but 2 correct answers given
14(a)	similar	1	
14(b)	11.61	3	M2 for $8.6 \times \sqrt{\frac{65.61}{36}}$ or M1 for $\sqrt{\frac{65.61}{36}}$ or $\sqrt{\frac{36}{65.61}}$ or $\left(\frac{8.6}{BX}\right)^2 = \frac{36}{65.61}$ oe
15	63 corresponding [angles] 59 angles [in a] triangle [add up to] 180 oe	4	B1 for [$a =$] 63 B1 for corresponding angles B1FT for [$b =$] 59 or <i>their a + their b = 122</i> B1 for angles [in a] triangle [add up to] 180 oe
16(a)	2.24	2	M1 for $0.5 \times 1.6 \times 2.8$
16(b)	3.22 or 3.224 to 3.225	2	M1 for $[AC^2 =] 1.6^2 + 2.8^2$

Question	Answer	Marks	Partial Marks
17	$\frac{-7 \pm \sqrt{(7)^2 - 4(2)(-3)}}{2 \times 2}$	B2	B1 for $\sqrt{(7)^2 - 4(2)(-3)}$ or better B1 for $p = -7$ and $r = 2 \times 2$ if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ Completing the square method: B1 for $(x + 1.75)^2$ oe B1 for $-1.75 \pm \sqrt{1.5 + 1.75^2}$ oe
	0.39 and – 3.89 final ans cao		B1 for each If B0 , SC1 for 0.4 and – 3.9 or 0.386...and – 3.886... or 0.39 and – 3.89 seen in working or – 0.39 and 3.89
18(a)	Correct ruled perpendicular bisector of AB with correct pairs of arcs	2	B1 for correct perpendicular bisector without correct arcs or for correct arcs, with no/wrong line
18(b)	Correct ruled bisector of angle ABC with 2 correct pairs of arcs	2	B1 for correct angle bisector without correct arcs or for correct arcs, with no/wrong line
19(a)(i)	\in	1	
19(a)(ii)	$X \cap Y$ oe	1	
19(a)(iii)	\emptyset	1	
19(b)	u, v, w	1	
19(c)	5	1	
20(a)	Rotation [centre] origin oe 90° [anti-clockwise] oe	3	B1 for each
20(b)	Enlargement [centre] $(0, 3)$ [sf] – 2	3	B1 for each
21(a)	2	2	M1 for $f(5)$ or $7 - (7 - x)$ or better
21(b)	$30 - 4x$ final answer	2	M1 for $4(7 - x) + 2$ or better or for correct answer then spoilt
21(c)	$15 - 4x^2$ final answer	2	M1 for $15 - (2x)^2$ or better or for correct answer then spoilt

Question	Answer	Marks	Partial Marks
22(a)	$\frac{9}{20}$ oe	1	
22(b)(i)	$\frac{6}{20} \times \frac{5}{19}$	M1	
	$\frac{30}{380}$ oe	A1	
22(b)(ii)	$\frac{258}{380}$ oe	4	<p>M3 for $1 - \frac{3}{38} - \frac{5}{20} \times \frac{4}{19} - \frac{9}{20} \times \frac{8}{19}$ oe</p> <p>or M2 for $\frac{3}{38} + \frac{5}{20} \times \frac{4}{19} + \frac{9}{20} \times \frac{8}{19}$ oe</p> <p>or $\frac{5}{20} \times \frac{9}{19} + \frac{6}{20} \times \frac{9}{19} + \frac{6}{20} \times \frac{5}{19}$ oe</p> <p>or M1 for one correct product other than $\frac{6}{20} \times \frac{5}{19}$</p>

MATHEMATICS

0580/42

Paper 42 (Extended)

March 2018

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	23.27 final answer	2	M1 for 9×2.97 soi
1(a)(ii)	2.75 final answer	3	M2 for $2.97 \div \frac{108}{100}$ oe or M1 for 108[%] associated with 2.97 oe
1(b)	12.4[0] or 12.41 to 12.42	2	M1 for $35 \div 0.0153$ oe If 0 scored, SC1 for answer 0.19
1(c)	70 nfww	3	M2 for $(600 + 2.5) \div (9 - 0.5)$ or B1 for one of $600 + 2.5$ or $9 - 0.5$ seen
2(a)	128	2	M1 for $4 \times \frac{1}{2} \times 8 \times 8$ oe
2(b)(i)	18.3 or 18.26 to 18.29...	3	M2 for $\frac{1}{4}(\pi \times 8^2 - \text{their } 128)$ oe or M1 for $\pi \times 8^2 - \text{their } 128$ oe or for $\frac{1}{4} \times \pi \times 8^2$ oe OR SC2dep for answer 4.56 to 4.57...
2(b)(ii)	23.9 or 23.87 to 23.882	4	M3 for $\frac{90}{360} \times 2 \times \pi \times 8 + \sqrt{8^2 + 8^2}$ oe OR M1 for $\frac{90}{360} \times 2 \times \pi \times 8$ oe M1 for $\sqrt{128}$ oe OR SC3dep for answer 11.9 or 11.93 to 11.94...
3(a)	0 –0.17 2.4	3	B1 for each
3(b)	Fully correct smooth curve	4	B3FT for 9 or 10 correct points or B2FT for 7 or 8 correct points or B1FT for 5 or 6 correct points
3(c)	$x \leq 0.17$ to 0.25 and $x \geq 2.25$ to 2.3	3	B2 for strict inequalities or one correct or B1 for 0.17 to 0.25 and 2.25 to 2.3 seen

Question	Answer	Marks	Partial Marks
3(d)(i)	$y = 4 - x$ oe final answer	2	B1 for $4 - x$ or $y = k - x$ or $y = 4 + kx$ oe
3(d)(ii)	correct ruled line	1	FT if in form $y = mx + c$ oe ($m, c \neq 0$)
	0.125 to 0.2 and 2.15 to 2.2	2	B1 for each
4(a)	$[\pm]\sqrt{k-s}$ final answer	2	M1 for $t^2 = k-s$
4(b)(i)	$(x-5)(x+5)$ final answer	1	
4(b)(ii)	$\frac{x-5}{x-7}$ nfww final answer	3	M2 for $(x-7)(x+5)$ or M1 for $x(x+5) - 7(x+5)$ or $x(x-7) + 5(x-7)$ or $(x+a)(x+b)$ where $a+b = -2$ or $ab = -35$
4(c)	$\frac{4x^2 - 7x - 8}{x(x+1)}$ or $\frac{4x^2 - 7x - 8}{x^2 + x}$ final answer	3	M1 for $(x-8)(x+1) + 3x \times x$ oe isw B1 for common denominator $x(x+1)$ oe isw
4(d)	3, 4, 5, 6 nfww	3	B2 for 3 correct or 4 correct and 1 extra or M2 for $n > \frac{18}{8}$ oe and $n \leq 6$ or M1 for $18 < 8n \leq 30 + 3n$ or $[18 - 3n] \leq 30$ seen
5(a)(i)	1930 or 1940 or 1933.4 to 1935.3	5	B1 for interior angle 120 soi or angle at centre 60 soi or for correct use of Pythagoras' with 7 and 3.5 or with 14 and 7 M3 for $6 \times \frac{1}{2} \times 7^2 \times \sin 60 \times 15.2$ oe or complete other methods or M2 for $6 \times \frac{1}{2} \times 7^2 \times \sin 60$ oe OR M1 for $\frac{1}{2} \times 7^2 \times \sin 60$ oe or other partial area of hexagon M1dep for <i>their</i> area $\times 15.2$ evaluated

Question	Answer	Marks	Partial Marks
5(a)(ii)	893 or 892.8 to 893.0...	3	M2 for $6 \times 7 \times 15.2 + 2 \times 6 \times \frac{1}{2} \times 7^2 \times \sin 60$ oe or for $6 \times 7 \times 15.2 + 2 \times$ <i>their area of hexagon from (a)</i> oe or M1 for $[6 \times] 7 \times 15.2$ oe or $2 \times$ <i>their area of hexagon from (a)</i> oe
5(b)	2.71 or 2.709 to 2.710	3	M2 for $\sqrt[3]{500 \div \left(6 \times \frac{4}{3} \pi \right)}$ oe or M1 for $500 = 6 \times \frac{4}{3} \pi r^3$ oe If 0 scored, SC1 for answer 4.92 or 4.923 to 4.924
6(a)	$y > x$	1	
	$x \geq 15$	1	
	$y < 50$	1	
	$x + y \leq 70$	1	
6(b)	Four correct ruled lines and correct region indicated	5	all lines ruled B1 for $y = x$ broken B1 for $x = 15$ B1 for $y = 50$ broken B1 for $x + y = 70$
6(c)	189	2	M1 for (21, 49) seen or for $2x + 3y$ written for a point (x, y) in <i>their</i> region where x and y are integers
7(a)(i)	$\frac{9}{160}$ oe	1	
7(a)(ii)	58.125 nfw	4	M1 for mid-points soi M1 for use of Σfx with x in correct interval including both boundaries M1 (dep on 2nd M1) for $\Sigma fx \div 160$
7(b)	[3 42] 85 140 151 160	2	B1 for 1 error FT other values

Question	Answer	Marks	Partial Marks
7(c)	correct curve	3	B1FT <i>their (b)</i> for 6 correct heights B1 for 6 points at upper ends of intervals on correct vertical line B1FT dep on at least B1 for increasing curve through <i>their</i> 6 points After 0 scored, SC1 for <i>their</i> 5 correct points plotted
7(d)(i)	57 to 59	1	
7(d)(ii)	36 to 42	2	B1 for UQ = 76 to 80 or LQ = 38 to 40 soi
7(d)(iii)	92 to 94	2	B1 for 144 seen
7(d)(iv)	130 to 137	2	B1 for 23 to 30 seen
8(a)	356 or 356.2 to 356.3	4	B1 for [Angle <i>LPM</i>] = 74 soi M2 for $\frac{248 \times \sin \text{their } 74}{\sin 42}$ oe or M1 for implicit statement
8(b)(i)	320 or 319.9 to 320.2...	3	B1 for angle <i>PLM</i> = 64 soi or for angle between <i>LM</i> and perpendicular from <i>M</i> = 26 soi or [<i>PM</i>] = 333.[1...] M1 for <i>their</i> $356 \times \sin \text{their } 64$ oe or <i>their</i> $356 \times \cos \text{their } 26$ oe
8(b)(ii)	0257 or 257 am	3	B2 for 6 hours 12 mins or 372 mins seen or M1 for $248 \div 40$ oe If 0 scored, SC1 for <i>their</i> time in hours converted to hours and minutes
9(a)	7.07 or 7.071...	2	M1 for $(-1)^2 + 7^2$ oe
9(b)	-6	2	M1 for $6 \times m - 5 \times 2m [= 24]$
9(c)(i)	(10) final answer	2	B1 for answer 10 without brackets
9(c)(ii)	$\binom{2}{6}$ final answer	2	M1 for $\binom{2}{k}$ or $\binom{k}{6}$
9(c)(iii)	$\begin{pmatrix} 19 & 55 \\ 33 & 96 \end{pmatrix}$ final answer	2	M1 for 2 or 3 correct elements
9(c)(iv)	$\frac{1}{3} \begin{pmatrix} 9 & -5 \\ -3 & 2 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} 9 & -5 \\ -3 & 2 \end{pmatrix}$ soi or det = 3 soi

Question	Answer	Marks	Partial Marks
10(a)	10.8 or 10.81 to 10.82	3	M2 for $\sqrt{(6--3)^2 + (-2-4)^2}$ oe or M1 for $(6--3)^2 + (-2-4)^2$ oe
10(b)(i)	(6, 4)	2	B1 for each
10(b)(ii)	2	2	M1 for $\frac{12-(-4)}{10-2}$ oe
10(b)(iii)	$y = -\frac{1}{2}x + 4$ oe final answer	3	M1 for gradient = $-\frac{1}{2}$ or $-\frac{1}{\text{their (b)(ii)}}$ M1 for (2, 3) substituted into their $y = mx + c$ or $y - y_1 = m(x - x_1)$ oe
11(a)	25 9 16	3	B1 for each
11(b)(i)	$(n-1)^2$ oe	2	B1 for any quadratic of form [1] $n^2[+bn+c]$
11(b)(ii)	$n+3$ oe	1	
11(c)	25	2	M1 for their $(n-1)^2 = 576$
11(d)(i)	$n^2 - 3n - 2$ final answer	3	M1 for their $(n-1)^2 - \text{their}(n+3)$ oe or 2nd diff = 2 soi B1 for $n^2 - n - n + 1$ or better or $-n - 3$ or for expression of form $n^2 - 2n - n + k$ or correct expression not in simplest form
11(d)(ii)	808 cao	2	M1 for substituting 30 in their (d)(i)

MATHEMATICS

0580/22

Paper 2 (Extended)

October/November 2017

MARK SCHEME

Maximum Mark: 70

Published

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oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial marks
1	-3	1	
2	[0].00517	1	
3	$BC \ AB$ oe	1	
4(a)	2, 3, 4, 6	1	
4(b)	27, 36 cao	1	
5	$[x =] 60$ $[y =] 40$	2	B1 for each or for two numbers that add to 100
6	2.5	2	B1 for 2200 or 0.055 seen or SC1 for answer figs 25
7	32	2	M1 for $\frac{1}{2} \times 33 \times h = 528$ oe
8	16.5	2	M1 for $\frac{55}{60}$ or speed \times time (numerical)
9	1.32×10^{41}	2	M1 for 0.12×10^{41} or 12×10^{40} or SC1 for figs 132
10	20.75 final answer cao	2	B1 for one of 5.15, 6.25 or 9.35 seen or M1 for $(5.2 - 0.05) + (6.3 - 0.05) + (9.4 - 0.05)$
11	$48.\dot{4}\dot{8} - 0.\dot{4}\dot{8}$ oe	M1	SC1 for $\frac{48}{99}$ or $\frac{16}{33}$ or equivalent fraction with no/insufficient working
	$\frac{48}{99}$ or $\frac{16}{33}$ or equivalent fraction	A1	
12	$15 + 2n - n^2$ final answer	2	M1 for three terms of $15 + 5n - 3n - n^2$ correct

Question	Answer	Marks	Partial marks
13(a)	$3\frac{2}{3}$ cao	1	
13(b)	$\frac{3}{12} \text{ [and } \frac{5}{12}] \text{ oe}$	M1	For correct method to find common denominator e.g. $\frac{12}{48}$ and $\frac{20}{48}$
	$\frac{2}{3}$ cao	A1	
14	-1, 0, 1, 2, 3	3	B2 for $-2 < n \leq 3$ or list with one error or omission or M1 for $-5 + 1 < 2n$ or $2n \leq 5 + 1$ or a list with 3 correct and no more than 1 incorrect or if zero scored, SC1 for 5, 3, 1, -1, -3
15	$\frac{y+x}{xy}$ final answer	3	B1 for $y(x+1) - x(y-1)$ B1 for common denominator xy or SC2 for $\frac{y-x}{xy}$ final answer
16(a)	-1	1	
16(b)	$-6n + 29$ oe	2	M1 for $-6n + k$ (any k) or $-kn + 29$ ($k \neq 0$)
17	60	3	B2 for $x = 6$ or M1 for $29x + x = 180$ oe and M1 for $360 \div 6$ or $360 \div \text{their } x$ or $180(n-2) = \text{their } x \times 29n$
18	Correctly eliminating one variable	M1	
	$[x =] \frac{2}{3}$ or 0.667 or 0.6666...	A1	
	$[y =] \frac{1}{3}$ or 0.333 or 0.333...	A1	If zero scored, SC1 for 2 values satisfying one of the original equations or if no working shown but 2 correct answers given
19	$[\pm] \sqrt{y^2 - 1}$ final answer	3	M1 for correct squaring M1 for correct rearranging for x or x^2 term M1 for correct square root
20	132	3	M2 for $\frac{1}{2}(7 + 15) \times 12$ or M1 for any correct area

Question	Answer	Marks	Partial marks
21	$\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ oe simplified	3	B2 for correct unsimplified vector for \overrightarrow{OK} in terms of \mathbf{a} and \mathbf{b} or M1 for a correct route for \overrightarrow{OK} or $\overrightarrow{AB} = -\mathbf{a} + \mathbf{b}$ or $\overrightarrow{BA} = -\mathbf{b} + \mathbf{a}$ or recognition of \overrightarrow{OK} as a position vector
22	$[w =] 54$ $[x =] 126$ $[y =] 60$	3	B1 for $[w =] 54$ B1 for $[x =] 126$ If B0 B0 for first two B marks then B1 for <i>their w + their x = 180</i> B1 for $[y =] 60$ or for <i>their w + their x + their y = 240</i>
23	$[k =] 3$ $[c =] 9$	3	M1 for $\frac{30}{360} \times \pi \times 6^2$ M1 for $\frac{1}{2} \times 6 \times 6 \times \sin 30$
24(a)	$\frac{5}{14}$ or 0.357 or 0.357...	2	M1 for $7 - 2 = 11n + 3n$ oe or better
24(b)	18	2	M1 for $p - 3 = 3 \times 5$ or $\frac{p}{5} = 3 + \frac{3}{5}$
25(a)	$(x-12)(x+11)$ final answer	2	B1 for $(x+a)(x+b)$ where $ab = -132$ or $a+b = -1$
25(b)	$x(x+2)(x-2)$ final answer	2	B1 for $x(x^2 - 4)$ or $(x+2)(x^2 - 2x)$ or $(x-2)(x^2 + 2x)$
26	21.8 or 21.80...	4	M3 for $\tan = \frac{2}{\sqrt{3^2 + 4^2}}$ oe or M1 for $\sqrt{3^2 + 4^2}$ or $\sqrt{3^2 + 4^2 + 2^2}$ and M1 for recognising angle QAC

Question	Answer	Marks	Partial marks
27(a)	27	1	
27(b)	x^2 final answer	1	
27(c)	$\frac{y^2}{2}$ or $0.5y^2$ final answer	2	M1 for $\left(\frac{y^6}{8}\right)^{\frac{1}{3}}$ or $\left(\frac{2}{y^2}\right)^{-1}$ or better or SC1 for answer $\frac{y^2}{c}$ or $\frac{y^k}{2}$ or $\frac{2}{y^2}$

MATHEMATICS

0580/42

Paper 4 (Extended)

October/November 2017

MARK SCHEME

Maximum Mark: 130

Published

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This document consists of 7 printed pages.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial marks
1(a)(i)	4 : 5	1	
1(a)(ii)	4 : 5	1	
1(a)(iii)	3 : 4	2	B1 for 12 : 16 or answer 4 : 3
1(b)(i)	26.8 or 26.79...	3	M2 for $\frac{15600 - 11420}{15600} [\times 100]$ or $\frac{11420}{15600} \times 100$ or M1 for $\frac{11420}{15600}$
1(b)(ii)	16 000 nfww	3	M2 for $15600 \times \frac{100}{100 - 2.5}$ oe or M1 for 15600 associated with 97.5[%] seen
1(c)	1.6 or $\frac{8}{5}$	2	M1 for $\frac{200 \times x \times 15}{100} = 48$ oe or M1 for figs 16
1(d)	2.5 or $\frac{5}{2}$ cao nfww	3	B2 for 2.49[9...] or 102.4[99...] or 1.024[99...] or 2.50 or 102.5 or 1.025 or M2 for $\sqrt[10]{\frac{256}{200}}$ oe or M1 for $256 = 200(x)^{10}$ seen

Question	Answer	Marks	Partial marks
2(a)(i)	1070 or 1072. ...	3	M1 for $\pi \times 8^2 \times 2 \times 8$ M1 for $\frac{4}{3} \times \pi \times 8^3$ or M2 for $\frac{2}{3} \pi r^3$ or M1 for $\pi r^2 2r - \frac{4}{3} \pi r^3$
2(a)(ii)	2.58 or 2.580 to 2.581	3	B2 for $r^3 = \frac{36 \times 3}{2\pi}$ or better or M1 for $\pi \times r^2 \times 2 \times r - \frac{4}{3} \times \pi \times r^3 = 36$ oe
2(b)(i)	4.24 or 4.241 to 4.242	4	M3 for $(\pi \times 5^2 + \pi \times 5 \times \sqrt{5^2 + 12^2})$ or M2 for $\pi \times 5 \times \sqrt{5^2 + 12^2}$ or M1 for $5^2 + 12^2$ or $\pi \times 5^2$
2(b)(ii)	64 cao final answer	3	M2 for $\frac{[k\pi] \times 5^2 \times 12}{[k\pi] \times 1.25^2 \times 3}$ or M1 for $\frac{1}{3} \times \pi \times 5^2 \times 12$ or $\frac{1}{3} \times \pi \times 1.25^2 \times 3$ OR M2 for 4^3 or $\left(\frac{1}{4}\right)^3$ seen or M1 for factor 4 or $\frac{1}{4}$ soi
3(a)	7040 or 7035.	3	M1 for $\frac{1}{2} \times 100 \times 70$ oe M1 for $\frac{1}{2} \times 100 \times 110 \times \sin 40$ oe
3(b)	374 or 375 or 374.4 to 374.5....	5	M2 for $110^2 + 100^2 - 2 \times 110 \times 100 \times \cos 40$ oe or M1 for implicit form A1 for 5250 or 5247. (or 72.4 or 72.43 to 72.44) M1 for $70^2 + 100^2$
3(c)	64.3 or 64.27 to 64.28 nfww	2	M1 for $\sin 40 = \frac{\text{distance}}{100}$ oe
3(d)	235	3	B2 for [angle $ACB =]$ 34.99 to 35 or [angle $ABC =]$ 55[.0...] or M1 for $\tan[ACB] = \frac{70}{100}$ or $\tan[ABC] = \frac{100}{70}$ or equivalent trig ratio

Question	Answer	Marks	Partial marks
4(a)(i)	Correct translation	2	B1 for translation $\begin{pmatrix} 6 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$
4(a)(ii)	Correct rotation	2	B1 for rotation 180° but other centre
4(a)(iii)	Correct reflection	2	B1 for reflection in $y = -x$
4(b)(i)	Enlargement [factor] $\frac{1}{2}$ or 0.5 [centre] $(0, 0)$ oe	3	B1 for each
4(b)(ii)	$\begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix}$ oe	2	B1 for matrix of form $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$ oe, $k \neq 0$ or 1
4(c)	± 2.5	3	B2 for $25u^2 = 156.25$ or $5u = [\pm]12.5$ or M1 for $(4u)^2 + (3u)^2$
5(a)	3.2 or 3.15 or 3.152 to 3.153 5.2 or 5.19 or 5.20 or 5.196...	2	B1 for each
5(b)	Correct graph for $0.5 \leq x \leq 3.5$	4	B3FT for 6 or 7 correct points or B2FT for 4 or 5 correct points or B1FT for 2 or 3 correct points
5(c)	1.7 to 1.8	1FT	FT their graph if one answer
5(d)(i)	Any integer $k \geq -1$	1	
5(d)(ii)	Any integer $k < -1$	1	
5(e)	Tangent ruled at $x = -3$	B1	
	2.5 to 4	B2	dep on tangent drawn at $x = -3$ or close attempt at tangent at $x = -3$ M1 for rise/run also dep on tangent at $x = -3$ or close attempt at tangent at $x = -3$

Question	Answer	Marks	Partial marks
5(f)(i)	$y = 6 - x$ ruled accurately	M2	M1 for correct line but freehand or ruled line gradient -1.1 to -0.9 , or through $(0, 6)$ but not $y = 6$
	$2.85 \leq x \leq 3$		A1
5(f)(ii)	$[a =] 8$ $[b =] -48$ $[c =] -16$	4	B3 for 2 correct or $x^5 + 8x^3 - 48x^2 - 16 = 0$ seen or $-x^5 - 8x^3 + 48x^2 + 16 = 0$ seen or M2 for correct multiplication by $8x^2$ or B1 for answers $\pm 8, \pm 48, \pm 16$ or M1 for $\frac{x^2 \times x^3 - 8 \times 2}{x^2 \times 8} = 6 - x$ or M1 for correct multiplication by 8 or M1 for correct multiplication by x^2
6(a)(i)	280	1	
6(a)(ii)	320	1	
6(a)(iii)	90	1	
6(a)(iv)	10	2	M1 for 90 written
6(b)(i)	250.2 nfww cao	4	M1 for at least 4 correct mid-values M1 for Σfx M1 dep on second M1 for $\Sigma fx \div 100$
6(b)(ii)	Correct completion of histogram	4	B1 for each correct block If zero scored, then SC1 for correct frequency densities seen
6(c)	[22 m] further oe	1	
7(a)	$\frac{5}{6}$	1	
7(b)	$\frac{4}{36}$ oe	2	M1 for $\frac{2}{6} \times \frac{2}{6}$
7(c)	20	1	

Question	Answer	Marks	Partial marks
7(d)(i)	Diagram completed correctly x x 3 3 3 9 x x 2 2 2 6 x x 2 2 2 6 x x 2 2 2 6 x x 1 1 1 3	2	B1 for 3 correct columns or for 4 correct rows
7(d)(ii)(a)	$\frac{9}{36}$ oe	1FT	FT their (d)(i)
7(d)(ii)(b)	$\frac{4}{36}$ oe	1FT	FT their (d)(i)
7(e)	$\frac{512}{7776}$ oe	2	M1 for $\left(\frac{4}{6}\right)^k \times \frac{2}{6}$ oe $k = 3, 4 or } 5 only$
8(a)(i)	$7a + 9p = 354$ oe final answer	1	
8(a)(ii)	[$a =] 21$ [$p =] 23$	3	M1 for correctly eliminating one variable A1 for $a = 21$ A1 for $p = 23$
8(b)(i)	$\frac{2}{x}$	1	
8(b)(ii)(a)	$\frac{2}{x} + \frac{3}{x-1} = 2$	M1	
	$2(x-1) + 3x = 2x(x-1)$ oe	M1dep	Both sides of the equation could be over $x(x-1)$ at this stage Dep on M1 or 3 term equation with fractions but one sign error
	$2x - 2 + 3x = 2x^2 - 2x$ oe $2x^2 - 7x + 2 = 0$	A1	Answer reached with one correctly expanded line seen and no errors seen
8(b)(ii)(b)	$\sqrt{(-7)^2 - 4(2)(2)}$	B1	or for $\left(x - \frac{7}{4}\right)^2$
	$\frac{-7 + \sqrt{q}}{2 \times 2}$ or $\frac{-7 - \sqrt{q}}{2 \times 2}$	B1	or for $\frac{7}{4} + \text{or} - \sqrt{-1 + \left(\frac{7}{4}\right)^2}$
	3.19 only	B2	B1 for 3.19 with other root or for 3.2 or 3.186... isw other root or for 0.31 or 0.314 or 0.3138 to 0.3139

Question	Answer	Marks	Partial marks
9(a)	3	1	
9(b)	$-\frac{2}{5}$ oe	2	M1 for $2(1 - 2x) = x + 4$
9(c)	$-2x - 7$ final answer	2	M1 for $1 - 2(x + 4)$
9(d)	26	2	B1 for $h(5)$ soi or M1 for $(x^2 + 1)^2 + 1$
9(e)	$\frac{1-x}{2}$ oe final answer	2	M1 for $x = 1 - 2y$ or $2x = 1 - y$ or $\frac{y}{2} = \frac{1}{2} - x$ or $y - 1 = -2x$
9(f)	$[p =] - 20$ $[q =] 26$	4	B3 for $[\text{hgf}(x)] = 4x^2 - 20x + 26$ seen and not spoilt by further working or M1 for $(1 - 2x) + 4$ M1 dep for $(\text{their } (5 - 2x))^2 + 1$ B1FT dep for $25 - 10x - 10x + 4x^2$
10(a)	5.68 or 5.684 to 5.685	5	M2 for $2x\sqrt{x^2 + x^2}$ oe or $2 \times \sqrt{2} \times x^2$ or M1 for $x\sqrt{2}$ or $\sqrt{x^2 + x^2}$ oe soi M1 for $\frac{270}{360} \times \pi \times x^2$ oe M1 for $0.5 x^2$ oe
10(b)	4.4[0] or 4.398 to 4.401	2	dep on a correct value for k in (a) M1 for $\left[x^2\right] = \frac{110}{\text{their } k}$

MATHEMATICS

0580/22

Paper 2 (Extended)

May/June 2017

MARK SCHEME

Maximum Mark: 70

Published

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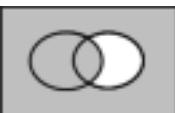
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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Part Marks
1	[0].072	1	
2	[0].15 oe	1	
3	[0].62	1	
4	[0].394 or [0].3944 to [0].3945	1	
5	41.9 or 41.87	1	
6	$7(2x - 3y)$ final answer	1	
7	41	2	M1 for $5(7) - 3(-2)$
8	110	1	
	70	1	
9	$\frac{5}{6} - \frac{3}{6}$ oe	M1	oe for $\frac{5k}{6k} - \frac{3k}{6k}$
	$\frac{1}{3}$ cao final answer	A1	
10	$\frac{1}{6}$ oe	2	M1 for $2 - 1 = 5x + x$ oe
11(a)	6.05×10^{-2}	1	
11(b)	5.1×10^3	1	
12	34.8 or 34.84 to 34.85	2	M1 for $\sin [=] \frac{4}{7}$
13	$n < 3.5$ oe final answer	2	M1 for $18 - 11 > 5n - 3n$ oe
14(a)	25	1	
14(b)	9	1	

Question	Answer	Marks	Part Marks
15	$[\pm]\sqrt{\frac{p}{2}}$ oe	2	M1 for $\frac{p}{2} = q^2$ or $\sqrt{p} = \sqrt{2}q$ or $[q =] \sqrt{\text{their } \frac{p}{2}}$ or $[q =] \frac{\sqrt{p}}{\text{their } \sqrt{2}}$
16(a)	Correct bisector with correct arcs	2	B1 for correct bisector but no arcs or correct arcs but no line
16(b)	Correct region shaded	1	
17	4.34 or 4.336 to 4.337	3	M2 for $\frac{8.15 \sin 30}{\sin 110}$ or M1 for $\frac{\sin 110}{8.15} = \frac{\sin 30}{AC}$ oe
18	2859.75 2968.75 cao final answer	3	B2 for one correct seen or B1 for 62.5 or 61.5 or 46.5 or 47.5 seen or M1 for $(62 + 0.5) \times (47 + 0.5)$ or $(62 - 0.5) \times (47 - 0.5)$
19	37.4 or 37.38... and 142.6 or 142.6...	3	B2 for one correct or M1 for $0.5 \times 8 \times 7 \sin = 17$ oe If zero or M1 only scored, SC1 for two answers with a sum of 180
20	$\frac{2x^2 + x - 7}{3(x+1)}$ or $\frac{2x^2 + x - 7}{3x+3}$ final answer	3	M1 for $(2x - 1)(x + 1) - 2 \times 3$ oe with an attempt to expand the brackets B1 for $3(x + 1)$ or $3x + 3$ for denominator
21	1.5 or $\frac{3}{2}$ or $1\frac{1}{2}$	3	M1 for $\frac{k}{\sqrt{1+x}}$ M1 for $y = \frac{\text{their } k}{\sqrt{1+15}}$ or M2 for $\frac{2}{\sqrt{1+15}} = \frac{y}{\sqrt{1+8}}$
22(a)	$(3t+u)(3t-u)$ final answer	2	B1 for $(at+bu)(ct+du)$ final answer where $ac = 9$ or $ad + bc = 0$ or $bd = -1$
22(b)	$(c-2d)(2-p)$ or $(p-2)(2d-c)$ final answer	2	M1 for $2(c-2d) - p(c-2d)$ or $c(2-p) - 2d(2-p)$ or $p(2d-c) - 2(2d-c)$ or $2d(p-2) - c(p-2)$
23(a)(i)	24	1	
23(a)(ii)	5	1	

Question	Answer	Marks	Part Marks
23(a)(iii)	$\frac{7}{12}$	1	
23(b)		1	
24(a)	Similar	1	
24(b)	5.6	2	M1 for $\frac{4}{8} = \frac{2.8}{AX}$ oe
24(c)	$\frac{y}{4}$ oe	1	
25(a)	$8x^{12}$ final answer	2	B1 for $8x^k$ or kx^{12} in final answer $k \neq 0$
25(b)	9	2	M1 for $27^{\frac{2}{3}}$ or 3^k or $p^{\frac{1}{2}} = 3$ or $p^3 = 729$
26	[w =] 40	1	
	[x =] 95	2	B1 for angle $ABC = 85$ or <i>their w + their CBD = 85</i>
	[y =] 45	2	B1 for angle $CBD = 45$ or angle $ACD = 40$ or angle $ACD = \text{their } w$ or $y = \text{their } CBD$
27(a)	$y = 2x + 4$	3	B2 for $2x + 4$ or $y = 2x + c$ or $y = mx + 4$ or B1 for $2x + c$ or for $kx + 4$ or M1 for rise/run
27(b)	$y = -\frac{1}{2}x + \frac{3}{2}$ oe	4	B1 for $(-1, 2)$ M1 for the gradient $-\frac{1}{2}$ oe or $\frac{-1}{\text{their } 2}$ oe M1 for substituting <i>their</i> $(-1, 2)$ into <i>their</i> $y = mx + c$ oe

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2017

MARK SCHEME

Maximum Mark: 130

Published

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Question	Answer	Marks	Part marks
1(a)(i)	$600 \div (11+9) \times 11$ [=330] with no errors seen	M1	Could be in separate steps
1(a)(ii)	270	1	
1(b)(i)	372 cao nfww	3	B2 for answer 371.7... or M1 for $330 \times \left(1 + \frac{1.5}{100}\right)^8$ oe not spoiled After zero scored, SC1 for answer 42 or 41.7...
1(b)(ii)	12.6 or 12.7 or 12.63 to 12.73	2	M1 for $\frac{\text{their (b)(i)} - 330}{330}$ or $\frac{\text{their (b)(i)}}{330} \times 100$ soi by 112.7 or 113 After zero scored, SC1 for answer 12%
1(c)(i)	$\frac{99}{280}$ cao final answer	1	
1(c)(ii)	27.5[0]	3	M2 for $24.75 \div \frac{100-10}{100}$ oe or M1 for recognising 24.75 as 90[%] oe
1(d)(i)	32 cao	2	M1 for $\left(1 - \frac{20}{100}\right)\left(1 - \frac{15}{100}\right)[x]$ oe or for $0.15 \times 0.8 [x]$ oe
1(d)(ii)	13 cao	2	M1 for $\left(1 - \frac{20}{100}\right)\left(1 - \frac{15}{100}\right) \times x = 40.84 - 32$ oe seen or for $\text{their (d)(i)} + \left(1 - \left(\frac{\text{their (d)(i)}}{100}\right)\right)x = 40.84$ oe
2(a)(i)	Image at (8, 1), (10, 5), (8, 5)	2	B1 for translation $\begin{pmatrix} 6 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$ or 3 correct points not joined
2(a)(ii)	Image at (4, 10), (4, 8), (8, 8)	2	B1 for rotation 90° anticlockwise but different centre or for rotation 90° clockwise about (4, 10) or 3 correct points not joined
2(a)(iii)	Image at (6, 3), (6, 5), (7, 5)	2	B1 for enlargement factor $\frac{1}{2}$ but incorrect centre or 3 correct points not joined
2(b)	Reflection	1	
	$y = -x$ oe	1	If zero scored, M1 for correct use of matrix product

Question	Answer	Marks	Part marks
2(c)(i)(a)	$\begin{pmatrix} 13 \\ 16 \end{pmatrix}$	2	B1 for each in a 2 by 1 matrix or SC1 for (13 [,] 16)
2(c)(i)(b)	$\begin{pmatrix} 2 & 10 \\ 3 & 15 \end{pmatrix}$	2	B1 for answer any 2 by 2 matrix
2(c)(i)(c)	$\frac{1}{2} \begin{pmatrix} 4 & -3 \\ -2 & 2 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} 4 & -3 \\ -2 & 2 \end{pmatrix}$ oe soi ($k \neq 0$) or for determinant = 2 oe soi
2(c)(ii)	NM or MP or N² oe or P² oe	1	
3(a)(i)	175.5 nfww	4	M1 for at least four of 50, 125, 175, 225, 325 soi M1 for Σfx with x inside or on boundary of each interval M1 (dep on second M1) for $\frac{\text{their } \Sigma fx}{200}$
3(a)(ii)	Fully correct histogram	4	B1 for each correct bar If zero scored, B1 for 0.2, 1.32, 0.7, 0.16 seen
3(b)(i)	Fully correct cumulative frequency diagram	3	B1 for correct horizontal plots B1 for correct vertical plots B1FT dep on at least B1 earned for points joined with smooth increasing curve or polygon If zero scored, SC1 for 4 correct plotted points
3(b)(ii)(a)	170 to 175	1	
3(b)(ii)(b)	152 to 158	2	M1 for 42 to 48 written
4(a)	-1.75 to -1.7	1	
	1.7 to 1.75	1	
4(b)(i)	Correct ruled solid tangent at (-1.5, 3.5)	1	
4(b)(ii)	-7 to -5	2 dep	dep on close attempt at ruled solid tangent at $x = -1.5$ in part (b)(i) M1 for rise/run dep on close attempt at ruled solid tangent at $x = -1.5$
4(c)(i)	1	1	
4(c)(ii)	Correct curve	3	B2 for 4 or 5 correct points or B1 for 2 or 3 correct points

Question	Answer	Marks	Part marks
4(d)(i)	-0.95 to -0.8	1	
	1.1 to 1.45	1	
4(d)(ii)	<i>their</i> (-0.95 to -0.8) < x < <i>their</i> (1.1 to 1.45) oe	1FT	correct or FT <i>their</i> (d)(i)
4(e)(i)	0.125 oe and 0.03125 oe and 0.000976 to 0.000977 oe	1	
4(e)(ii)	0	1	accept zero, nought, etc
5(a)(i)	94.2 or 94.3 or 94.24 to 94.26	2	M1 for $\pi \times 3 \times 10$
5(a)(ii)	9.54 or 9.539...	3	M2 for $\sqrt{10^2 - 3^2}$ or M1 for $h^2 + 3^2 = 10^2$ oe
5(a)(iii)	89.9 or 89.90 to 89.92...	2	M1 for $\frac{1}{3} \times \pi \times 3^2 \times \text{their}(a)(ii)$
5(b)	108 or 107.9 to 108.1 nfww	4	M3 for $\frac{\pi \times 3 \times 10}{\pi \times 10^2} \times 360$ oe or $\frac{\text{their } (a)(i)}{\pi \times 10^2} \times 360$ oe or $\frac{2 \times \pi \times 3}{2 \times \pi \times 10} \times 360$ oe or M2 for $\frac{x}{360} \times \pi \times 10^2 = \text{their}(a)(i)$ oe or $\frac{x}{360} \times 2 \times \pi \times 10 = 2 \times 3 \times \pi$ oe or M1 for $\frac{x}{360} \times \pi \times 10^2$ seen or $\frac{x}{360} \times 2 \times \pi \times 10$ seen
5(c)	46.6 to 46.8	4	M3 for $\frac{\text{their } (b)}{360} \times \pi \times 10^2 - \frac{1}{2} \times 10 \times 10 \times \sin(\text{their } (b))$ oe or M1 for $\frac{\text{their } (b)}{360} \times \pi \times 10^2$ or <i>their</i> (a)(i) soi and M1 for $\frac{1}{2} \times 10 \times 10 \times \sin(\text{their } (b))$ soi
6(a)	$\frac{1}{3}, \frac{6}{7}$ correctly placed	1	
	$\frac{4}{7}, \frac{3}{7}$ correctly placed	1	

Question	Answer	Marks	Part marks
6(b)	$\frac{2}{21}$ oe	2	M1 for $\frac{2}{3} \times \frac{1}{7}$
6(c)(i)	$\frac{15}{21}$ oe	3	M2 for $\frac{2}{3} \times \frac{6}{7} + \frac{1}{3} \times \frac{3}{7}$ oe or M1 for $\frac{2}{3} \times \frac{6}{7}$ oe or $\frac{1}{3} \times \frac{3}{7}$ oe seen
6(c)(ii)	50	2FT	FT ($70 \times$ their (c)(i)) rounded up or down to integer M1 for $70 \times$ their (c)(i)
6(d)	$\frac{10}{243}$ oe	2	M1 for $\frac{2}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} [\times k]$ oe nfw where k is positive integer less than 5
7(a)(i)	4.5 or $4\frac{1}{2}$ or $\frac{9}{2}$ final answer	3	M2 for $[2](4x + 7) = [2](6x - 2)$ oe or M1 for $2(2x + 6) + 2(2x + 1)$ oe or $4(3x - 1)$ oe or M1 for correctly reaching $ax = b$ from their linear equation
7(a)(ii)	$(2x + 6)(2x + 1) = (3x - 1)^2$	M1	May be seen in different stages
	$5x^2 - 20x - 5 [= 0]$ oe	B3	B1 for $4x^2 + 2x + 12x + 6$ or better B1 for $9x^2 - 3x - 3x + 1$ or better
	$\frac{-(-20) \pm \sqrt{(-20)^2 - 4(5)(-5)}}{2(5)}$ oe	M2	FT their 3 term quadratic provided formula used or complete the square M1 for $\sqrt{(-20)^2 - 4(5)(-5)}$ oe or if in form $\frac{-(-20) \pm \sqrt{q}}{2(5)}$ or $\frac{-(-20) - \sqrt{q}}{2(5)}$ FT ± their quadratic or for completing the square M2 for $2 \pm \sqrt{1+2^2}$ or M1 for $(x - 2)^2$
	4.24 or 4.236... cao	B1	
7(b)(i)	$(x + 5)(x - 1)$ final answer	2	B1 for $x(x - 1) + 5(x - 1)$ or $x(x + 5) - [1](x + 5)$ or for $(x + a)(x + b)$ where $ab = -5$ or $a + b = 4$

Question	Answer	Marks	Part marks
7(b)(ii)	$5(x+1) - 8x = x(x+1)$ or $5x + 5 - 8x = x^2 + x$	M2	Could be seen in different stages M1 for $5(x+1) - 8x$ seen or for common denominator of $x(x+1)$ for LHS or both sides soi
	-5 and 1 cao		A2 A1 for $x^2 + 4x - 5 [= 0]$ oe
8(a)	66[.]0 or 66.03 to 66.04	2	M1 for $\tan = \frac{9}{4}$ oe
8(b)	$\sqrt{3^2 + 4^2}$ or $\frac{1}{2}\sqrt{6^2 + 8^2}$	M1	Any alternative method must be full and complete and result in exactly 5
8(c)	60.9 or 60.94 to 60.95	2	M1 for $\tan = \frac{9}{5}$ oe
8(d)	5.83 or 5.84 or 5.827 to 5.840	6	M1 for $[PB \text{ or } PC =] \sqrt{9^2 + 5^2}$ or $[XC =] \sqrt{9^2 + 5^2} - 7.5$ M1 for angle $BPX = 2 \times \text{inv} \sin \frac{3}{\text{their } PB}$ oe B1 for $[PB \text{ or } PC =] \sqrt{106} = 10.29$ to 10.30 or $XC = 2.79$ to 2.8[0] or angle $BPX = 33.9$ or 33.86 to 33.90... M2 for $\sqrt{(\text{their } PB)^2 + 7.5^2 - 2 \times \text{their } PB \times 7.5 \times \cos(\text{their } BPX)}$ oe or M1 for correct implicit equation
9(a)(i)	100	1	
9(a)(ii)	92.3 or 92.29... to 92.31	3	M2 for $200 \div (2 + \frac{10}{60})$ oe or M1 for $200 \div$ their time interval or M1 for $\frac{10}{60}$ soi oe
9(b)(i)	240 nfww	3	M2 for $\frac{V}{2} \left(\frac{30}{60} + \frac{20}{60} \right) = 100$ oe or M1 for any correct relevant area seen in terms of V
9(b)(ii)	$\frac{2}{9}$ oe	2FT	FT for their (b)(i) $\div 1080$ to 3 sf or better M1 for their (b)(i) $\times \frac{1000}{3600}$ soi

Question	Answer	Marks	Part marks
10(a)	-11	1	
10(b)	7	2	M1 for $3x - 2 = 19$ or better
10(c)	25	2	M1 for $3 \times 3^x - 2$ oe
10(d)	$9x^2 - 8x + 2$ final answer	3	M1 for $(3x - 2)^2 + 3x - 2 + x$ oe B1 for $\left[(3x - 2)^2 = \right] 9x^2 - 6x - 6x + 4$ oe
10(e)	$\frac{x+2}{3}$ oe final answer	2	M1 for $x = 3y - 2$ or $y + 2 = 3x$ or $\frac{y}{3} = x - \frac{2}{3}$ or better

MATHEMATICS

0580/22

Paper 22 (Extended)

March 2017

MARK SCHEME

Maximum Mark: 70

Published

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This document consists of 5 printed pages.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Part Marks
1	$18w+14$ final answer	2	M1 for $20w+12$ or $-2w+2$ or answer $18w+k$ or $kw+14$
2	Equilateral triangle with correct arcs	2	M1 for clear evidence of constructed 60° angles or arcs crossing equal in length to AB or an accurate diagram with no/incorrect arcs
3	$\frac{10 \times 20}{90 - 40}$ 4 nfww	M1 A1	
4	4 nfww	2	M1 for $[7.31 =] 7 \left(1 + \frac{1.1}{100}\right)^k$ oe
5	150	2	M1 for $2 \times 3 + 16 \times 3^2$
6	$10^k \times 0.1\dot{7} - [10] \times 0.1\dot{7}$ $k \geq 1$ oe $\frac{16}{90}$ or $\frac{8}{45}$ oe nfww	M1 A1	
7	70.7625 cao and 72.4625 cao	3	B2 for 70.7625 or 72.4625 or M2 for 9.25×7.65 and 9.35×7.75 or B1 for two of 9.25, 9.35, 7.65, 7.75 seen
8	$\frac{10}{3}$ or $\frac{5}{2}$ <i>their</i> $\frac{10}{3} \times$ <i>their</i> $\frac{2}{5}$ $1\frac{1}{3}$ cao	B1 M1 A1	oe improper fractions accept $\frac{20}{6} \div \frac{15}{6}$
9	18.1 or 18.10....	3	M2 for $\sqrt{20^2 - \left(\frac{1}{2}(17)\right)^2}$ oe or M1 for $h^2 + \left(\frac{1}{2}(17)\right)^2 = 20^2$

Question	Answer	Marks	Part Marks
10	1050	3	M2 for $924 \div \frac{(100-12)}{100}$ oe or M1 for 88[%] associated with 924 oe
11		3	B2 for correct translation of A seen or B1 for translation of A by $\begin{pmatrix} -1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$ seen and B1 for correct reflection of their translation in $x = 2$ seen If 0 scored SC2 for correct $\text{TM}(A)$ or SC1 for reflection in $x = 2$ seen or a correct translation of $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$ seen
12	4	3	M1 for $y = \frac{k}{x^2}$ M1 for $y = \frac{\text{their } k}{10^2}$ or M2 for $5^2 \times 16 = 10^2 \times y$ oe
13 (a)	$5c(3c-1)$ final answer	2	B1 for $5(3c^2 - c)$ or $c(15c - 5)$
(b)	$(2p-m)(k+3)$ final answer	2	B1 for $k(2p-m) + 3(2p-m)$ or $2p(k+3) - m(k+3)$
14 (a)	Point at (3, 5)	1	
(b)	$\begin{pmatrix} 1 \\ -3 \end{pmatrix}$	1FT	FT their \overrightarrow{AC}
(c)	$\begin{pmatrix} 0 \\ 4 \end{pmatrix}$ or $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$	2	M1 for a vector of magnitude 4 or of form $\begin{pmatrix} 0 \\ \pm k \end{pmatrix}$
15 (a)	t^{20} final answer	1	
(b)	x^{10} final answer	1	
(c)	$27m^6$ final answer	2	B1 for $27m^k$ or km^6 as final answer

Question	Answer	Marks	Part Marks
16 (a)	0.25 or $\frac{1}{4}$	1	
(b)	0.45	3	B2 for 450 or M2 for $\frac{1}{2} \times 60 \times 15 \div 1000$ or M1 for $\frac{1}{2} \times 60 \times 15$ If 0 scored SC1 for correct conversion of their distance in metres to kilometres
17 (a) (i)		2	B1 for 2 correct of 4, 2, 5, 9 in the correct places or SC1 for
(ii)	9	1FT	FT their 9
(b)		1	
18 (a)	$\begin{pmatrix} 27 & -24 \\ -5 & -10 \end{pmatrix}$	2	B1 for two correct elements
(b)	$-\frac{1}{13} \begin{pmatrix} -2 & -3 \\ -1 & 5 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} -2 & -3 \\ -1 & 5 \end{pmatrix}$ or $\det = -13$ soi
19 (a)	11.4 or 11.40 to 11.41	2	M1 for $\frac{1}{2} \times 2.8 \times 8.3 \times \sin 79$ oe
(b)	231 or 230.8 to 231.1	2FT	FT their (a) $\times 4.5^2$ M1 for 4.5^2 or 20.25 seen

Question	Answer	Marks	Part Marks
20 (a)	$[y =] -2x + 3$	3	B2 for $[y =] -2x + c$ or M1 for rise/run and B1 for $[y =] kx + 3, k \neq 0$ or $c = 3$
(b)	$y = \frac{1}{2}x - \frac{5}{2}$ oe final answer	3	M1 for gradient = $-\frac{1}{\text{their gradient in (a)}}$ or gradient = 0.5 oe M1 for substitution of (3, -1) into <i>their</i> $y = mx + c$ oe
21 (a)	10	2	M1 for $\frac{x}{4} - 3 = -0.5$
(b)	$\frac{x+7}{6}$ final answer	2	M1 for $y + 7 = 6x$ or $\frac{y}{6} = x - \frac{7}{6}$ or $x = 6y - 7$
(c)	-2	2	M1 for $[f(13) =] \frac{1}{4}$

MATHEMATICS

0580/42

Paper 42 (Extended)

March 2017

MARK SCHEME

Maximum Mark: 130

Published

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Abbreviations

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dep	dependent
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isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Part Marks
1 (a)	22.9 or 22.85 to 22.86	2	M1 for $\frac{8}{10+17+8} [\times 100]$ oe
(b)	$5635 \times \frac{17}{10+17+8}$ or better [= 2737]	2	M1 for $\frac{5635}{(10+17+8)}$
(c)	5000	3	M2 for $5635 = k \left(1 + \frac{2.42}{100}\right)^5$ oe or B1 for $\left(1 + \frac{2.42}{100}\right)$
(d)	9950	2	M1 for 2×2500 or 3×1650
(e)	1.98 final answer	2	B1 for 1.976 or 1.98 not final answer or M1 for 130×0.0152
2 (a) (i)	Rotation	1	
	90° [anticlockwise] oe	1	
	(9, 5)	1	
(ii)	Translation	1	
	$\begin{pmatrix} -8 \\ -14 \end{pmatrix}$ oe	1	
(iii)	Enlargement	1	
	[sf] $\frac{1}{3}$	1	
	(-8, -2)	1	
(b) (i)	Image at (1, -3) (2, -3) (2, -5)	2	M1 for triangle correct size and orientation, wrong position or SC1 for correct reflection in $y = -x$
(ii)	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$	2	B1 for 1 correct column or row

Question	Answer	Marks	Part Marks
3 (a)	0 0.5 oe 1.25 oe	1, 1, 1	
(b)	Fully correct smooth curve	4	B3 FT for 7 or 8 points or B2 FT for 5 or 6 points or B1 FT for 3 or 4 points
(c)	3.6 to 3.8	2	M1 for $y = 3.5$ soi
(d)	line $y = x + 1$ ruled −1.55 to −1.40 4.55 to 4.8	M1 A1 A1	If 0 scored SC1 for $y = x + 1$ stated or implied or for 2 correct values given
(e) (i)	Point plotted at (5, 5)	1	
(ii)	Tangent ruled from A	1	
(iii)	1.2 to 1.4	B2	B2 and M1 dep on reasonable attempt at tangent from (5, 5) M1 for change in y / change in x of <i>their</i> ruled line
4 (a)	$\frac{1}{8}$ oe	3	M2 for $\frac{1}{2} \left(1 - \frac{1}{6} - \frac{1}{4} - \frac{1}{3} \right)$ oe or M1 for $\frac{1}{6} + \frac{1}{4} + \frac{1}{3}$ seen oe or idea that all sum to 1
(b)	$\frac{7}{12}$ oe	2	M1 for $\frac{1}{3} + \frac{1}{4}$ oe
(c) (i)	$\frac{1}{16}$ oe	2	M1 for $\frac{1}{4} \times \frac{1}{4}$ oe
(ii)	$\frac{2}{24}$ oe	3	M2 for $2 \times \frac{1}{6} \times \frac{1}{4}$ oe or M1 for $\frac{1}{6} \times \frac{1}{4}$ oe
(d)	12	1	

Question	Answer	Marks	Part Marks
5 (a) (i)	$(3x-1)(x+4)$	2	M1 for $(3x+b)(x+c)$ with $bc = -4$ or $3c+b=11$ or for $3x(x+4)-1(x+4)$ or for $x(3x-1)+4(3x-1)$
(ii)	$\frac{1}{3}$ oe and -4	1	
(b) (i)	$2 \times 2(x-4) - 2(2x+11) = (2x+11)(x-4)$ or better	M2	M1 for common denom $2(2x+11)(x-4)$ seen or attempt to multiply through by denominators or for $\frac{2(x-4)-(2x+11)}{(2x+11)(x-4)} = \frac{1}{2}$
	$2x^2 + 11x - 8x - 44$ or better	B1	or for other correct relevant 2 bracket expansion if alt method used
	$4x - 16 - 4x - 22 = 2x^2 - 8x + 11x - 44$ $2x^2 + 3x - 6 = 0$	A1	correct solution reached with all brackets expanded and no errors or omissions seen
(ii)	$\frac{-3 \pm \sqrt{(3)^2 - 4(2)(-6)}}{2 \times 2}$	2	B1 for $\sqrt{(3)^2 - 4(2)(-6)}$ or better or $\left(x + \frac{3}{4}\right)^2$ oe and B1 for $\frac{-3 + \sqrt{q}}{2(2)}$ or $\frac{-3 - \sqrt{q}}{2(2)}$ or better or $-\frac{3}{4} + \sqrt{\frac{57}{16}}$ oe or $-\frac{3}{4} - \sqrt{\frac{57}{16}}$ oe
	-2.64 and 1.14 final ans cao	B1B1	SC1 for -2.6 or -2.637... and 1.1 or 1.137... or -2.64 and 1.14 seen in working or 2.64 and -1.14 as final answers
6 (a) (i)	27	1	
(ii)	3.89 or 3.888 to 3.889	2	M1 for $\frac{7}{EZ} = \frac{9}{5}$ oe
(b)	76 cao	3	B2 for $ABC = 104$ or $AOC = 152$ or $COD = 28$ or $OBA = 52$ and $OCB = 52$ or $BCD = 128$ and $OCB = 52$ or B1 for any one of $OBA, OBC, OCB = 52$ or $BCD = 128$

Question	Answer	Marks	Part Marks
(c) (i)	90 angle in semicircle	1 1	
(ii)	27 tangent [perpendicular to] radius	1 1	
(iii)	rectangle	1	
7 (a)	72.7 or 72.70 to 72.71 nfww	4	M1 for midpoints soi (condone 1 error or omission) (47.5, 55, 65, 80, 95, 110) M1 for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) (1092.5, 3520, 7930, 10880, 2470, 3190) M1 (dep on 2nd M1) for $\sum fx \div 400$
(b) (i)	[23] 87 209 345 371 [400]	2	B1 for 2 or 3 correct
(ii)	Correct graph	3	B1FT <i>their (b)(i)</i> for 6 correct heights B1 for 6 points at upper ends of intervals on correct vertical line B1FT (dep on at least B1) for increasing curve or polygon through 6 points After 0 scored, SC1FT <i>their (b)(i)</i> for 5 correct points plotted
(iii) (a)	69 to 70	1	
(b)	20 to 23	2FT	FT <i>their</i> cumulative freq curve M1 for correct UQ or LQ for <i>their</i> cumulative freq curve
(c)	72 to 75	2	M1 for 240 soi
8 (a) (i)	5.14 or 5.135 to 5.142 nfww	4	M2 for $[XY^2 =] 12.5^2 + 9.9^2 - 2 \times 12.5 \times 9.9 \times \cos 23$ or M1 for implicit version A1 for 26.4 to 26.5 OR B1 for $[XYT =] 108$ or $[TXY =] 49$ M2 for $\frac{12.5 \sin 23}{\sin(180 - 72)} \text{ oe}$ or M1 for $\frac{\sin(180 - 72)}{12.5} = \frac{\sin 23}{XY} \text{ oe}$

Question	Answer	Marks	Part Marks
(ii)	15.6 or 15.7 or 15.64 to 15.68	3	M2 for $[TZ =] \frac{9.9}{\sin 37} \times \sin(72)$ oe or M1 for $\frac{9.9}{\sin 37} = \frac{TZ}{\sin 72}$ oe OR M2 for $\frac{12.5 \times \sin(180 - 23 - 108)}{\sin 37}$ oe or M1 for $\frac{\sin 37}{12.5} = \frac{\sin(180 - 23 - 108)}{TZ}$ oe
(b)	3.79 or 3.793 to 3.794	4	M3 for $r = 20.5 \div \left(2 + \frac{3 \times 65 \times 2\pi}{360} \right)$ oe or M2 for $20.5 = 2r + \frac{3 \times 65}{360} \times 2\pi r$ oe or M1 for $[3 \times] \frac{65}{360} \times 2\pi r$ oe or $20.5 = 2r + \text{expression involving } \pi$
9 (a)	$x < 10$ oe	1	Accept $x \leq 9$
	$y \geq 2$ oe	1	Accept $y > 1$
(b)	$x + 3y \leq 21$ oe	1	Mark answer line isw
(c)	ruled broken line $x = 10$	B1	or ruled line $x = 9$
	ruled line $y = 2$	B1	or ruled broken line $y = 1$
	ruled line from $(0, 7)$ to $(21, 0)$	B2	SC1 for line with negative gradient correct only at $(0, 7)$ or $(21, 0)$
	correct region indicated cao	1	
(d) (i)	4	1	
(ii)	20	1	
10 (a) (i)	$(6 - 2) \times 180$ or $(2 \times 6 - 4) \times 90$ or $(360 \div 6)$	M1	
	$(6 - 2) \times 180 \div 6$ or $(2 \times 6 - 4) \times 90 \div 6$ or $180 - (360 \div 6)$	M1dep	dep on previous M1
(ii)	$1.73x$ or $x\sqrt{3}$ oe	3	M2 for $2x\sin 60$ or $2x\cos 30$ oe or for $\sqrt{x^2 + x^2 - 2 \times x \times x \times \cos 120}$ or M1 for $x\sin 60$ or $x\cos 30$ oe or for $x^2 + x^2 - 2 \times x \times x \times \cos 120$

Question	Answer	Marks	Part Marks
(iii)	$(10 - x)\sin 30$ seen oe $10 + 2((10 - x)\sin 30)$ oe $10 + 10 - x$ or $10 + 2 \times \frac{1}{2} \times (10 - x)$	M1 M1dep A1	dep on previous M1 with no errors or omissions seen
(b)	12.7 or 12.67 to 12.68.... nfww	4	B3 for 7.32 to 7.33 or M2 for $x = 20 \div (1 + 1.73)$ oe or M1 for $20 - x = \text{their (a)(ii)}$ oe
11 (a)	4 5 6 7 8 16 32 64 128	1 3	B2 for 3 or 4 correct or B1 for first 2 correct If 0 scored, SC1 for 4 values correctly doubled FT one error
(b)	2^n oe	1	
(c) (i)	$2 + 4 + 8 = 14$	1	
	$16 - 2 = 14$	1	or for $14 + 2 = 16 = 2^4$
(ii)	62 and 6	2	B1 for each
(iii)	$2^{n+1} - 2$ oe	1	
(iv)	9	1	

MATHEMATICS

0580/22

Paper 2 (Extended)

October/November 2016

MARK SCHEME

Maximum Mark: 70

Published

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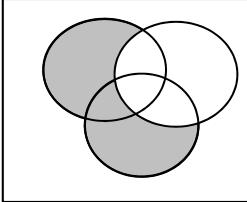
Page 2	Mark Scheme Cambridge IGCSE – October/November 2016	Syllabus 0580	Paper 22
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oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a)	15000 cao	1	
(b)	1.5×10^4	1FT	FT <i>their</i> (a)
2	25	2	B1 for 67 or 113 seen once in correct position or M1 for $a + 42 = 67$ or $a + 42 + 113 = 180$ or better
3	21	2	M1 for $k - 8 = 13$ or $6k - 48 = 78$ or better
4	58	2	M1 for $\frac{(13+16) \times 4}{2}$ or $4 \times 13 + \frac{1}{2} \times 4 \times 3$ oe
5	$9y^3$ final answer	2	B1 for $9y^k$, $9 \times y^3$ or ky^3 ($k \neq 0$) as final answer
6	72.25 cao	2	M1 for $8 + 0.5$ or better seen
7	1, 2, 3	3	B2 for $t < 4$ or M1 for $2 + 6 > 3t - t$ oe or better If zero scored, SC1 for answer 0, 1, 2, 3 or 1, 2, 3, 4
8	correctly eliminating one variable [$x =] 9$ [$y =] 3.5$	M1 A1 A1	If zero scored, SC1 for 2 values satisfying one of the original equations SC1 if no working shown but 2 correct answers given
9	234 or 234.3 to 234.4	3	M2 for $[\text{dist} =] \frac{300}{\tan 52}$ oe or M1 for correct implicit trig statement allow M1 if they use <i>their</i> 52 or <i>their</i> 38 provided it is marked on the diagram or B1 for 52 or 38 correctly placed If zero scored, SC1 for final answer 384

Page 3	Mark Scheme Cambridge IGCSE – October/November 2016	Syllabus 0580	Paper 22
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Question	Answer	Mark	Part marks
10	46.3 or 46.29 to 46.30	3	M2 for $53 \times \sqrt[3]{\frac{20}{30}}$ oe or M1 for $\sqrt[3]{\frac{20}{30}}$ or $\sqrt[3]{\frac{30}{20}}$ or $\left(\frac{53}{x}\right)^3 = \frac{30}{20}$ or better
11 (a)	Accurate angle bisector with correct arcs	2	B1 for accurate angle bisector or correct arcs with no/wrong line
(b)	Equidistant (oe) from AB and AC	1	
12 (a)	38	2	M1 for $57 \div (2 + 1)$ or better
(b)	$12 : 7$	2	M1FT for their $38 - 2$ and their $19 + 2$ seen dep on sum = 57 If M0 SC1 for answer $7 : 12$
13 (a)	$m(m^2 + 1)$ final answer	1	
(b)	$(5 - y)(5 + y)$ final answer	1	
(c)	$(x - 4)(x + 7)$ final answer	2	B1 for $(x - 4)(x + 7)$ seen then spoiled or M1 for $(x + a)(x + b)$ where $ab = - 28$ or $a + b = 3$ or for $x(x + 7) - 4(x + 7)$ or $x(x - 4) + 7(x - 4)$
14	Common denominator 24 Two correct from $\frac{18}{24}, \frac{16}{24}$ and $\frac{3}{24}$ oe $1\frac{7}{24}$ cao	B1 M1 A2	accept $k \times 24$ accept $\frac{18k}{24k}, \frac{16k}{24k}$ and $\frac{3k}{24k}$ A1 for $\frac{31}{24}$ or $\frac{31k}{24k}$ or $1\frac{7k}{24k}$
15 (a) (i)	9	1	
(ii)	12	1	
(b)	$\frac{5}{14}$	1	
(c)		1	

Page 4	Mark Scheme Cambridge IGCSE – October/November 2016	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
16 (a)	$\begin{pmatrix} -7 \\ 3 \end{pmatrix}$	2	M1 for $\overrightarrow{CB} = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$ or for correct route allow e.g. $BA - BC, CB + BA$
(b)	7.81 or 7.810....	2	M1 for $\sqrt{(-5)^2 + 6^2}$
17	1024 cao	5	B4 for 1023 to 1024.0... or 1020 or M3 for $\frac{125}{360} \times \pi \times 48^2 - \frac{125}{360} \times \pi \times 40^2 + 32 \times 8$ or M1 for $\frac{125}{360} \times \pi \times 48^2$ or $\frac{125}{360} \times \pi \times 40^2$ and M1 for $32 \times 8 + k\pi$ If B0 scored B1 for <i>their</i> more accurate decimal answer rounded correctly to an integer
18 (a)	Enlargement [s.f.] $\frac{1}{2}$ [centre] $(-1, 3)$	1 1 1	
(b)	Triangle at $(3, -1) (5, -1) (5, -5)$	3	M2 for 2 correct vertices on grid or in working or M1 for identifying matrix as a reflection in the x -axis or for $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} 3 & 5 & 5 \\ 1 & 1 & 5 \end{pmatrix}$ oe
19 (a)	$\frac{1}{7} \begin{pmatrix} -4 & 3 \\ -5 & 2 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} -4 & 3 \\ -5 & 2 \end{pmatrix}$ or $\det = 7$ soi
(b)	6 nfww	4	M3 for $(w-6)^2 = 0$ or M2 for $w^2 - 12w + 36 [= 0]$ or M1 for $w(w-12) - 4 \times (-9) [= 0]$ oe or clear attempt at determinant = 0 oe

Page 5	Mark Scheme Cambridge IGCSE – October/November 2016	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
20 (a)	(7 , 1)	1	
(b)	-1.25 or $-\frac{5}{4}$ or $-1\frac{1}{4}$	2	M1 for rise/run
(c)	$y = \frac{4}{5}x + 2$ oe	3	B2 for $\frac{4}{5}x + 2$ or $y = \frac{-1}{\text{their(b)}}x + 2$ oe or M1 for $-\frac{1}{\text{their(b)}}$ oe or B1 for $\frac{4}{5}x$ seen or $[y =] mx + 2$ ($m \neq 0$)

MATHEMATICS

0580/42

Paper 4 Paper 4 (Extended)

October/November 2016

MARK SCHEME

Maximum Mark: 130

Published

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Page 2	Mark Scheme Cambridge IGCSE – October/November 2016	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a) (i)	11 054.25 final answer	2	M1 for $18000 \times \left(1 - \frac{15}{100}\right)^3$ oe
(ii)	16 500	3	M2 for $14025 \div \left(1 - \frac{15}{100}\right)$ oe or M1 for recognition of 14 025 as 85% soi
(b)	260 final answer	2	M1 for $P\left(1 + \frac{5}{100}\right)^2 = 286.65$ oe
(c) (i)	6.18	3	M2 for $\frac{224.72 - 200}{200 \times 2} \times 100$ oe or $\frac{1}{2} \left(\frac{224.72}{200} \times 100 - 100 \right)$ or M1 for $\frac{200 \times r \times 2}{100}$ oe or $\frac{224.72 - 200}{200 \times 2}$ or $\frac{224.72}{200} \times 100 - 100$ soi by 12.36 If zero scored, SC1 for 56.18 or 56.2 as final answer
(ii)	6	3	M2 for $\sqrt{\frac{224.72}{200}}$ or $\sqrt{\frac{224.72}{2}}$ soi by 1.06 or 106 or 10.6 or M1 for $200 \left(1 + \frac{r}{100}\right)^2 = 224.72$ oe

Page 3	Mark Scheme Cambridge IGCSE – October/November 2016	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
2 (a)	1 1	1 1	
(b)	Fully correct graph	4	B3FT for 6 or 7 points plotted or B2FT for 4 or 5 points plotted or B1FT for 2 or 3 points plotted
(c) (i)	$-1 < \text{ans} < -0.8$ $1.25 < \text{ans} < 1.45$ $2.5 < \text{ans} < 2.6$	1 1 1	
(ii)	$-0.7 < \text{ans} < -0.5$	2	M1 for evidence of $y = -x$ or $\frac{x^3}{3} - x^2 + 1 = -x$
(d) (i)	$y = 1$ to 1.1 oe	1FT	FT only if a clear maximum point
	$y = -0.4$ to -0.33 oe	1FT	FT only if a clear minimum point
(ii)	-0.4 to -0.33 oe	1FT	Correct or FT <i>their</i> graph
3 (a)	$\frac{240 \sin 85}{\sin 50}$	M2	or M1 for $\frac{\sin 50}{240} = \frac{\sin 85}{AB}$ oe
	312 or 312.1	B1	
(b)	$\frac{1}{2} \times 180 \times 240 \times \sin A = 12000$	M1	
	33.748 to 33.749	A2	A1 for $\sin = \frac{24000}{43200}$ or better or 0.555 or 0.556 or $0.\dot{5}$ or 0.5555 to 0.5556
(c)	328 or 328.3 to 328.5	5	B1 for [angle $A =]$ 78.75 seen M2 for $180^2 + (\text{their } AB)^2 - 2 \times 180 \times \text{their } AB \times \cos 78.75$ or M1 for $\cos 78.75 = \frac{180^2 + (\text{their } AB)^2 - x^2}{2 \times 180 \times (\text{their } AB)}$ A1 for 107800 to 107900
(d) (i)	108.75 or 108.7 or 108.8	1	
(ii)	288.75 or 288.7 or 288.8	2FT	FT $180 + \text{their (d)(i)}$ M1 for $180 + \text{their (d)(i)}$ or $360 - (180 - \text{their(d)(i)})$

Page 4	Mark Scheme Cambridge IGCSE – October/November 2016	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
4 (a)	15	2	M1 for $10 \div 40 [\times 60]$
(b)	49.2 nfww	4	M1 for 35, 42.5, 47.5, 52.5, 57.5, 70 soi M1 for Σfx $8 \times 35 + 22 \times 42.5 + 95 \times 47.5 + 55 \times 52.5 + 14 \times 57.5 + 6 \times 70$ M1 dep for their $\Sigma fx \div 200$
(c)	Fully correct histogram	4	B3 for 4 correct blocks or B2 for 2 or 3 correct blocks or B1 for 1 correct block If zero scored, SC1 for correct frequency densities 0.8, 19, 11, 2.8, 0.3 soi
(d) (i)	125, 180	1	
(ii)	Correct diagram	3	B1FT their (d)(i) for 6 correct heights within correct square(including boundaries) or touching correct line if should be on a grid line and B1 for 6 points at upper ends of intervals on correct vertical line and B1FT (dep on at least B1) for increasing curve or polygon through 6 points If zero scored, SC1FT for 5 correct points plotted
(iii) (a)	48 to 49	1	
(b)	55	1	
(c)	8 to 14	2FT	B1FT for 186 to 192 seen

Page 5	Mark Scheme Cambridge IGCSE – October/November 2016	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
5 (a) (i)	$\frac{3}{4}, \frac{1}{4}$ $\frac{7}{8}, \frac{1}{8}$	2	B1 for any 2 correct
(ii)	$\frac{21}{32}$ oe	2	M1 for $\frac{7}{8} \times \frac{3}{4}$ oe
(iii)	$\frac{441}{1024}$ oe	2FT	M1 for $\left(\frac{7}{8} \times \frac{3}{4}\right)^2$ or <i>their ((a)(ii))²</i> oe
(b)	175	2	M1 for $200 \times \frac{7}{8}$
(c)	2400	2	M1 for $1575 \div \text{their(a)(ii)}$

Page 6	Mark Scheme Cambridge IGCSE – October/November 2016	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
6 (a) (i)	1.32	2	M1 for $0.8 \times 1.5 \times 1.1$
(ii)	0.725 or 0.7246 to 0.7247...	2	M1 for $\pi r^2 \times 0.8 = \text{their(a)(i)}$ or $\pi r^2 = 1.5 \times 1.1$ oe
(iii)	0.513 to 0.518 nfww	5	M1 for $2(1.5 \times 1.1 + 1.5 \times 0.8 + 1.1 \times 0.8)$ M1 for [2 ×] $\pi \times (\text{their (a)(ii)})^2$ M2 for $\pi \times 2 \times (\text{their (a)(ii)}) \times 0.8$ or M1 for $\pi \times 2 \times (\text{their (a)(ii)})$
(b) (i)	$x + y \geqslant 9$ oe $y \geqslant 2$ oe	1 1	If zero scored, SC1 for $x + y > 9$ and $y > 2$
(ii)	Fully correct diagram with unwanted region shaded	4	B1 for $2x + 3y = 24$ ruled B1 for $x + y = 9$ ruled B1 for $y = 2$ ruled
(iii)	20 $[x =] 7$ $[y =] 2$	1 1 1	If zero scored, SC1 for $2x + 3y$ evaluated from integers

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0580	42

7 (a)	54.50 final answer	2	B1 for 54.495 to 54.496 or 54.5 or M1 for $200 \div 3.67$
(b) (i)	$\frac{1000}{x(x+1)}$ final answer	3	M1 for $1000(x+1) - 1000x$ M1 for denominator $x(x+1)$
(ii)	$\frac{1000}{x} - \frac{1000}{x+1} = 4.5 [0] \text{ oe}$ or $\frac{1000}{x(x+1)} = 4.5$ $1000 = 4.5x(x+1)$ $4.5x^2 + 4.5x - 1000 = 0$ $9x^2 + 9x - 2000 = 0$	M1dep A1	Allow <i>their</i> (b)(i) for first M1 only for a single fraction Correctly multiplying by algebraic denominator Equation reached without any errors or omissions and at least one step after clearing the denominators of the fractions still with brackets included
(iii)	$\frac{-9 \pm \sqrt{9^2 - 4(9)(-2000)}}{2(9)}$ -15.42 14.42	2 B1 B1	B1 for $\sqrt{9^2 - 4(9)(-2000)}$ If in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ then B1 for $p = -9$ and $r = 2(9)$ SC1 for answers – 15.4 or – 15.42 to – 15.41 and 14.4 or 14.41 to 14.42 or for – 14.42 and 15.42 or – 15.42 and 14.42 seen but not final answer Answers without working only score B1, B1 or SC1
(iv)	69.34 to 69.37 final answer must be 2 dp	2FT	FT $1000 \div \text{their positive } x$ with final answer rounded up or down to 2 dp or M1 for $1000 \div \text{their positive } x$

Page 8	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0580	42

8 (a)	[$u =] 80$ [$v =] 160$	1 1	
(b)	6.24 or 6.244 to 6.245	3	M2 for $\sqrt{8^2 - 5^2}$ oe or M1 for $l^2 + 5^2 = 8^2$ oe or B1 for suitable right angled triangle drawn with 5 on correct side
(c)	5.05 or 5.052....	2	M1 for $\frac{4.8}{2.5} = \frac{9.7}{MN}$ oe
(d)	4 nfww	4	M3 for $[x^n](x+1) = 4 \times \frac{5}{12}[x^n](x-1)$ oe, $n = 1, 2$ or 3 or M2 for $\frac{[x](x+1)}{\frac{5}{12}[x](x-1)} = \left(\frac{2[x]}{[x]}\right)^2$ oe or M1 for 2^2 or $\left(\frac{1}{2}\right)^2$ soi
9 (a) (i)	1.5 oe	1	
(ii)	$\frac{3}{y-2}$ oe final answer	3	M1 for correct removal of fraction M1 for collection of terms in x and factorises OR M1 subtracts 2 from both sides M1 multiplies by x to remove fraction and M1 for correct division by expression of the form $ay + b$, a and $b \neq 0$
(b) (i)	-3	1	
(ii)	65 536 final answer	2	B1 for $h(16)$ oe e.g. $h(2^4)$
(iii)	-6	2	M1 for $2 - x = 2^3$ oe
(iv)	3	1	
10 (a)	7.5	2	M1 for $3x + x + 3x + x = 60$ oe
(b)	5	3	B2 for $3x + 4x + 5x [= 60]$ or better or M1 for $(3x)^2 + (4x)^2$ oe
(c)	16.8 or 16.80....	3	M2 for $x + x + \frac{90}{360} \times \pi \times 2 \times x [= 60]$ oe or M1 for $\frac{90}{360} \times \pi \times 2 \times x$ oe

MATHEMATICS

0580/22

Paper 2 (Extended)

May/June 2016

MARK SCHEME

Maximum Mark: 70

Published

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2016	0580	22

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1	5.74×10^{-5}	1	
2	5.89 or 5.885 to 5.886	1	
3	3.590 cao	1	
4	Parallelogram	1	
5 (a)	9 and 16	1	
(b)	11	1	
6	$\frac{1}{8}x^2$ or $0.125x^2$ final answer	2	B1 for answer $\frac{1}{8}x^k$ or nx^2
7	460	2	B1 for $1 \text{ cm}^2 : 100 \text{ km}^2$ oe or M1 for $4.6 \times 1000000^2 \div 100000^2$ oe seen
8	$x > -9$	2	M1 for $\frac{x}{3} > 2 - 5$ oe or $\left(\frac{x}{3} + 5\right) \times 3 > 2 \times 3$ oe
9	45	3	M2 for $360 \div (180 - 172)$ or M1 for $180 - 172$ or $\frac{180(n-2)}{n} = 172$ oe
10	$p = \frac{8r-5}{r-3}$ oe final answer	3	M1 for correctly collecting terms in p on one side and terms not in p on the other side M1 for correct factorising M1 for correct division dependent on p appearing only once in a factorised expression Maximum M2 for an incorrect final answer
11	68 76 78 78	3	B1 for four values with a mode of 78 B1 for four values with a median of 77 B1 for total of four values is 300

Page 3	Mark Scheme Cambridge IGCSE – May/June 2016	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
12	$\frac{11}{30}$ cao	3	B2 for $\frac{33}{90}$ oe as final answer or M1 for $36.\dot{6} - 3.\dot{6}$ or $36.6^r - 3.6^r$ oe or B1 for $\frac{k}{90}$
13	10 cao nfww	3	M2 for $42.5 \times 2 \div 8.5$ allowing one error in the UB or LB provided it is still $UB \times 2 \div LB$ or M1 for one of 42.5 or 8.5 seen as bounds
14	$\frac{21}{8} \times \frac{3}{7}$ oe $1\frac{1}{8}$ cao final answer	M1 A2	Must be shown A1 for $\frac{9}{8}$ oe e.g. $\frac{63}{56}$
15	$a = 3.5$ or $\frac{7}{2}$ and $b = -17.25$ or $-\frac{69}{4}$	3	B2 for one correct or M2 for $(x + \frac{7}{2})^2 - 5 - \left(\frac{7}{2}\right)^2$ or M1 for $(x + \frac{7}{2})^2$ oe or $2a = 7$ or $a^2 + b = -5$ after $x^2 + 2ax + a^2$
16	Correctly eliminating one variable $x = 4$ $y = 0.5$ oe	M1 A1 A1	If zero scored SC1 for 2 values satisfying one of the original equations or if no working shown, but 2 correct answers given
17 (a)	Bisector of angle B accurate with two pairs of correct arcs	2	B1 for accurate line with no/wrong arcs or for correct arcs with no/wrong line
(b)	Ruled line parallel to AC at a distance of 3 cm to AC only inside the triangle	1	
18 (a)	$3n + 13$ oe final answer	2	M1 for $3n + c$ or $kn + 13$
(b)	3^{n-1} oe final answer	2	M1 for recognition of terms being powers of 3
19 (a)	7.74 or 7.738 to 7.739 [billion]	2	M1 for $7.23 \times \left(1 + \frac{1.14}{100}\right)^6$
(b)	2042	2	B1 for 28 or 28.6... or 29 or answer 2043

Page 4	Mark Scheme Cambridge IGCSE – May/June 2016	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
20 (a)	240	2	M1 for any three pairs of products from 2.5×12 , 2.5×26 , 5×15 , 5×10 , 10×2
(b)	29.2 or 29.16 to 29.17	2	M1 for $(5 \times 10 + 10 \times 2) / \text{their (a)}$ or for their total of the bars above 10 minutes $\div \text{their (a)}$
21	62 on answer line or clearly identified as $\angle ACB$ and two correct supporting reasons	4	B1 for $\angle AOB = 124$ or for $\text{their } \angle AOB \div 2$ or other appropriate correct angle one step from $\angle ACB$ B1 for any correct reason e.g. isosceles triangle or angles in triangle = 180 B1 for a different correct reason leading directly to $\angle ACB$ e.g. angle at circumference is $\frac{1}{2}$ angle at centre oe B1 for 62
22 (a)	$\begin{pmatrix} 20 & 4 \\ -12 & -8 \end{pmatrix}$	1	
(b)	$\begin{pmatrix} 22 & 3 \\ -9 & 1 \end{pmatrix}$	2	B1 for two correct elements
(c)	$-\frac{1}{7} \begin{pmatrix} -2 & -1 \\ 3 & 5 \end{pmatrix}$ oe isw	2	M1 for $-\frac{1}{7} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ or $k \begin{pmatrix} -2 & -1 \\ 3 & 5 \end{pmatrix}$ or $\det = -7$ soi
23	Correct shading with three ruled accurate solid boundary lines 	5	B2 for $3x + 4y = 12$ line through (0, 3) and (4, 0) or B1 for a diagonal line through one of these points B1 for $y = 2x$ line through (0, 0) and (1, 2) or through (1, 2) and (3, 6) B1 for $x = 3$ line

Page 5	Mark Scheme Cambridge IGCSE – May/June 2016	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
24 (a)	$\mathbf{a} + \mathbf{b} - \mathbf{c}$	1	
(b)	$\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b} + \frac{1}{2}\mathbf{c}$	2	M1 for $\mathbf{c} + \frac{1}{2}$ (<i>their (a)</i>) or for a correct route e.g. $\overrightarrow{OC} + \frac{1}{2}\overrightarrow{CB}$, \overrightarrow{OQ}
(c)	$\frac{1}{2}\mathbf{c} - \frac{1}{2}\mathbf{a} - \frac{1}{6}\mathbf{b}$	2	M1 for $\frac{1}{3}\mathbf{b} - \frac{1}{2}$ (<i>their (a)</i>) or other correct route e.g. $-\frac{2}{3}\mathbf{b} - \mathbf{a} + \text{their (b)}$, $\overrightarrow{PO} + \overrightarrow{OQ}$

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2016

MARK SCHEME

Maximum Mark: 130

Published

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Page 2	Mark Scheme Cambridge IGCSE – May/June 2016	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Abbreviations

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SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a) (i)	1245 [pm]	2	B1 for 2045 seen or 845 pm seen or [0]135 seen
(ii)	788 or 787.8 to 788.1	2	M1 for $8800 \div 11$ h 10 mins oe
(b) (i)	4230[.00]	2	M1 for $2350 \div 5$ oe
(ii)	22.2 or 22.2...	1	
(c) (i)	3808 final answer	2	M1 for $2240 \times \frac{100+70}{100}$ oe
(ii)	800	3	M2 for $2240 \div \frac{100+180}{100}$ oe or M1 for 2240 associated with 280%
(d) (i)	1130	4	M3 for $(826.5[0] - 12 \times (28 + 6.5[0])) \div 1.25$ seen or M2 for $826.5[0] - 12 \times (28 + 6.5[0])$ seen or M1 for $12 \times (28 + 6.5[0])$ seen
(ii)	\$146.9[0] final answer	2FT	FT their(d)(i) $\times 0.13$ correctly evaluated If answer not exact to at least 3 sf or better M1 for $their(d)(i) \div 10 \times 1.3$
2 (a) (i)	5	1	
(ii)	$\frac{1}{2}$ oe	1	
(iii)	$\frac{5}{3}$ oe	2	M1 for $2^{3x} = 2^5$ oe or better or SC1 for either denominator or numerator of index correct in final answer
(iv)	$-\frac{2}{3}$ oe	2	M1 for $3^{3x} = 3^{-2}$ oe or better or $\left(\frac{1}{3}\right)^{-3x} = \left(\frac{1}{3}\right)^2$ or better or SC1 for $\frac{2}{3}$ or any negative index

Page 3	Mark Scheme Cambridge IGCSE – May/June 2016	Syllabus 0580	Paper 42
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Question	Answer	Mark	Part marks
(b)	$(y - 10)(y + 3)$ seen 10 and -3 final answers	B2 B1	B1 for $y(y - 10) + 3(y - 10) [= 0]$ or $y(y + 3) - 10(y + 3) [= 0]$ or for $(y + a)(y + b) [= 0]$ where $ab = -30$ or $a + b = -7$ or for $y - 10 [= 0]$ and $y + 3 [= 0]$
3 (a) (i)	Image at $(3, 1), (5, 1), (5, 4), (4, 4), (4, 2), (3, 2)$	2	SC1 reflection in $y = 1$ or $x = k$ or 6 correct points not joined
(ii)	Image at $(2, 1), (6, 1), (6, -5), (4, -5), (4, -1), (2, -1)$	2	SC1 for other enlargement of scale factor -2, correct size and correct orientation or 6 correct points but not joined
(iii)	Image at $(-1, -1), (-2, -1), (-2, -2), (-4, -2), (-4, -3), (-1, -3)$	3	M2 for 6 correct points shown in working or plotted correctly but not joined or M1 for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} -1 & -1 & -2 & -2 & -3 & -3 \\ 1 & 2 & 2 & 4 & 4 & 1 \end{pmatrix}$ or for rotation 90° [anticlockwise] centre (0, 0) stated
(b)	Enlargement [sf] 3 origin oe	3	B1 for each
4 (a) (i)	$-2, -0.5$ or $-\frac{1}{2}$	2	B1 for each
(ii)	Complete correct curve	5	SC4 for correct curves but branches joined or touching y -axis or B3FT 9 or 10 points or B2FT for 7 or 8 points or B1FT for 5 or 6 points and B1indep two separate branches not touching or crossing y -axis
(b)	-1.95 to -1.8 -0.4 to -0.2 2.05 to 2.2	3	B1 for each
(c)	Any integer k where $k \leq -3$	1	

Page 4	Mark Scheme Cambridge IGCSE – May/June 2016	Syllabus 0580	Paper 42
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Question	Answer	Mark	Part marks
(d) (i)	Correct line $y = -5x - 2$ ruled and – 0.4 to – 0.2 0.55 to 0.75	4	M2 for correct ruled line or M1 for correct line but freehand or for ruled line gradient – 5 or ruled line y -intercept – 2, but not $y = -2$ and A1 for each correct solution dependent on at least M1 If 0 scored, SC1 for both correct with no line drawn
(ii)	$[a =] 5$ and $[b =] -2$	2	B1 for one correct value or M1 for $x^3 + 5x^2 - 2x - 1 = 0$ seen
5 (a)	0.05 oe	2	M1 for $1 - (0.2 + 0.3 + 0.45)$ oe
(b)	15	1	
(c) (i)	0.75 oe	2	M1 for $0.45 + 0.3$ oe
(ii)	0.135 oe	2	M1 for 0.45×0.3 oe
(iii)	0.12 oe	3	M2 for $2(0.3 \times 0.2)$ oe or M1 for 0.3×0.2 or 0.06 oe nfww
(d)	0.243 oe	5	M4 for $3(0.45 \times 0.45 \times 0.2) +$ $3(0.3 \times 0.3 \times 0.45)$ oe or M3 for $3(0.45 \times 0.45 \times 0.2)$ or $3(0.3 \times 0.3 \times 0.45)$ oe or M2 for $0.45 \times 0.45 \times 0.2$ and $0.3 \times 0.3 \times 0.45$ or M1 for $0.45 \times 0.45 \times 0.2$ or $0.3 \times 0.3 \times 0.45$ oe or for identifying the correct 6 outcomes e.g. 10 0 0, 0 0 10, 0 10 0, 5 5 0, 5 0 5, 0 5 5
6 (a)	3	1	
(b) (i)	9900	3	M2 for $2(60 \times 35) + 2(60 \times 30) + 2(30 \times 35)$ oe or M1 for one correct rectangle
(ii)	0.99 oe	1FT	FT <i>their(b)(i) ÷ 10 000</i>

Page 5	Mark Scheme Cambridge IGCSE – May/June 2016	Syllabus 0580	Paper 42
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Question	Answer	Mark	Part marks
(c) (i)	75.7 or 75.66 to 75.67	4	M3 for $\sqrt{60^2 + 30^2 + 35^2}$ oe could be in stages or M2 for $60^2 + 30^2 + 35^2$ oe or M1 for $60^2 + 30^2$ or $60^2 + 35^2$ or $35^2 + 30^2$ oe
(ii)	23.4 or 23.3 or 23.34 to 23.36...	3	M2 for $\sin^{-1}(30 \div \sqrt{60^2 + 35^2 + 30^2})$ oe or for $\sin^{-1}(30 \div \text{their (c)(i)})$ or M1 for $\sin = 30 \div \sqrt{60^2 + 35^2 + 30^2}$ oe or for $\sin = 30 \div \text{their (c)(i)}$
(d) (i)	$30 \times 35 \times 60 [= 63\,000]$	1	With no errors seen
(ii)	22.4 or 22.38 to 22.391	3	M2 for $\sqrt{\frac{63\,000}{40\pi}}$ oe or M1 for $40\pi r^2 = 63\,000$ oe
7 (a)	$360 - 210 [= 150]$ $(180 - 150) \div 2 [= 15]$ or $150 \div 2 [= 75]$ and $180 - 75 - 90 [= 15]$	M1 M1	
(b)	15.5 or 15.45 to 15.46 nfww	4	M3 for $2 \times 8 \cos 15$ oe or M2 for $8 \cos 15$ oe or M1 for $\frac{x}{8} = \cos 15$ oe
(c)	29.5 or 29.4 or 29.39 to 29.50..	3	M2 for $[\sin ABC =] \frac{8 \times \sin 72}{\text{their}(b)}$ or M1 for $\frac{\sin ABC}{8} = \frac{\sin 72}{\text{their}(b)}$ oe
(d)	194 or 193.7 to 194.1 nfww	6	M2 for $\frac{210}{360} \times \pi \times 8^2$ or M1 for $[k] \pi \times 8^2$ seen and M1 for $\frac{1}{2} \times 8^2 \times \sin 150$ oe and M2 for $\frac{1}{2} \times 8 \times \text{their (b)} \times \sin(108 - \text{their (c)})$ oe or B1 for $[\text{angle } CAB =] 108 - \text{their (c)}$
(e)	12.1 or 12.11 to 12.13	2FT	FT $\text{their (d)} \div 4^2$ oe M1 for 4^2 or $\left(\frac{1}{4}\right)^2$ soi

Page 6	Mark Scheme Cambridge IGCSE – May/June 2016	Syllabus 0580	Paper 42
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Question	Answer	Mark	Part marks
8 (a) (i)	-3	2	M1 for $[g(1) =] -2$ provided not used in a product or for $5\left(\frac{4}{x-3}\right) + 7$ or better
(ii)	$\frac{4}{5x+4}$ final answer	2	M1 for $\frac{4}{5x+7-3}$
(iii)	$\frac{4+3x}{x}$ or $\frac{4}{x} + 3$ final answer	3	M2 for $xy = 4 + 3x$ or $y - 3 = \frac{4}{x}$ or $x = \frac{4}{y} + 3$ or $x = \frac{4+3y}{y}$ or M1 for $x = \frac{4}{y-3}$ or $y(x-3) = 4$ or $x - 3 = \frac{4}{y}$ or $x(y-3) = 4$
(iv)	2	1	
(b) (i)	$(5x + 7)(x - 3) = 4$	M1	
	$5x^2 - 15x + 7x - 21 = 4$ oe	B1	Condone omission of ‘= 4’ for the B mark
	$5x^2 - 8x - 25 = 0$	A1	Dep on M1B1 and no errors or omissions at any stage seen
(ii)	$\sqrt{(-8)^2 - 4(5)(-25)}$ or better	B1	or for $\left(x - \frac{4}{5}\right)^2$ oe
	$p = -(-8)$ and $r = 5 \times 2$ oe	B1	must see $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or both or for $\frac{4}{5} + \sqrt{\left(\frac{4}{5}\right)^2 + 5}$ or $\frac{4}{5} - \sqrt{\left(\frac{4}{5}\right)^2 + 5}$
	-1.57 and 3.17	B1B1	SC1 for final answers -1.6 or -1.574 to -1.575 and 3.2 or 3.174 to 3.175 or -1.57 and 3.17 seen in working or for -3.17 and 1.57 as final ans
9 (a)	19[.] or 18.97.. nfww	3	M2 for $\sqrt{(4--2)^2 + (13--5)^2}$ oe or M1 for $(4-2)^2 + (13--5)^2$ oe

Page 7	Mark Scheme Cambridge IGCSE – May/June 2016	Syllabus 0580	Paper 42
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Question	Answer	Mark	Part marks
(b)	$[y =] 3x + 1$	3	B2 for answer $[y =] 3x + c$ oe or answer $kx + 1$ ($k \neq 0$) or M1 for $\frac{13 - 5}{4 - 2}$ oe or 3 and M1 for correct substitution of $(-2, -5)$ or $(4, 13)$ into $y = (\text{their } m)x + c$ oe
(c)	$y = 3x - 5$ oe	2FT	FT <i>their gradient from (b)</i> M1 for $y = mx - 5$ with other m , $m \neq 0$ or $y = \{\text{their gradient from (b)}\}x + c$ If 0 scored, SC1 for answer $3x - 5$
(d)	$y = -\frac{1}{3}x + \frac{13}{3}$ oe isw	5	B2FT for $-\frac{1}{3}x + c$ (c can be numeric or algebraic) FT $-1/\text{their gradient from (b)}$ or M1 for $-1/\text{their gradient from (b)}$ soi and B1 for [midpoint of $AB =$] $(1, 4)$ and M1 for substitution of $(1, k)$ or $(k, 4)$ into a linear equation

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MARK SCHEME for the March 2016 series

0580 MATHEMATICS

0580/22 Paper 2 (Paper 22 – Extended), maximum raw mark 70

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Page 2	Mark Scheme Cambridge IGCSE – March 2016	Syllabus 0580	Paper 22
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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1	7, -4	1	
2	$2x(1 - 2y)$ final answer	2	M1 for $2(x - 2xy)$ or $x(2 - 4y)$ or for correct answer then spoilt
3	75.1 or 75.09 to 75.10	2	M1 for $\cos [\dots =] \frac{0.9}{3.5}$
4	$n < 1.5$ oe final answer	2	B1 for 1.5 oe in answer or M1 for $3 > 8n - 6n$ oe
5	9.1 oe	2	M1 for $\frac{5.2}{PQ} = \frac{12.4}{21.7}$ oe
6	$\frac{4}{9}$ oe, must be fraction	2	M1 for $10 \times 0.\dot{4} - 0.\dot{4}$ oe
7	130 or 130.0 to 130.1	2	M1 for $\frac{1}{2} \times 22.3 \times 27.6 \times \sin 25^\circ$
8	$\frac{1}{5} \begin{pmatrix} 7 & 2 \\ 8 & 3 \end{pmatrix}$ oe isw	2	M1 for $\frac{1}{5} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ soi or $k \begin{pmatrix} 7 & 2 \\ 8 & 3 \end{pmatrix} \quad k \neq 0$ or $\det = 5$ soi
9	$\frac{35(\text{or } 95)}{60} + \frac{39}{60}$ $2\frac{7}{30}$	M1 A2	accept $\frac{35k(\text{or } 95k)}{60k} + \frac{39k}{60k}$ or A1 for $\frac{67}{30}$ or $\frac{134k}{60k}$ or $1\frac{74k}{60k}$ or $2\frac{14k}{60k}$
10	64000	3	M2 for $\frac{1.6 \times 20000^2}{100^2}$ oe or M1 for figs 64 in answer or $1 \text{ cm}^2 = 40000 \text{ m}^2$

Page 3	Mark Scheme Cambridge IGCSE – March 2016	Syllabus 0580	Paper 22
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Qu.	Answers	Mark	Part Marks
11	16.58 cao	3	B2 for 16.6 or 16.580 to 16.583 final answer or 16.58 not as final answer or M1 for $\frac{38}{360} \times 2 \times \pi \times 25$ and B1 for rounding their more accurate answer correctly to 4sf
12	87 cao nfww	3	B2 for 87.04.... or 87.0 nfww or M1 for 500.5 or 5.75 seen or for $(500 + 0.5) \div (5.8 - 0.05)$ and B1 for truncating their decimal answer to an integer
13 (a)	$2^5 \times 3^2 \times 7$ oe final answer	3	B2 for product of two of 2^5 , 3^2 , 7 or B1 for 2, 3 and 7 seen or M1 for 2×1008 or 3×672 or 7×288 soi
(b)	2.016×10^3	1	
14 (a)	$x^8 y^7$ final answer	2	B1 for answer $x^8 y^k$ or $x^k y^7$ ($k \neq 0$)
(b)	$27 p^6 m^{15}$ final answer	2	B1 for 2 correct of 27, p^6 , m^{15} in a product as answer
15	111.2 or 111.1 to 111.2	4	M2 for $[\cos =] \frac{2.8^2 + 3.6^2 - 5.3^2}{2 \times 2.8 \times 3.6}$ or M1 for implicit form A1 for $[\cos =] -0.362$ to -0.361
16	44.1 or 44.07...	4	M1 for 4 of mid-values 15 30 45 55 75 soi M1 for $\sum fx$ for any x in intervals including boundaries M1 dep for $\sum fx \div 70$ Dep on 2nd M mark earned

Page 4	Mark Scheme Cambridge IGCSE – March 2016	Syllabus 0580	Paper 22
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Qu.	Answers	Mark	Part Marks
17	$\frac{-(-11) \pm \sqrt{(-11)^2 - 4(3)(4)}}{2 \times 3}$ 0.41 and 3.26 final ans cao	2 B1B1	B1 for $\sqrt{(-11)^2 - 4(3)(4)}$ or better and, if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$, B1 for $p = -(-11)$ and $r = 2(3)$ SC1 for 0.4 and 3.3 or 0.409... and 3.257... or -0.41 and -3.26 or 0.41 and 3.26 seen in working
18 (a)	47	1	
(b)	117	2	M1 for $360 - (115 + 85 + 97)$
(c)	244	2	B1 for 116 seen at centre or 122 seen at circumference
19	$y < 2$ oe and $x \geq -2$ oe $y \geq \frac{1}{2}x + 1$ oe and $y \leq -x + 3$ oe	2 3	B1 for either correct B2 for either $y \geq \frac{1}{2}x + 1$ oe or $y \leq -x + 3$ oe or SC2 for $y = \frac{1}{2}x + 1$ oe and $y = -x + 3$ oe or SC1 for $y = \frac{1}{2}x + 1$ oe or $y = -x + 3$ oe or SC4 for $y \leq 2$ oe, $x > -2$ oe, $y > \frac{1}{2}x + 1$ oe and $y < -x + 3$ oe
20 (a)	$9a + 3b$	1	
(b)	$36a + 6b = 96$ or $9a + 3b = 21$ for correct method to eliminate one variable $a = 3$ $b = -2$	B1 M1 A1 A1	If M0 A0 A0 scored SC1 for 2 values satisfying $36a + 6b = 96$ or $9a + 3b = 21$ or if no working shown, but 2 correct answers given

Page 5	Mark Scheme Cambridge IGCSE – March 2016	Syllabus 0580	Paper 22
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Qu.	Answers	Mark	Part Marks
21 (a)	$\frac{2}{3}$ oe	1	
(b)	<i>their</i> $\frac{2}{3}$, $\frac{7}{8}$, $\frac{5}{8}$ oe	2	B1 for either $\frac{7}{8}$ or $\frac{5}{8}$
(c) (i)	$\frac{1}{24}$ oe	2	M1 for $\frac{1}{3} \times \frac{1}{8}$ seen
(ii)	$\frac{17}{24}$ oe	3	M2FT for $\frac{1}{3} \times \frac{7}{8} + \frac{2}{3} \times \frac{5}{8}$ or M1FT for $\frac{1}{3} \times \frac{7}{8}$ or $\frac{2}{3} \times \frac{5}{8}$

CAMBRIDGE INTERNATIONAL EXAMINATIONS
Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2016 series

0580 MATHEMATICS

0580/42 Paper 4 (Extended), maximum raw mark 130

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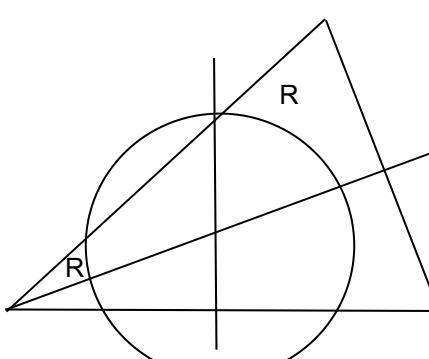
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Page 2	Mark Scheme Cambridge IGCSE – March 2016	Syllabus 0580	Paper 42
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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1 (a)	$\frac{8}{8+15+9} \times 640$ oe	1	With no errors seen
(b)	300 and 180	2	B1 for each or SC1 for answers reversed
(c)	10 nfww	2	M1 for $160 \div 15.25$ implied by 10.5 or 10.49... nfww
(d)	$\frac{7}{24}$	3	M1 for $\frac{3}{8} + \frac{1}{3}$ oe M1dep on previous M1 for $1 - \text{their } (\frac{3}{8} + \frac{1}{3})$ oe
2 (a)	Correct perpendicular bisector of AB with 2 pairs of correct arcs isw	2	B1 for accurate with no/wrong arcs or M1 for correct intersecting arcs with no or wrong line
(b)	Correct angle bisector at A with two pairs of correct arcs isw	2	B1 for accurate with no/wrong arcs or M1 for two pairs of correct arcs with no or wrong line
(c)	Circle centre E radius 5 cm isw	2FT	FT circle centre <i>their E</i> radius 5 cm provided (a) and (b) attempted
(d)		2	M1 for $250 \div 50$ oe soi e.g. from arc If 0 scored SC1 for circle centre <i>their E</i> cao B1 for each If 0 scored, SC1 for two ‘correct’ regions but in part (c), centre correct but radius incorrect

Page 3	Mark Scheme Cambridge IGCSE – March 2016	Syllabus 0580	Paper 42
---------------	---	--------------------------------	---------------------------

Qu.	Answers	Mark	Part Marks
3 (a) (i)		3	B1 for each
(ii)	46	1FT	FT 29 + their 3 values from (a)
(iii)	11	1	
(iv)	$\frac{7}{19}$ oe	2	M1 for $\frac{n}{16+their\ 3}$ ($0 < n < (16 + \text{their } 3)$) or $\frac{4+their\ 3}{k}$ ($k > (4 + \text{their } 3)$)
(b) (i)	$\frac{9}{200}$ or 0.045	1	
(ii)	10800	3	M2 for $\frac{1}{2}(900 + 1500) \times 9$ oe or M1 for method of finding a relevant area
(iii)	7.2	1FT	FT (their 10800) \div 1500
4 (a) (i)	64	1	
(ii)	16 to 16.5	2	M1 for UQ = 71 to 71.5 or LQ = 55
(iii)	62	2	B1 for 24 indicated
(iv)	6	2	B1 for 54 seen
(b)	[8] 12 23 11 [4] 2	3	B2 for 1 incorrect reading FT others B1 for 2 correct
(c)	Blocks of height 0.6 2.3 1.1 0.4 with correct widths	4FT	FT their (b) for heights B1FT for each correct block If B0, SC1 for blocks of widths 20, 10, 10, 10 or for their correct frequency densities
5 (a)	6250	3	M2 for $\frac{6000}{100-4} \times 100$ oe or M1 for 6000 associated with 96 [%]
(b)	4441	3	B2 for 4441.1 to 4441.2 or 4440 or M1 for $\frac{6000}{1.351}$

Page 4	Mark Scheme Cambridge IGCSE – March 2016	Syllabus 0580	Paper 42
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Qu.	Answers	Mark	Part Marks
(c)	1.58 or 1.581...	5	<p>M1 for $6000 \times \left(1 + \frac{1.5}{100}\right)^8$ oe</p> <p>A1 for 6758.95..... or 6758.96 to 3 sf or better or 758.95 or 758.96 rounded or truncated to 3 sf</p> <p>and M2 for</p> $\{their(6000 \times 1.015^8) - 6000\} \times \frac{100}{6000 \times 8}$ <p>or M1 for $\frac{6000 \times r \times 8}{100}$ oe</p>
6 (a) (i)	Rotation	1	
	90° [anticlockwise] oe	1	
	(4, 4)	1	
(ii)	Enlargement	1	
	[centre] (5, 1)	1	
	[scale factor] 2	1	
(b) (i)	Image at (-2, 5) (-2, 7) (-1, 7)	2	<p>B1 for translation by $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$</p>
(ii)	Image at (-2, 1) (-2, -1) (-1, -1)	2FT	<p>FT their triangle P reflected in line $y = 3$</p> <p>B1 for reflection of triangle P in the line $x = 3$ or $y = k$</p>
(c)	Image at (-2, 3) (-4, 3) (-4, 4)	3	<p>B2 for 2 vertices correct in triangle or 3 correct co-ordinates soi in working</p> <p>or B1 for 1 vertex in triangle correct soi</p> <p>or M1 for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 3 & 3 & 4 \\ 2 & 4 & 4 \end{pmatrix}$ shown</p> <p>or statement</p> <p>rotation 90° [anticlockwise] about (0, 0)</p>
7 (a)	3.5[0] 1.94 3.11	3	<p>B1 for each</p>
(b)	Fully correct curve	5	<p>B3 FT for 10 or 11 points</p> <p>or B2 FT for 8 or 9 points</p> <p>or B1 FT for 6 or 7 points</p> <p>B1 indep two separate branches not touching or cutting y-axis</p>
(c)	-0.7 to -0.6	1	<p>SC4 for correct curve, but branches joined</p>

Page 5	Mark Scheme Cambridge IGCSE – March 2016	Syllabus 0580	Paper 42
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Qu.	Answers	Mark	Part Marks
(d) (i)	-1 2.5	1 1	If 0,0, M1 for $y = 2.5 - x$ oe seen in working
(ii)	-0.6 to -0.5 with correct ruled line	3	B2FT for drawing <i>their</i> ruled line from (d)(i) or M1 for ruled line through (0, 2.5)FT or gradient -1 FT
(e)	Correct tangent and $0.5 \leqslant \text{grad} \leqslant 0.85$	3	B2 for close attempt at tangent at $x = 2$ and answer in range OR B1 for ruled tangent at $x = 2$, no daylight at $x = 2$ Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 1.8$ and 2.2 and M1 (dep on B1 or close attempt at tangent [at any point] for $\frac{\text{rise}}{\text{run}}$
8 (a)	15 nfww	3	M1 for $y = k\sqrt{(x+2)}$ oe A1 for $k = 3$
(b)	$\frac{x+6}{x-2}$ nfww final answer	5	B2 for $(x+6)^2$ oe or SC1 for $(x+a)(x+b)$ where $ab = 36$ or $a + b = 12$ or $x(x+6) + 6(x+6)$ B2 for $(x-2)(x+6)$ or SC1 for $(x+a)(x+b)$ where $ab = -12$ or $a + b = 4$ or $x(x+6) - 2(x+6)$ or $x(x-2) + 6(x-2)$
(c)	$\frac{X}{W^2 + 1}$ nfww final answer	5	M1 for $W^2 = \frac{X-a}{a}$ or $W\sqrt{a} = \sqrt{X-a}$ M1 for next productive step M1 for 2nd productive step M1 for 3rd productive step M1 for final step leading to $a =$
(d)	$\frac{-7x-1}{x^2-1}$ or $\frac{-7x-1}{(x-1)(x+1)}$ final answer	5	M1 for common denominator $(x-1)(x+1)$ isw M1 for $(x-2)(x-1) - (x+3)(x+1)$ B2 for $x^2 - 2x - x + 2 - (x^2 + 3x + x + 3)$ oe or B1 for either expansion

Page 6	Mark Scheme Cambridge IGCSE – March 2016	Syllabus 0580	Paper 42
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Qu.	Answers	Mark	Part Marks
9 (a) (i)	y	1	
(ii)	$x + y$	1	
(iii)	$x + 2y$	2	M1 for a correct unsimplified route or identifying \overrightarrow{OS}
(b)	$-(\frac{1}{2}x + y)$ oe	2	M1 for a correct unsimplified route or $\overrightarrow{GR} = -\frac{1}{2}\mathbf{x}$ or $\overrightarrow{RG} = \frac{1}{2}\mathbf{x}$
(c) (i)	$\overrightarrow{MG} = 2\mathbf{x} + 2\mathbf{y}$	2	M1 for a correct unsimplified route e.g. $2\overrightarrow{PQ}$
(ii)	$\overrightarrow{MH} = \mathbf{x} + \mathbf{y}$ or $\overrightarrow{HG} = \mathbf{x} + \mathbf{y}$	M1	Accept $\overrightarrow{HM} = -\mathbf{x} - \mathbf{y}$ or $\overrightarrow{GH} = -\mathbf{x} - \mathbf{y}$
	$\overrightarrow{MG} = 2\overrightarrow{MH}$ oe	A1	Dep on (c)(i) correct, arrows essential
10 (a)	5.2[0] or 5.196...	3	M2 for $[h^2 =] 6^2 - 3^2$ or better or M1 for $h^2 + 3^2 = 6^2$ or B1 for PR (or PQ or QR) = 6
(b) (i)	7.2[0] or 7.196...	1FT	FT their (a) + 2
(ii)	62.4 or 62.35...	5	M4 for $12 \times 6 \times \frac{1}{2} \tan 60$ oe or M3 for $6 \times \frac{1}{2} \tan 60$ oe or M2 for realising that $\frac{1}{2}$ base = $1 \times \tan 60$ oe or B1 for angle 30 or 60 in correct position on diagram or in a calculation
			If 0 scored, SC1 for volume = an area \times 12 seen
11 (a) (i)	11	1	
(ii)	$14x + 3$ final answer	1	
(b)	$17 - 21x$ final answer	2	M1 for $7(2 - 3x) + 3$ oe
(c)	$-\frac{1}{9}$	3	M1 for $3(2 - 3x) = 7$ oe M1 for correct first step
(d)	-1.3	3	M1 for $2 - 3(x + 4) - (7x + 3) = 0$ M1 for $-10x - 13 = 0$ oe
			If 0 scored, SC1 for answer - 0.7 oe after $2 - 3(x + 4) - 7x + 3 = 0$ shown previously

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MARK SCHEME for the October/November 2015 series

0580 MATHEMATICS

0580/22

Paper 2 (Extended), maximum raw mark 70

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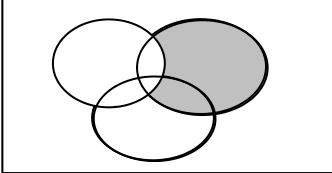
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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0580	22

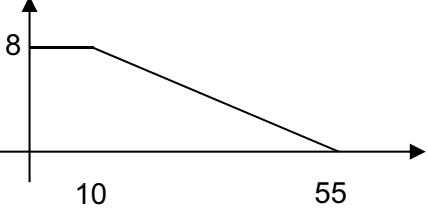
Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part Marks
1	17	1	
2	Parallelogram	1	
3	694 or 694.4[4...]	2	M1 for $950 \div 1.368$
4	5.83 or 5.830 to 5.831	2	M1 for $\sqrt{(-3)^2 + 5^2}$
5	262 or 261.7 to 261.83...	2	M1 for $\frac{1}{2} \times \frac{4}{3} \pi \times 5^3$ If zero scored SC1 for final answer 524 or 523.5 to 523.7
6 (a)	18	1	
(b)		1	
7	$\begin{pmatrix} 11 & -8 \\ -6 & 8 \end{pmatrix}$	2	B1 for two correct elements
8	3826 or 3826.38	2	M1 for $8000 \times \left(1 - \frac{10}{100}\right)^7$ oe
9	0.3	2	M1 for $\frac{k \times 50000 \times 50000}{100000 \times 100000}$ oe If zero scored SC1 for figs 3
10	54	3	M2 for $14.4 \times \frac{15}{4}$ oe or M1 for $14.4 \div 4$ or $\frac{4}{15}$ associated with 14.4 If zero scored SC1 for final answer 19.6[4]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0580	22

11	6.24 or 6.244 to 6.245	3	M2 for $\sqrt{8^2 - 5^2}$ or M1 for $8^2 = 5^2 + x^2$ or better
12	$2\frac{3}{12}$ or $1\frac{15}{12}$ or $\frac{27}{12}$ or $\frac{9 \times 3}{4 \times 3}$ <i>their</i> $(\frac{27}{12} - \frac{11}{12} = \frac{16}{12})$ oe $1\frac{1}{3}$ or $\frac{4}{3}$ cao	M1 M1 A1	Accept any correct conversion with common denominator $12k$ Correct resolving of <i>their</i> subtraction with denominator $12k$ showing full working Working and then simplified answer must both be seen
13	8.12 or 8.118...	3	M2 for $\frac{12.4}{\sin 74} \times \sin 39$ or M1 for implicit version $\frac{\sin 39}{y} = \frac{\sin 74}{12.4}$ oe
14	2500 nfww	3	M2 for $2475 \div \left(1 - \frac{1}{100}\right)$ oe or M1 for 2475 associated with 99%
15 (a)	$(3w+10)(3w-10)$ final answer	1	
(b)	$(m+n)(p-6q)$ oe final answer	2	B1 for $p(m+n) - 6q(m+n)$ oe or $m(p-6q) + n(p-6q)$ oe
16	36.8 or 36.80 to 36.81	3	M1 for $\frac{26}{360} \times 2 \times \pi \times 15$ M1 for $2 \times 15 +$ a term involving π
17	175	3	M1 for $y = k(x-1)^2$ oe A1 for $k = 7$ or M2 for $\frac{63}{(4-1)^2} = \frac{y}{(6-1)^2}$ oe
18	16.2 16.6 nfww	3	M1 for two of 2.35, 5.75, 2.45, 5.85 seen or $2 \times (5.8 - 0.05 + 2.4 - 0.05)$ or $2 \times (5.8 + 0.05 + 2.4 + 0.05)$ A1 16.2 or 16.6 in either answer space If zero scored SC2 for both correct reversed answers provided 16.6 nfww

19 <p> $\sqrt{(-6)^2 - 4(5)(-3)}$ or better seen if $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ seen then $p = -(-6)$ and $r = 2 \times 5$ -0.38 1.58 cao final answers </p>	B1 If completing the square B1 for $\left(x - \frac{3}{5}\right)^2$ oe B1 for $\frac{3}{5} + \sqrt{\frac{3}{5} + \left(\frac{3}{5}\right)^2}$ or $\frac{3}{5} - \sqrt{\frac{3}{5} + \left(\frac{3}{5}\right)^2}$ oe B1 If B0, SC1 for – 0.4 and 1.6 or – 0.379[795..] and 1.579[795..] or – 1.58 and 0.38 as final answers or – 0.38 and 1.58 seen in working
20 (a)  (b) 260	B1 line from (0, 8) to (10, 8) B1 line from <i>their</i> (10, 8) to (55, 0) 3FT M2FT for $8 \times 10 + 0.5 \times 8 \times 45$ oe or for a fully correct area calculation for <i>their</i> graph or M1FT for 8×10 or $0.5 \times 8 \times 45$ or for one correct area calculation for <i>their</i> graph
21 (a) 12 (b) 12.8	2 M1 for $\frac{7.2}{x} = \frac{15}{25}$ oe or better eg $7.2 \times \frac{25}{15}$ 3 M2 for $16 \times \sqrt[3]{\frac{192}{375}}$ oe or M1 for $\sqrt[3]{\frac{192}{375}}$ or $\sqrt[3]{\frac{375}{192}}$ oe or $\left(\frac{16}{y}\right)^3 = \frac{375}{192}$ oe
22 (a) 3.5 nfw (b) 2 nfw	3 M1 for Σfx soi M1 (dep) for $\div 24$ 3 M2FT for $\frac{\text{their } 84+x}{25} = 3.44$ or better or M1 for 25×3.44

Page 5	Mark Scheme Cambridge IGCSE – October/November 2015	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

23 (a)	$\frac{8}{14}$ and $\frac{5}{13}$	1	
	$\frac{6}{13}$ and $\frac{7}{13}$	1	
(b) (i)	$\frac{30}{182}$ oe	2	M1FT for $\frac{6}{14} \times \text{their } \frac{5}{13}$
	$\frac{126}{182}$ oe	3	M2FT for $1 - \frac{8}{14} \times \frac{7}{13}$ or $\frac{6}{14} \times \frac{5}{13} + \frac{6}{14} \times \frac{8}{13} + \frac{8}{14} \times \frac{6}{13}$ or $\frac{6}{14} + \frac{8}{14} \times \frac{6}{13}$ oe or M1FT for sum of any two of $\frac{6}{14} \times \frac{5}{13}$ or $\frac{6}{14} \times \frac{8}{13}$ or $\frac{8}{14} \times \frac{6}{13}$

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MARK SCHEME for the October/November 2015 series

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0580	42

Abbreviations

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dep	dependent
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oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a) (i)	$\frac{512}{7+11+14} \times 14$	M2	or M1 for $\frac{512}{7+11+14}$
(ii)	112	1	
(b)	10 100	2	M1 for 224×45 soi by 10080
(c)	19	2	M1 for $224 \div 12$ soi by 18.66 to 18.67 or 18.7 or $18\frac{2}{3}$
(d) (i)	4093000	1	
(ii)	4.093×10^6	1FT	FT their (d)(i)
(e)	198 or 198.1 to 198.2	3	M2 for $\frac{8.2 - 2.75}{2.75} \times 100$ oe or M1 for $\frac{8.2}{2.75} \times 100$ or $\frac{8.2 - 2.75}{2.75}$
2 (a)	0 4 0.625 0.875	1,1,1,1	
(b)	Fully correct smooth curve	4	B3 FT for 8 or 9 points or B2 FT for 6 or 7 points or B1 FT for 4 or 5 points
(c)	line $y = x + 1$ ruled and 0.2 to 0.3 and 1.8 to 1.95	3	Line must be fit for purpose ie at least from $x = 0$ to $x = 2$ B2 for correct line and 1 correct value or B1 for correct line or SC1 for no/wrong line and 2 correct values

Page 3	Mark Scheme Cambridge IGCSE – October/November 2015	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

(d)	Tangent ruled at $x = -1.5$ 2.2 to 5	B1 2	No daylight between tangent and curve at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.6$ and $x = -1.4$ dep on B1 M1 for $\frac{\text{rise}}{\text{run}}$ also dep on any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent
3 (a) (b) (i) (ii) (c) (d) (e)	Correct diagram 32 to 34 120 – reading at $r = 50$ 8 18 27 35.2 or $35\frac{1}{6}$ or 35.16 to 35.17 nfw 1.6 1.35 0.3	3 1 2FT 2 4 4FT	B1 for correct vertical plots and B1 for correct horizontal plots and B1 dep on at least B1 for reasonable <u>increasing</u> curve or polygon through <i>their</i> 6 points If zero scored, SC1 for 5 out of 6 correct plots B1FT for reading at $r = 50$ seen B1 for 2 correct M1 for mid-values soi M1 FT for $\sum f_x$ with x in the correct interval including boundaries M1dep for $\sum f_x \div 120$ dependent on second M1 earned FT from (c) <i>their</i> $8 \div 5$ and <i>their</i> $27 \div 20$ B3FT for any 2 correct or B2FT for first or second answer correct or B1 for 0.3 only
4 (a) (b)	1.6[0] or 1.601 to 1.602 43.5 or 43.6 or 43.49 to 43.56	3 4	M2 for $\frac{0.6}{\cos 68}$ oe or M1 for $\cos 68 = \frac{0.6}{AC}$ M2 for $\frac{1.9^2 + 2.3^2 - \text{their } 1.6^2}{2 \times 1.9 \times 2.3}$ or M1 for implicit statement A1 for $[\cos =] 0.724$ to 0.726

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0580	42

<p>(c)</p> <p>(d)</p>	<p>1.33 or 1.332...nfww</p> <p>41.1 or 41.13 to 41.14</p>	<p>4</p> <p>3</p>	<p>M2 for $\sqrt{2.3^2 - \left(\frac{1}{2} \times 1.2\right)^2}$ or M1 for $2.3^2 = h^2 + (0.5 \times 1.2)^2$ and M1 for $\frac{1}{2} \times 1.2 \times \text{their } 2.22$ (<i>their 2.22</i> must come from attempt at Pythag or from trig in triangle BCD)</p> <p>M2 for $\sin = \frac{1.25}{1.9}$ oe or M1 for correct angle identified</p>
<p>5 (a) (i)</p> <p>(ii)</p> <p>(b)</p> <p>(c)</p>	<p>$4x(3x+13) - 2x(4x - \{3x-9\}) = 24$ oe</p> <p>$12x^2 + 52x - 2x^2 - 18x$</p> <p>$5x^2 + 17x - 12 = 0$</p> <p>$(5x-3)(x+4) [= 0]$</p> <p>$\frac{3}{5}$ oe , -4</p> <p>For correctly eliminating one variable</p> <p>$x = 3$ $y = -7$</p> <p>$t = -2$ nfww</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>M2</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>A1</p> <p>5</p>	<p>Correct removal of all <i>their</i> brackets Dep on two areas added or subtracted</p> <p>with no errors or omissions seen and at least one more line of working showing collection of like terms or division by 2</p> <p>M1 for $(5x+a)(x+b)$ where $ab = -12$ or $5b+a = 17$ [a, b integers]</p> <p>If zero scored SC1 for correct answers with no working or from other methods.</p> <p>SC1 if no working shown, but 2 correct answers given If zero scored SC1 for 2 values satisfying one of the original equations</p> <p>M1 for $2(t+3)(t+3) - t^2$ or better seen M1 for denominator[s] $t(t+3)$ isw or for $t(t+3)$ isw on RHS M1dep for $2t^2 + 12t + 18 - t^2 = t^2 + 3t$ oe dependent on both numerators and denominator expanding to give quadratics A1 for $9t + 18 = 0$ oe</p>

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0580	42

6	(a) (i)	43	1	
	(ii)	62	1	
		Isosceles triangle or OYZ is isosceles	1	
		Angle at centre is twice angle at circumference	1	
	(iii)	30 [Opposite angles of a cyclic quadrilateral [add up to 180°]]	2 1	M1 for $p + 5p = 180$ oe
	(b) (i)	$1 : 2$ oe	1	
7	(ii)	OQ $MQ = NQ$	1 1	
		$OM = ON$	1	
		Centre or O	1	Not origin
7	(a) (i)	Rotation	1	
		[+]90 or 90 anticlockwise oe	1	
		$(0, 2)$	1	Not as column vector
	(ii)	Reflection $y = 1$ oe	1 1	
	(iii)	Enlargement [s f] $-\frac{1}{2}$ oe Origin oe	1 1 1	
	(b)	$\begin{pmatrix} -\frac{1}{2} & 0 \\ 0 & -\frac{1}{2} \end{pmatrix}$ oe	2FT	FT their s f from (a)(iii) SC1 for $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$, $k \neq 1$ or 0
(c)				
		Image at $(4, 1)$ $(6, 1)$ $(6, 5)$ $(4, 3)$	2	ruled or good freehand SC1 for translation $\begin{pmatrix} 2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -3 \end{pmatrix}$ or for 4 correct vertices not joined
(d)	Reflection $y = x$ oe		1	

Page 6	Mark Scheme Cambridge IGCSE – October/November 2015	Syllabus 0580	Paper 42
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8 (a)	(4, 6)	1, 1	
(b)	4.47 or 4.472	3	M2 for $\sqrt{(8-4)^2 + (5-3)^2}$ or better or M1 for $(8-4)^2 + (5-3)^2$ or better
(c)	$y = 2x - 2$ oe	3	B2 for $2x - 2$ or $y = 2x + c$ oe or M1 for $[m =] \frac{8-4}{5-3}$ oe soi by $2x$ and M1 for (3, 4) or (5, 8) or <i>their</i> midpoint substituted into <i>their</i> $y = mx + c$ with m numerical
(d)	-3	3	M1 for use of gradient \times <i>their</i> $m = -1$ soi by $-\frac{1}{2}$ M1 for $r =$ <i>their</i> gradient $\times 6$ [+0]
9 (a) (i)	11	1	
(ii)	256	2	M1 for $[g(3) =] 8$ or 2^3 or 2^{2^x}
(b)	$\frac{x-5}{2}$ oe final answer	2	M1 for $x = 2y + 5$ or $2x = y - 5$ or better or $\frac{y}{2} = x + \frac{5}{2}$
(c)	$19 - 6x$ final answer	2	M1 for $2(7 - 3x) + 5$
(d)	-1, 0, 1, 2	3	Additional values count as errors B2 for one error /omission or B1 for two errors/omissions or M2 for $-2 < x \leq 2$ oe seen or M1 for $-2 < x$ or $x \leq 2$ or $x = -2$ and $x = 2$ or $-4 < 2x \leq 4$
10 (a)	8 25 17	2	B1 for 2 correct
(b)	$n + 2$ oe	1	
(c) (i)	$(n - 1)^2$ oe	2	M1 for $(n + k)^2$ for integer k
(ii)	92	2	M1 for $\sqrt{8281}$ or 91 seen
(d) (i)	$n^2 - 3n - 1$ final answer	2	M1 for <i>their</i> $(n - 1)^2 -$ <i>their</i> $(n + 2)$ soi
(ii)	39	1	

Page 7	Mark Scheme Cambridge IGCSE – October/November 2015	Syllabus 0580	Paper 42
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(e)	$1 \quad \text{and} \quad -\frac{1}{2}$ oe $\frac{1}{4}$ oe $-\frac{1}{8}$ oe	1 1 1	
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MARK SCHEME for the May/June 2015 series

0580 MATHEMATICS

0580/22

Paper 2 (Extended), maximum raw mark 70

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Abbreviations

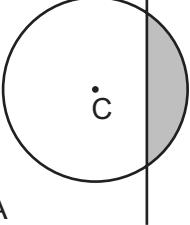
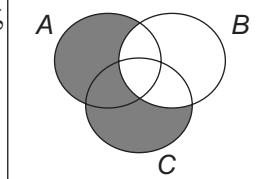
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SC	Special Case
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soi	seen or implied

Question	Answer	Mark	Part marks
1	5.34×10^7	1	
2	9 [h] 30 [min] cao	1	
3	$\frac{1}{4}$ or 0.25	1	
4 (a)	7	1	
(b)	Any number except 3, 7 or 20	1	
5	0.2 oe	2	M1 for $1 - (0.15 + 0.3 + 0.35)$
6	8×10^3 or 8000 nfww	2	M1 for $w + 4 \times 10^3 = 1.2 \times 10^4$ oe or $5w + 20 \times 10^3 = 6 \times 10^4$ oe
7	Parallel Same length	1 1	
8	$2n^2 + 3$ oe final answer	2	M1 for a quadratic expression as final answer or $2n^2 + 3$ oe in working
9	$\frac{23}{90}$ oe, must be fraction	2	M1 for $25.\dot{5} - 2.\dot{5}$ oe e.g. $2.55^r - 0.25^r$ or B1 for $\frac{k}{90}$
10	7	2	B1 for 120.5 or 113.5 seen
11	$\frac{1}{5} \begin{pmatrix} -2 & -1 \\ 11 & 3 \end{pmatrix}$ oe	2	M1 for $k \begin{pmatrix} -2 & -1 \\ 11 & 3 \end{pmatrix}$ soi or $\frac{1}{5} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ or $\det = 5$ soi

Page 3	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

12	$\frac{8}{3}$ $\frac{4}{5} \times \text{their } \frac{3}{8}$ oe $\frac{3}{10}$ cao	B1 M1 A1	or $\frac{40}{15}$ accept $\frac{3}{8}$ or $\frac{15}{40}$ or $\frac{12}{15} \div \text{their } \frac{40}{15}$ or equivalent division with fractions with common denominators
13 (a)	11	1	
(b)	8	2FT	FT $30 - 2 \times \text{their (a)}$ or M1 for $4 \times 7 = 2(x - 1) + FG$ oe or $4(x - 4) = 2(x - 1) + FG$ oe or $2 \times 7 + 2(x - 4) = 2(x - 1) + FG$ oe Allow x to be <i>their (a)</i> in each
14	684	3	M2 for $0.95 \times 4 \times 3 \times 60$ or M1 for $0.95 \times 4 [\times 3]$ or $4 \times 3 \times 60$ or $0.95 \times 3 \times 60$ or $0.95 \times 4 \times 60$
15	$\frac{2x - 23}{(x + 2)(2x - 5)}$ final answer	3	B1 for a common denominator of $(x + 2)(2x - 5)$ B1 for $3(2x - 5) - 4(x + 2)$ or better or SC2 for final answer $\frac{2x - 7}{(x + 2)(2x - 5)}$ or SC1 for numerator of $2x - 7$ in final answer
16 (a) (i)	0.5 or -0.5 or $\frac{1}{2}$ or $-\frac{1}{2}$	1	
(ii)	4	1	
(b)	1.37 or 1.37[4...]	1	
17 (a)	$[y =] 2x + 3$ cao	3	M2 for correct unsimplified equation or B1 for gradient $= (11 - 3) \div (4 - 0)$ or better and B1 for $c = 3$
(b)	$-\frac{1}{2}$ oe	1FT	$-1 \div \text{their } m$

Page 4	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

18 (a)	78	3	$\mathbf{M2}$ for $5 \times 12 + \frac{1}{2} \times 12 \times (8 - 5)$ or $\frac{1}{2} \times 6 \times (5 + 8) \times 2$ oe or $\mathbf{M1}$ for 5×12 , $\frac{1}{2} \times 12 \times (8 - 5)$, $\frac{1}{2} \times 6 \times (5 + 8)$ or $12 \times 8 - (\dots)$
(b)	1170	1FT	$15 \times \text{their (a)}$
19 (a)		1	Correct circle, radius 4 cm centre C
(b)		2	$\mathbf{B2}$ for correct bisector with 2 pairs of correct arcs or $\mathbf{B1}$ for correct bisector with no/wrong arcs
(c)		1	Correct complete boundary and correct shading. Dep on at least $\mathbf{B1}$ in (b)
20 (a) (i)	4	1	
(ii)	{3, 9}	1	
(iii)	fewer than 6 numbers from {1, 3, 5, 7, 9, 11} or \emptyset	1	
(b)	ξ 	1	
21 (a)	$m = 2$ $n = -10$	2	$\mathbf{B1}$ for $m = 2$ $\mathbf{B1}$ for $n = -10$ If 0 scored $\mathbf{SC1}$ for $(x + 2)^2$ in working or $x^2 + 2mx + m^2 + n$ and equating coefficients $2m[x] = 4[x]$ or $m^2 + n = -6$
(b)	1.16 or 1.16[2...] from completing square	2FT	\mathbf{FT} dep on negative n $\mathbf{B1}$ for $(x + \text{their } m)^2 = -\text{their } n$ or $\mathbf{SC1}$ for correct answer from using formula or for both answers 1.16 and -5.16 whatever method used

Page 5	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

22	(a) 44 (b) 24 (c) 5	2 2 2	M1 for 48 soi M1 for 40 or 16 or both lines drawn from 15 and 45 across and down to the horizontal axis M1 for answer 55 or line or mark on graph indicating 55
23	(a) 0.4 or $\frac{2}{5}$ (b) 1430 (c) 11.9 or 11.91 to 11.92	1 3 1FT	
24	(a) $9x^2$ (b) $\frac{x - 5}{3}$ (c) $9x + 20$ cao final answer	1 2 2	M2 for correct, complete, area statement e.g. $120 \times 10 + \frac{1}{2} \times 20 \times 8 + \frac{1}{2} \times 30 \times 10$ oe or M1 for one area calculation e.g. 10×120 or $\frac{1}{2} \times 20 \times 8$ or $\frac{1}{2} \times 30 \times 10$ <i>their (b)</i> $\div 120$ M1 for correct first algebraic step e.g. $y - 5 = 3x$ or $\frac{y}{3} = x + \frac{5}{3}$ or better or for interchanging x and y , e.g. $x = 3y + 5$, this does not need to be the first step M1 for $3(3x + 5) + 5$

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Cambridge International General Certificate of Secondary Education

MARK SCHEME for the May/June 2015 series

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

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Page 2	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a)	1848 final answer	2	M1 for $1650 \times \left(1 + \frac{12}{100}\right)$ oe
(b) (i)	1750	2	M1 for $\frac{500}{9-5}$ [$\times 5$] or [$\times 9$] or any equation which would lead to $4x = 500$ or $4x = 2500$ or $4x = 4500$ or $4x = 7000$ when simplified
(ii)	$64\frac{2}{7}$ or 64.3 or 64.28 to 64.29	1	
(c) (i)	33 : 20 oe	2	B1 for 33 : 6 or 20 : 6 or 5.5 oe seen or 3.33...oe seen or M1 for two ratios with a common number of children implied by $20k$ and $33k$ seen, $k > 0$
(ii)	236	3	M2 for $\frac{24}{2} \times 11 + \frac{24}{3} \times 10$ oe or $((3 \times 11) + (2 \times 10)) \times 24 \div 6$ or $\frac{6}{6+20+33} \times x = 24$ or M1 for $\frac{24}{2} \times 11$ or $\frac{24}{2} \times 13$ soi or $\frac{24}{3} \times 10$ or $\frac{24}{3} \times 13$ soi oe or $24 \div 6$ soi
(d)	17[.00]	3	M2 for $20.40 \div \left(1 + \frac{20}{100}\right)$ oe or M1 for (100 + 20)% oe associated with 20.40 seen

Page 3	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
2 (a) (i)	66	1	
(ii)	24	1FT	FT 90 – <i>their (a)(i)</i>
(iii)	66	2FT	FT 90 – <i>their (a)(ii)</i> M1 for [BOD =] $180 - 48$ or $180 - 2 \times \text{their (a)(ii)}$
(iv)	114	1FT	FT $180 - \text{their (a)(iii)}$
(b)	83.6 or 83.60[...]	2	M1 for $\frac{1}{2} \times 15 \times 15 \times \sin(180 - 48)$ oe or $\frac{1}{2} \times 15 \times 15 \times \sin(180 - 2 \times \text{their (a)(ii)})$ oe
(c)	Opposite angles add up to 180 OR Angle in a semicircle [=90]	1	

Page 4	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
3 (a) (i)	$\frac{600}{x+20}$ final answer	1	
(ii)	$\frac{600}{x} - \text{their } \frac{600}{x+20} = 1.5 \text{ oe}$	M1	
	$600(x+20) - 600x = 1.5x(x+20)$ or $\frac{600(x+20) - 600x}{x(x+20)} [= \text{their } 1.5]$	M1	Correctly clearing, or correctly collecting into a single fraction, two fractions both with algebraic denominators, one being $\frac{600}{x}$
	$600x + 12000 - 600x = 1.5x^2 + 30x$ [$0 = 1.5x^2 + 30x - 12000$]	M1	Dep on previous M1, correctly multiplying <i>their</i> brackets and clearing fraction
	$0 = x^2 + 20x - 8000$	A1	With no errors or omissions seen, dep on M3
(b)	-100, 80	3	M2 for $(x + 100)(x - 80)$ or M1 for $(x + a)(x + b)$ where $ab = -8000$ or $a + b = 20$ OR B1 for $\sqrt{20^2 - 4 \times 1 \times (-8000)}$ or better and B1 for $\frac{-20 + \sqrt{q}}{2 \times 1}$ or $\frac{-20 - \sqrt{q}}{2 \times 1}$
(c)	6.67 or 6.666 to 6.667 oe	2FT	FT $\frac{12}{2(\text{their } 80) + 20} \times 100$ correctly evaluated to at least 3 sf M1 for choosing and using <i>their</i> positive root

Page 5	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Question	Answer	Mark	Part marks
4 (a) (i)	9π final answer	2	M1 for $\frac{135}{360} \times 2 \times \pi \times 12$ oe
(ii) (a)	4.5[0] or 4.497 to 4.504...	2FT	FT their $9 \div 2$ M1 for $2\pi r = \text{their } 9\pi$ or $12\pi r = \frac{135}{360}\pi 12^2$ oe
(b)	11.1 or 11.12[...]	3FT	FT their $\sqrt{12^2 - \text{their } 4.5^2}$ to 3 sf or better (their $4.5 < 12$) M2 for $\sqrt{12^2 - \text{their } 4.5^2}$ (their $4.5 < 12$) or M1 for $12^2 = h^2 + \text{their } 4.5^2$ oe (their $4.5 < 12$)
(b) (i)	75 nfww	3	M2 for $l = \frac{35}{7} \times 15$ or $x = \frac{35}{7} \times 8$ oe or for 40 seen nfww or correct trig or Pythagoras' method leading to value rounding to 40.0 M1 for $\frac{l}{15} = \frac{35}{7}$ oe or $\frac{x}{8} = \frac{35}{7}$ oe or $\frac{l-35}{8} = \frac{35}{7}$ oe or $\frac{l-35}{l} = \frac{8}{15}$ oe
(ii)	2730 or 2730.0 to 2730.4 nfww	3	M2 dep for $\pi \times 15 \times \text{their } 75 - \pi \times 8 \times (\text{their } 75 - 35)$ [$+\pi \times 8^2$] dep their $75 > 35$ or 805π [2527.7 to 2530] nfww or 869π [2728.6 to 2731.2] nfww or M1 for $\pi \times 15 \times \text{their } 75$ or 1125π [3532.5 to 3535.8] nfww seen or $\pi \times 8 \times (\text{their } 75 - 35)$ or 320π [1004.8 to 1005.8] nfww seen or $\pi \times 8^2$ or 64π [200.9 to 201.2] nfww seen
(c) (i)	$16r^3$	2	M1 for $[M=] k \times r^3$ or $1458 = k \times 4.5^3$ oe or $\frac{M}{1458} = \frac{r^3}{4.5^3}$ oe After M0, SC1 for 16 seen
(ii)	8 : 27 oe	1	Must be numeric, e.g. 128:432

Page 6	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

5	(a) 2 and 7	2	B1 for each value
	(b) Complete correct curve	5	B3 FT for <i>their</i> 9 or 10 points or B2 FT for <i>their</i> 7 or 8 points or B1 FT for <i>their</i> 5 or 6 points and B1 independent for one branch on each side of the y -axis and not touching the y -axis SC4 for correct curve with branches joined
	(c) Correct tangent and $-13 \leqslant \text{grad} \leqslant -8$	3	B2 for close attempt at tangent at $x = 1$ and answer in range OR B1 for ruled tangent at $x = 1$, no daylight at $x = 1$ Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 0.8$ and 1.2 and M1 (dep on B1 or close attempt at tangent [at any point] for $\frac{\text{rise}}{\text{run}}$
	(d) (i) 5 to 6	1	
	(ii) 2 to 2.35 and $-2.55 \leqslant k \leqslant -2.35$	2FT	FT <i>their</i> k B1FT for each correct solution
	(e) $[a =] -5$ $[b =] -1$ $[c =] 12$	3	B2 for two correct values or for $x^3 - 5x^2 - x + 12 [= 0]$ oe or M1 for $x^2 - 2x + \frac{12}{x} = 3x + 1$

Page 7	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

6	(a) 95.5 ² + 83.1 ² – 2 × 95.5 × 83.1 × cos 101 138.0...	M2	$\mathbf{M1}$ for $\cos 101 = \frac{95.5^2 + 83.1^2 - AB^2}{2 \times 95.5 \times 83.1}$
	(b) 110 or 109.7 to 109.8	A2 4	$\mathbf{A1}$ for 19054.[...] also implies M2 B3 for 36.2 or 36.20 to 36.24[1..]
	(c) 18.8 or 18.79[...]	 2	or M2 for [$\sin =$] $\frac{83.1 \times \sin 101}{138[.0..]}$ oe or M1 for correct implicit version After M0 , SC1 for angle $ABC = 42.76$ to 42.8 M1 for $46.2 \times \cos(45 + 21)$ oe After M0 , SC1 for answer 42.2 or 42.20 to 42.21
7	(a) (i) 316 (ii) Three correct blocks with heights 0.09, 0.36, 0.24 with correct widths and no gaps (b) Students have a greater range of estimates oe [On average] adults estimated a greater mass oe	4 3 B1	M1 for 100, 250, 325, 375, 450 soi M1 for Σfm with m 's in intervals including boundaries [15800] M1 (dep on 2nd M1) for <i>their</i> $\Sigma fm \div 50$ B2 for two correct blocks or B1 for one correct block or three correct frequency densities soi B1

Page 8	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

8	(a) (i)	$x \geq 100$ final answer	1	
	(ii)	$y \geq 120$ final answer	1	
	(iii)	$x + y \leq 300$ final answer	1	
	(iv)	$40x + 80y \geq 16000$ or $0.4x + 0.8y \geq 160$	M1	with no errors seen but isw substitution of values after correct inequality
	(b)	$x = 100$ ruled	B1	
		$y = 120$ ruled	B1	
		$x + y = 300$ ruled	B1	
		$x + 2y = 400$ ruled	B2	Allow B1 for line with negative gradient passing through (400, 0) or (0, 200) when extended
		Correct shading	B1	Dep on all previous marks earned Condone any clear indication of the required region
(c)	200		2	M1 for $x = 100$ and $y = 200$ selected or for $x \times 0.4 + y \times 0.8$ oe evaluated where (x, y) is an integer point in <i>their</i> [unshaded] region

Page 9	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 42
--------	--	------------------	-------------

9	(a) $4x - 3x^2$ or $x(4 - 3x)$ nfww final answer	3	B2 for $3x^2 - 6x - 6x^2 + 10x$ or M1 for $3x^2 - 6x$ or $-6x^2 + 10x$
	(b) (i) $(2 + y)(3w - 2x)$ oe final answer	2	M1 for $3w(2 + y) - 2x(2 + y)$ or $2(3w - 2x) + y(3w - 2x)$
	(ii) $(2x + 5y)(2x - 5y)$ final answer	2	M1 for $(2x \pm 5y)(2x \pm 5y)$ or $(2x + ky)(2x - ky)$ or $(kx + 5y)(kx - 5y)$, $k \neq 0$ or $(2x + 5)(2x - 5)$ or $(2 + 5y)(2 - 5y)$
	(c) $\frac{27x^6}{64}$ final answer	2	B1 for 2 [out of 3] elements correct in the right form in final answer or final answer contains 27 and 64 and $x^{[-]6}$ or $\frac{3x^2}{4}$ seen or $\frac{729x^{12}}{4096}$ seen
	(d) (i) $2n$ is even and subtracting 1 gives an odd number	1	Must interpret the $2n$ as even or not odd and then the -1 oe
	(ii) $2n + 1$ oe final answer	1	
	(iii) <i>their</i> $(2n + 1)^2 - (2n - 1)^2$	M1	Could use alternate correct expressions for consecutive odd numbers. Allow method and accuracy marks if correct. Could reverse the algebraic terms <i>their</i> $(2n - 1)^2 - (2n + 1)^2$ leading to $-8n$. Allow method and accuracy marks if correct.
	$4n^2 + 4n + 1 - 4n^2 + 4n - 1$	M1	Dep on M1 for expanding brackets in <i>their</i> expressions. If seen alone and completely correct then implies previous M1 Allow $4n^2 + 4n + 1 - (4n^2 - 4n + 1)$
	$8n$	A1	With no errors seen. After 0 scored, allow SC1 for two correctly evaluated numeric examples of subtracting consecutive odd squares isw

Page 10	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 42
----------------	--	--------------------------------	---------------------------

10	(a) (i)	9.43[...]	2	M1 for $5^2 + (-8)^2$ or better
	(ii)	(-3, 5)	1	
	(b) (i) (a)	$\frac{1}{2}(\mathbf{a} + \mathbf{b})$ or $\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$	2	M1 for $\mathbf{a} + \frac{1}{2}\mathbf{AB}$ oe, e.g. $\mathbf{a} + \mathbf{AM}$, $\mathbf{OA} + \frac{1}{2}\mathbf{AB}$
	(b) (b)	$\frac{1}{4}(\mathbf{a} + \mathbf{b})$ or $\frac{1}{4}\mathbf{a} + \frac{1}{4}\mathbf{b}$	1FT	FT $\frac{1}{2}$ their (b)(i)(a) in terms of \mathbf{a} and/or \mathbf{b} in simplest form
	(c)	$\frac{1}{4}(\mathbf{b} - 3\mathbf{a})$ or $\frac{1}{4}\mathbf{b} - \frac{3}{4}\mathbf{a}$	2	M1 for $-\mathbf{a}$ + their (b)(i)(b) or any correct route
	(ii)	3 : 4 final answer	3	M1 for $[AN =] -\mathbf{a} + \frac{1}{3}\mathbf{b}$
				A1 for $\frac{1}{4} : \frac{1}{3}$ oe or $AN = \frac{1}{3}(-3\mathbf{a} + \mathbf{b})$ or 3k to 4k
				After 0 scored SC1 for final answer 4 : 3
	(c) (i)	Triangle drawn at (-3, -3), (-6, -3), (-6, -4 $\frac{1}{2}$)	3	B2 for 2 vertices correct in triangle or 3 correct co-ordinates soi in working or B1 for 1 vertex in triangle correct soi or triangle of correct size and orientation but wrong position or M1 for correct set up e.g. $\begin{pmatrix} -1.5 & 0 \\ 0 & -1.5 \end{pmatrix} \begin{pmatrix} 2 & 4 & 4 \\ 2 & 2 & 3 \end{pmatrix}$
	(ii)	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	2	SC1 for 1 correct row or column or for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

Page 11	Mark Scheme Cambridge IGCSE – May/June 2015	Syllabus 0580	Paper 42
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11 (a)	$\frac{38}{56}$ or $\frac{19}{28}$ oe	4	<p>[0.679 or 0.6785 to 0.6786]</p> <p>M3 for $\frac{4}{8} \times \frac{4}{7} + \frac{3}{8} \times \frac{5}{7} + \frac{1}{8} [\times \frac{7}{7}]$ oe</p> <p>or</p> <p>M2 for sum of two of the products isw</p> <p>$\frac{4}{8} \times \frac{4}{7}$, $\frac{3}{8} \times \frac{5}{7}$, $\frac{1}{8} [\times \frac{7}{7}]$ oe</p> <p>or</p> <p>M1 for $\frac{4}{8} \times \frac{4}{7}$ or $\frac{3}{8} \times \frac{5}{7}$ oe isw</p> <p>or $\frac{1}{8} \times \frac{7}{7}$ isw</p> <p>After 0 scored, SC1 for answer of $\frac{38}{64}$ oe</p>
(b)	$\frac{60}{336}$ or $\frac{5}{28}$ oe	2	<p>M1 for $\frac{5}{8} \times \frac{4}{7} \times \frac{3}{6}$</p> <p>or $\left(\frac{4}{8} \times \frac{3}{7} \times \frac{2}{6}\right) + 3\left(\frac{4}{8} \times \frac{1}{7} \times \frac{3}{6}\right)$ oe</p>

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MARK SCHEME for the March 2015 series

0580 MATHEMATICS

0580/22 Paper 2 (Paper 22 – Extended), maximum raw mark 70

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Page 2	Mark Scheme Cambridge IGCSE – March 2015	Syllabus 0580	Paper 22
---------------	---	--------------------------------	---------------------------

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1	Negative	1	
2	96	2	B1 for $96k$ or $2^5 \times 3$ or for listing multiples of each up to 96
3	572.4	2	M1 for figs ($120 \times 90 \times 53$)
4	$7p(2p + 3q)$	2	B1 for $7(2p^2 + 3pq)$ or $p(14p + 21q)$
5	$18 - 5n$ oe	2	M1 for $5n$ or $-5n$
6 (a)	Correct arc centre B , radius 5.7	1	
(b)	Shading below CN outside arc	1FT	FT shading below CN outside their arc centre B
7	37	2	M1 for $180 - 90 - 53$ oe or B1 for 53 or the right angle, either marked in correct place on diagram
8 (a)	68	1	
(b)	15	2	M1 for $\frac{360}{n} = 24$ or $(n-2)180 = 156n$
9	400 350 250	3	M1 for $\frac{1000}{8+7+5}$ implied by 50 A1 for one clearly assigned correct answer or SC2 for 3 correct answers in wrong order
10 (a)	$x + x + 4 + x + 4 = 26$ oe	1	
(b)	6[.00] cao	2	M1 for their linear eqn simplified to $ax = b$

Page 3	Mark Scheme Cambridge IGCSE – March 2015	Syllabus 0580	Paper 22
---------------	---	--------------------------------	---------------------------

11	Correctly eliminating one variable $[x =] 6$ $[y =] \frac{1}{4}$	M1 A1 A1	If 0 scored SC1 for 2 values satisfying one of the original equations SC1 if no working shown but correct answers given
12	44 300 cao	3	M1 for $50\ 000 \times (0.97)^4$ oe and B1 for 44260 or better or SC1 for correct method for 3% increase with final answer of 56300
13	12	3	M1 for $x = k \sqrt[3]{y}$ oe A1 for $k = 3$ or M2 for $\frac{6}{\sqrt[3]{8}} = \frac{x}{\sqrt[3]{64}}$ oe
14	$3y + x = 19$ oe	3	M1 for <i>their m</i> $\times 3 = -1$ oe or $-\frac{1}{3}$ soi M1 for $4 = 7 \times \text{their } m + c$
15 (a)	$\begin{pmatrix} 76 & 30 \\ 40 & 16 \end{pmatrix}$	2	B1 for two correct elements
(b)	$\frac{1}{4} \begin{pmatrix} 2 & -3 \\ -4 & 8 \end{pmatrix}$ oe	2	B1 for $k \begin{pmatrix} 2 & -3 \\ -4 & 8 \end{pmatrix}$ soi or $\frac{1}{4} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ seen or $\det = 4$ soi
16	$\frac{25}{9}$ $\frac{a}{b} \times \frac{6}{5}$ where $a > b$ <i>Their</i> $\frac{150}{45}$ or <i>their</i> correct full cancelling $\frac{10}{3}$ or $3\frac{1}{3}$ nfww	B1 M1 M1FT dep A1	(Alt) $\frac{25}{9}$ <i>their</i> $25 \times 2 \div 5 \times 3$ oe $\frac{\text{their } 25 \times 2}{5 \times 3}$ oe or $\frac{50}{18} \div \frac{15}{18}$ oe with 18's cancelled

Page 4	Mark Scheme Cambridge IGCSE – March 2015	Syllabus 0580	Paper 22
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17 (a)	$b - a$	2	M1 if unsimplified or correct route in terms of P, Q, R, S
(b)	$\frac{5}{8}x + \frac{3}{8}y$	2	M1 for a correct route e.g. $OX + XM$ or for $\frac{3}{8}\overrightarrow{XY}$ or $\frac{5}{8}\overrightarrow{YX}$
18	14.4 or 14.36...	4	M3 for $\tan = \frac{6}{\text{their } \sqrt{15^2 + 18^2}}$ oe or better or M1 for $AC = \sqrt{15^2 + 18^2}$ and M1 for identifying required angle
19	95	4	B1 for 2.3 or $2\frac{18}{60}$ M1 for $75 \div 30 (= 2.5)$ M1 for $\frac{381 + 75}{\text{their } 2.3 + \text{their } 2.5}$
20 (a)	35	2	M1 for $[Z =] 180 - 88 - 57$ or $VWX = 57$ or $YZX = 35$
(b)	10.8	2	M1 for $\frac{AC}{7.2} = \frac{12.6}{8.4}$ oe
21 (a) (i)	1	1	
(ii)	m^7	1	
(iii)	$2p^2$	2	SC1 for $2p^k$ or kp^2 $k \neq 0$
(b)	$\frac{2}{5}$ or 0.4	2	B1 for 3^5 or 3^{5x} or $243^{\frac{1}{5}}$ or $243^{\frac{2}{5}}$ seen
22 (a)	17	2	M1 for $[g(-2) =] 4$ seen or for $5x^2 - 3$
(b)	$25x^2 - 30x + 9$ or $(5x - 3)^2$ as final answer	2	M1 for $g(5x - 3)$
(c)	$\frac{x+3}{5}$	2	M1 for $5x = y + 3$ or $x = 5y - 3$ or $\frac{y}{5} = x - \frac{3}{5}$

CAMBRIDGE INTERNATIONAL EXAMINATIONS
Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2015 series

0580 MATHEMATICS

0580/42 Paper 4 (Paper 42 – Extended), maximum raw mark 130

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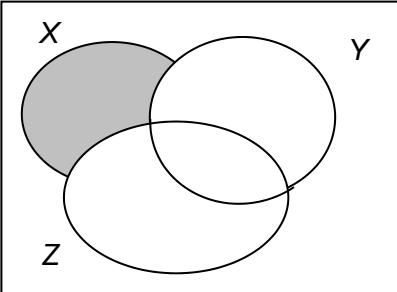
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Page 2	Mark Scheme Cambridge IGCSE – March 2015	Syllabus 0580	Paper 42
---------------	---	--------------------------------	---------------------------

Abbreviations

cao	correct answer only
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oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1 (a)	$\frac{1.5}{100} \times 450\,000$ oe	1	Accept equivalent methods
(b)	6000	3	M2 for $\frac{6750}{112.5} \times 100$ oe or M1 for 112.5% associated with 6750 oe
(c)	376.25 cao final answer	2	B1 for 21.5 and 17.5 seen
(d)	22.4	2	M1 for 200^2 or 2^2 seen oe
(e)	5184	2	M1 for $12 \times 16 \times 27$
(f)	9023	3	M1 for $12000 \div 1.33$ A1 for 9022.55 to 9022.56 or 9022.6 or 9020 B1indep for their answer rounded to the nearest euro if possible
2 (a) (i)		3	B2 for 8 or 9 numbers correct B1 for 6 or 7 numbers correct
(ii)	= cao	1	
	{3}	1FT	FT their intersection of all 3 sets – their diagram
	\emptyset or {}	1	
(iii)	5	1FT	FT their set B on diagram
(b) (i)	\subset	1	

(ii)		1	
3 (a)	2 0 -2 2	3	B2 for 3 correct B1 for 2 correct
(b)	smooth correct curve through correct points	4	B3FT for 8 or 9 correct plots B2FT for 6 or 7 correct plots B1FT for 4 or 5 correct plots FT <i>their</i> table
(c)	line $y = \frac{1}{2}(x + 1)$ ruled <u>and</u> -2.85 to -2.95 -1 0.85 to 0.95	4	Line must be fit for purpose B3 for correct line and 2 correct values or B2 for correct line and 1 correct value or B1 for correct line or SC2 for no/wrong line and 3 correct values or SC1 for no/wrong line and 2 correct values
(d)	tangent ruled - 1.1 to - 1.5	B1 2	No daylight between tangent and curve at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.85$ and $x = -1.65$ dep on B1 M1 for rise/run also dep on any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent Accept M1 for answer in range 1.1 to 1.5 after B1
4 (a)	$(11y - m)(11y + m)$ final answer	2	B1 for $11y$ seen
(b)	$\frac{3x^2 + 5x - 14}{(3x - 5)(x - 1)}$ final answer	3	B1 for denom $(3x - 5)(x - 1)$ oe isw and B1 for $3x^2 + 6x - 5x - 10$ soi

Page 4	Mark Scheme Cambridge IGCSE – March 2015	Syllabus 0580	Paper 42
---------------	---	--------------------------------	---------------------------

(c)	$\frac{-2 \pm \sqrt{2^2 - 4(3)(-7)}}{2 \times 3}$ – 1.90 1.23 final answers	2 1, 1	B1 for $\sqrt{2^2 - 4(3)(-7)}$ or better seen and if in form $\frac{p + or - \sqrt{q}}{r}$ B1 for $p = -2$ and $r = 2 \times 3$ SC1 for –1.9, –1.896 or –1.897 and 1.2 or 1.230 or –1.23 and 1.90 final answers or –1.90 and 1.23 seen in working
(d) (i)	$\frac{1}{2}(x+4+3x+2)(x+1)=15$ $4x^2 + 4x + 6x + 6 = 30$ or $2x^2 + 2x + 3x + 3 = 15$ $2x^2 + 5x - 12 = 0$	M1 M1 A1	Allow $\frac{1}{2}(4x+6)(x+1)=15$ Dep on 1 st M1 With no errors or omissions
(ii)	1.5 or $\frac{3}{2}$, –4	3	B2 for $(2x-3)(x+4)$ or $\frac{-5 \pm \sqrt{5^2 - 4(2)(-12)}}{2 \times 2}$ or SC1 for $(2x+a)(x+b)$ where a and b are integers and $a + 2b = 5$ or $ab = -12$ or $\sqrt{5^2 - 4(2)(-12)}$ or $\frac{p + or - \sqrt{q}}{r}$ where $p = -5$ and $r = 2 \times 2$
(iii)	6.5 or $\frac{13}{2}$	1FT	FT $3 \times$ their pos root from (d)(ii) + 2
5 (a)	$\frac{1}{2} \times 16 \times 5.4 \times \sin 62$ oe 38.14...	M1 A1	
(b)	95.6 or 95.64 to 95.65	4	M2 for $\frac{6.7 \times \sin 48}{8.4}$ or M1 for implicit form and M1dep for $180 - 48 -$ their 36.4

Page 5	Mark Scheme Cambridge IGCSE – March 2015	Syllabus 0580	Paper 42
---------------	---	--------------------------------	---------------------------

(c)	286 or 285.7 to 285.8	5	<p>B1 for [Angle $APB=$] 83°</p> <p>M2 for $180^2 + 245^2 - 2 \times 180 \times 245 \times \cos \text{their } 83$</p> <p>or M1 for implicit form A1 for [$AB^2 =$] 81676[.1...]</p> <p>After 0 scored, SC2 for ans 406.87 to 406.88 or 406.9 or 407 if 146° used in cos rule Or SC1 for $180^2 + 245^2 - 2 \times 180 \times 245 \times \cos 146$</p>
6 (a)	$\frac{4}{15}$	1	
(b)	80	1FT	FT $300 \times \text{their (a)}$
(c) (i)	$\frac{40}{225}$ oe	3	<p>M2 for $\frac{5}{15} \times \frac{4}{15} \times 2$ oe</p> <p>or M1 for $\frac{5}{15} \times \frac{4}{15}$</p>
(ii)	$\frac{121}{225}$	3	<p>M2 for $\frac{11}{15} \times \frac{11}{15}$ oe</p> <p>or M1 for $\frac{11}{15}$ or $1 - \frac{4}{15}$ seen</p>
(d) (i)	$\frac{108}{210}$ oe	3	<p>M2 for $\frac{6}{15} \times \frac{9}{14} + \frac{9}{15} \times \frac{6}{14}$ oe</p> <p>or M1 for $\frac{6}{15} \times \frac{9}{14}$ oe or $\frac{9}{15} \times \frac{6}{14}$ oe</p> <p>or $\frac{6}{15} \times \frac{5}{14}$ oe or $\frac{6}{15} \times \frac{4}{14}$ oe</p>
(ii)	$\frac{148}{210}$ oe	4	<p>M3 for $\frac{5}{15} \times \frac{10}{14} + \frac{6}{15} \times \frac{9}{14} + \frac{4}{15} \times \frac{11}{14}$ oe</p> <p>or $1 - \frac{5}{15} \times \frac{4}{14} - \frac{6}{15} \times \frac{5}{14} - \frac{4}{15} \times \frac{3}{14}$</p> <p>or M2 for equivalent of 2 of above products added together oe</p> <p>or M1 for one correct relevant product oe</p>
7 (a) (i)	Rotation [centre] (0, 0) or origin 90° [anticlockwise] oe	1 1 1	

Page 6	Mark Scheme Cambridge IGCSE – March 2015	Syllabus 0580	Paper 42
---------------	---	--------------------------------	---------------------------

	(ii) Enlargement [centre] $(-2, 1)$ [s.f.] – 2	1 1 1	
	(b) vertices at $(-3, 4)$ $(-3, 5)$ $(-3, 6)$ $(-2, 6)$	2	SC1 for translation by $\begin{pmatrix} 2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 1 \end{pmatrix}$
	(c) vertices at $(7, 3)$ $(7, 4)$ $(7, 5)$ $(6, 5)$	2	SC1 for reflection in $y = 1$ or reflection in any vertical line
	(d) reflection x -axis oe	1 1	
8 (a) (i)	47.7 or 47.74 to 47.75	3	M1 for $[\text{arc} =] 68 - 2 \times 24$ or $24 + 24 + \frac{x}{360} \times 2\pi \times 24 = 68$ M1 for $[x =] \text{their arc} \times 360 \div (2 \times \pi \times 24)$
	(ii) 252 or 252.3 to 252.4....	6	M1 for $r = \frac{20}{2\pi}$ or $\left(\frac{\text{their } 47.7}{360} \times 2 \times \pi \times 24 \right) \div (2\pi)$ A1 for $r = 3.18$ or 3.182 to $3.183\dots$ or $\frac{10}{\pi}$ M1 for $h^2 = 24^2 - \text{their } r^2$ A1 for $h = 23.8$ or $23.78\dots$ to 23.79 M1dep on M1 earned for $V = \frac{1}{3}\pi \times \text{their } h \times \text{their } r^2$
	(b) 139 or 139.3 to 139.4... nfww	5	M4 for $8^2 + \frac{1}{4}\pi \times 8^2 + \frac{1}{2}\pi \times \left(\frac{8}{2}\right)^2$ or M1 for $\frac{1}{4}\pi \times 8^2$ and M1 for $\frac{1}{2}\pi \times \left(\frac{8}{2}\right)^2$ and M1 for 8^2 added to at least one term with π
9 (a)	$140 < h \leqslant 144$	1	
	(b) 144.875 nfww	4	M1 for at least 4 correct mid-values soi M1 for $\sum fx$ where x is in the correct interval, allow one further error/omission M1 dep for $\div 40$ dependent on second method mark

Page 7	Mark Scheme Cambridge IGCSE – March 2015	Syllabus 0580	Paper 42
---------------	---	--------------------------------	---------------------------

(c)	4 correct blocks	4	B3 for 3 correct blocks B2 for 2 correct blocks B1 for 1 correct block or at least 3 correct frequency densities (1.4, 1, 1, 0.65)
10 (a)	$4x + 10y < 80$	1	With no errors seen
(b)	$y > x$	1	
	$y \leq 6$ or $y < 7$	1	Accept $0 \leq y \leq 6$ or $0 < y \leq 6$ or $0 \leq y < 7$ or $0 < y < 7$
(c)	ruled broken line through (5, 6) to (10, 4) ruled broken line $y = x$ ruled solid line $y = 6$ or broken $y = 7$ correct region indicated	B2 B1 B1	SC1 for correct only at (5, 6) or (10, 4) Must be consistent with <i>their</i> (b)
(d)	76	2	SC1 for (4, 6) indicated or $4x + 10y$ evaluated for (x, y) in <i>their</i> region, x, y integers
11 (a)		1	
(b)	30 10	1 1	
(c)	$n(n+1)$ oe	2	B1 for $an^2 + bn + c$ a, b, c numeric $a \neq 0$
(d)	$\frac{1}{2}n(n-1)$ oe	2	B1 for using $\frac{1}{2}$ oe in expression of form $\frac{1}{2}(an^2 + bn + c)$ $a \neq 0$ or $kn(n-1)$ $k \neq 0$

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0580 MATHEMATICS

0580/22

Paper 2 (Extended), maximum raw mark 70

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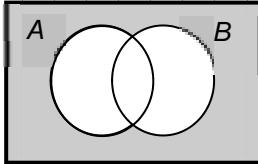
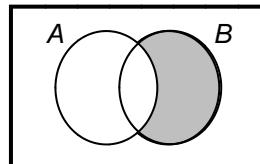
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Page 2	Mark Scheme Cambridge IGCSE – October/November 2014	Syllabus 0580	Paper 22
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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1	$6 + 5 \times (10 - 8) = 16$	1	One pair of brackets only
2	20	1	
3	8	1	
4	<p>ξ </p> <p>ξ </p>	1 1	
5	$v^3 - p$	2	M1 for $v^3 = p + r$
6	95.5 96.5 in correct places cao	2	B1 for 95.5 or 96.5 in correct place or for answers reversed
7 (a)	700	2	M1 for 2800×0.325
(b)	0.28	1	
8	$\frac{7}{6}$ oe <i>their</i> $\frac{7}{6} \times \frac{8}{7}$ oe $\frac{4}{3}$ or $1\frac{1}{3}$ cao must see working	B1 M1 A1	Or M1 for $\frac{56}{48} \div \frac{42}{48}$ or equivalent division with fractions with common denominator

Page 3	Mark Scheme Cambridge IGCSE – October/November 2014	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

9	9.13 or 9.127 to 9.1271	3	M2 for $\sqrt[3]{\frac{1000}{440}}$ [1.31] oe or $\sqrt[3]{\frac{440}{1000}}$ [0.761] oe Or M1 for $\frac{1000}{440}$ [2.27] oe or $\frac{440}{1000}$ [0.44] oe or $\sqrt[3]{\frac{\text{figs}440}{\text{figs}1000}}$ or $\sqrt[3]{\frac{\text{figs}1000}{\text{figs}440}}$
10	97.2[0]	3	M1 for $C = kr^2$ A1 for $k = 30$ or M2 for $\frac{202.8}{2.6^2} = \frac{c}{1.8^2}$ oe
11 (a)	$\begin{pmatrix} 6 & -4 \\ -8 & 38 \end{pmatrix}$	2	M1 for a 2 by 2 matrix with two correct elements SC1 for $\begin{pmatrix} 16 & -14 \\ -18 & 28 \end{pmatrix}$
(b)	14	1	
12		3	
13	13.5 or 13.45[...]	3	M2 for $\sqrt{\frac{2 \times 85}{\sin 110}}$ or M1 for $\frac{1}{2} \times a^2 \times \sin 110 = 85$ or $\frac{2 \times 85}{\sin 110}$ oe [180.9..]
14 (a)	2.47 or 2.474 to 2.4744	2	M1 for $\frac{56}{360} \times \pi \times 2.25^2$ oe
(b)	0.742 or 0.7422 to 0.74232	1FT	FT <i>their (a)</i> $\times 0.3[0]$ correctly evaluated.

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0580	22

15 (a)	$2 \times 3 \times 3 \times 5$	2	B1 for 2, 3, [3] and 5 identified as only prime factors or M1 for partial prime factorisation $6 \times 3 \times 5$ or $2 \times 9 \times 5$ or $3 \times 3 \times 10$ or $2 \times 3 \times 15$
(b)	630	2	M1 for $2 \times 3^2 \times 5 \times 7$ oe or for listing multiples of 90 and 105 at least up to 630
16 (a)	108	1	
	Angle at centre is twice angle at circumference oe	1	
(b) (i)	$-\frac{4}{3}$ oe	1	
(ii)	-1	1	
17	[0.]08	4	M3 for $200 \times \left(1 + \frac{2}{100}\right)^2 - 200 - \frac{200 \times 2 \times 2}{100}$ oe or M1 for $200 \times \left(1 + \frac{2}{100}\right)^2$ and M1 for $\frac{200 \times 2 \times 2}{100} [+200]$
18 (a)	56	2	B1 for 16 soi or M1 for $72 - \text{their } 16$
(b) (i)	63 or 63 to 63.5	1	
(ii)	22 or 21.6 to 23 nfww	2	B1 for 49.8 to 50.2 seen or 71.8 to 72.8
19 (a) (i)	$\mathbf{c} - \mathbf{a}$	1	
(ii)	$-\frac{1}{3} \mathbf{a} + \frac{1}{3} \mathbf{c}$	3	M2 for $-\mathbf{a} + \frac{1}{3}(\mathbf{c} + 2\mathbf{a})$ oe e.g. $-\mathbf{a} + \mathbf{c} + 2\mathbf{a} - \frac{2}{3}(\mathbf{c} + 2\mathbf{a})$ Or M1 for a correct route from A to X
(b)	\overrightarrow{AC} is a multiple of \overrightarrow{AX} and they share a common point [A]	1 1	oe oe

Page 5	Mark Scheme Cambridge IGCSE – October/November 2014	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

20 (a)	102 to 106	2	B1 for 5.1 to 5.3 seen
	(b) Correct position of F with correct arcs for angle bisector	5	B2 for Correct ruled angle bisector of A with correct arcs or B1 for correct bisector with no/wrong arcs and B2 for Arc centre C , radius 8 cm or B1 for arc centre C with incorrect radius or correct conversion to 8cm and B1 for marking position of F on <i>their</i> bisector and 8cm from C or on <i>their</i> arc centre C
21 (a)	$\frac{x+7}{(2x-1)(x+2)}$ Final answer	3	B1 for $3(x+2)-1(2x-1)$ seen or better B1 for denominator $(2x-1)(x+2)$ oe seen SC2 for final answer $\frac{x+5}{(2x-1)(x+2)}$
	$\frac{2x}{x+7}$ Final answer	4	M1 for $4x(x-4)$ or partial factorisation of numerator and M2 for $[2](x+7)(x-4)$ oe or M1 for $[2](x^2 + 3x - 28)$ or $[2](x+a)(x+b)$ where $ab = -28$ or $a+b = 3$ SC3 for answer $\frac{4x}{2x+14}$ oe

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0580 MATHEMATICS

0580/42

Paper 4 – Extended, maximum raw mark 130

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Page 2	Mark Scheme Cambridge IGCSE – October/November 2014	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Qu.	Answer	Mark	Part marks
1 (a) (i)	49.5[0]	3	M2 for $16.5[0] \div 5 \times (5 + 3 + 7)$ or M1 for $16.5[0] \div 5$
(ii)	66	1FT	FT <i>their (a)(i) $\div 75 \times 100$</i> to 3 sf or better
(b)	2 hours 39 mins 45 secs	3	B2 for 159.75 oe, e.g. 2.6625 [h] 9585 [s] or M1 for 3 hrs 33 mins oe / $(2 + 9 + 1)$ oe
(c)	18.75 final answer	3	M2 for $16.5[0] \div 0.88$ oe or M1 for 16.5[0] associated with 88[%]
2 (a)	$x > 0.5$ oe final answer nfww	3	B2 nfww for 0.5 with no/incorrect inequality or equals sign as answer or M2 for $7x + 15x > 6 + 5$ or better or $-6 - 5 > -7x - 15x$ or better or M1 for $6 - 15x$ seen
(b) (i)	$(p - 2)(q + 4)$ final answer	2	M1 for $q(p - 2) + 4(p - 2)$ or $p(q + 4) - 2(q + 4)$
(ii)	$(3p - 5)(3p + 5)$ final answer	1	
(c)	$(5x - 9)(x + 2)$	M2	M1 partial factorisation, e.g. $x(5x - 9) + 2(5x - 9)$ or SC1 for $(5x + a)(x + b)$ where $ab = -18$ or $a + 5b = 1$
	$\frac{9}{5}$ oe and -2 final answer	B1	

Page 3	Mark Scheme Cambridge IGCSE – October/November 2014	Syllabus 0580	Paper 42
--------	--	------------------	-------------

3	(a) $35 < t \leq 40$	1	
	(b) $22.5, 27.5, 32.5, 37.5, 42.5, 47.5$ $(2 \times 22.5 + 6 \times 27.5 + 7 \times 32.5 + 19 \times 37.5 + 9 \times 42.5 + 7 \times 47.5)$	M1 M1	At least 4 correct mid-values soi $\sum fx$ where x is in the correct interval allow one further slip $[45 + 165 + 227.5 + 712.5 + 382.5 + 332.5 = 1865]$
	$\div 50$ or their $\sum f$	M1dep	Dependent on second method
	37.3	A1	SC2 for correct answer with no working
	(c) (i) 15, 19, 16	1	
	(ii) rectangular bars of height 1, 3.8 and 1.6	B2FT	FT their (c)(i), on correct boundary lines B1FT for 2 correct heights If 0 scored for heights then SC1 for 3 correct frequency densities soi
	correct widths of 15, 5, 10 and no gaps	B1	
4	(a) Enlargement [SF] – $\frac{1}{2}$ oe [centre] (2, 5)	3	B1 for each
	(b) (i) Image at $(-2, 6), (-8, 3), (-4, 3)$	2	SC1 for reflection in any vertical line or for 3 correct points not joined
	(ii) Image at $(3, -2), (3, 2), (6, 4)$	2	SC1 for rotation 90° [anti clockwise] around origin at $(-3, 2), (-3, -2), (-6, -4)$ or for 3 correct points not joined
	(iii) Image at $(-5, 1), (-3, -2), (1, -2)$	2	SC1 for translation by $\begin{pmatrix} -1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$ or for 3 correct points not joined
	(c) (i) $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	2	B1 for a correct row or column
	(ii) Rotation, 90° [anticlockwise] oe origin oe	2	B1 for two elements correct

Page 4	Mark Scheme Cambridge IGCSE – October/November 2014	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

5	(a) (i)	8	1	<p>M1 for $[g(17) =] \frac{7}{14}$ or $2\left(\frac{7}{x-3}\right)^2 + 7\left(\frac{7}{x-3}\right)$</p> <p>M2 for $x^2 = 16$ or $x^2 - 16 = 0$ or M1 for $7 = (x-3)(x+3)$ or better</p> <p>B1</p> <p>B1FT $2x^2 + 7x \pm \text{their } k$ [$k \neq 0$] oe B1FT for $\sqrt{7^2 - 4(2)(-11)}$ or better or $\left(x + \frac{7}{4}\right)^2$ oe If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$, B1FT for -7 and $2(2)$ or better or $-\frac{7}{4} +$ or $-\sqrt{\frac{137}{16}}$ oe</p> <p>If B0, SC1 for answers -4.7 and 1.2 or $-4.676\dots$ and $1.176\dots$ seen or for -4.68 and 1.18 seen or for answer 4.68 and -1.18</p> <p>B1B1</p> <p>M1 for correct first step or better, e.g. $5y = x + 2$ or $x = \frac{y+2}{5}$ or $x = 5y - 2$ or $y + 2 = 5x$ or $\frac{y}{5} = x - \frac{2}{5}$</p>
	(ii)	4	2	
	(b)	4 or -4	3	
	(c)	$2x^2 + 7x - 11 [= 0]$ soi	B1	
		$\frac{-7 \pm \sqrt{(7)^2 - 4(2)(-11)}}{2(2)}$	B1FT B1FT	
		$-4.68, 1.18$ final answers	B1B1	
(d)	$\frac{x+2}{5}$ or $\frac{x}{5} + \frac{2}{5}$	2		
(e)	-2	1		

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0580	42

6	(a)	-3, 7.375, 8.875	1, 1, 1	Accept 7.4 or 7.37 or 7.38 for 7.375 and 8.9 or 8.87 or 8.88 for 8.875
	(b)	Correct curve	4	B3FT for 8 or 9 correct plots B2FT for 6 or 7 correct plots B1FT for 4 or 5 correct plots Point must touch line if exact or be in correct square if not exact (including boundaries)
	(c) (i)	Any integer less than 7 or greater than 10	1	
	(ii)	7, 8 or 9	1	
	(d)	$y = 15x + 2$ ruled and fit for purpose	B2	B1 for short line but correct or freehand full length correct line or for ruled line through (0, 2) (but not $y = 2$) or for ruled line with gradient 15 (acc ± 1 mm vertically for 1 horizontal unit)
		-1.45 to -1.35 and 0.4 to 0.5	B2	B1 for each
	(e)	Tangent ruled at $x = 1.5$	B1	No daylight at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 1.4$ and 1.6
		7 to 12	2	Dep on B1 or close attempt at tangent at $x = 1.5$ M1 for $y - \text{step}/x - \text{step}$ for their tangent
7	(a) (i)	$120 \times 55 \times 75 [= 495000]$	M1	
		$\div 1000 [= 495]$ or $495[\text{l}] \times 1000 = 495000[\text{ml}]$	M1	
	(b) (i)	11	2	M1 for $495000 \div 750 [\div 60]$ oe [660] After 0 scored, SC1 for answer figs 11
	(ii)	37.5 or 37.50 to 37.51	3	M2 for $\sqrt{\frac{\text{figs}495}{112\pi}}$ oe or M1 for $[112r^2 =] \frac{\text{figs}495}{\pi}$ or $[\pi r^2 =] \frac{\text{figs}495}{112}$ or better

Page 6	Mark Scheme Cambridge IGCSE – October/November 2014	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

(c)	15	4	<p>B3 for answer 60 or M3 for $75 - \sqrt{145^2 - (55^2 + 120^2)}$ oe M2 for $\sqrt{145^2 - (55^2 + 120^2)}$ oe or M1 for $\sqrt{55^2 + 120^2}$</p>
(d)	24.4[4..] to 24.45	3	<p>M2 for $\cos^{-1}(\sqrt{55^2 + 120^2}/145)$ oe, e.g. or $\sin^{-1}(75 - \text{their (c)})/145$ or $\tan^{-1}((75 - \text{their (c)})/\sqrt{55^2 + 120^2})$ or M1 for $\cos = \sqrt{55^2 + 120^2}/145$ oe or $\sin = (75 - \text{their (c)})/145$ or $\tan = (75 - \text{their (c)})/\sqrt{55^2 + 120^2}$</p>
8 (a)	Angle $LPQ = 32$ soi $58^2 + 74^2 - 2 \times 58 \times 74 \cos \text{their } P$ 39.50[1...]	B1 M2	<p>M1 for correct implicit cos rule</p>
(b)	$\sin PQL = \frac{58 \sin \text{their } P}{39.5}$ oe	A2	A1 for 1560.3 to 1560.4 or 1560
	51.1 or 51.08 to 51.09	M2	M1 for $\frac{\sin PQL}{58} = \frac{\sin(\text{their } P)}{39.5}$ oe
(c) (i)	322	B1	
(ii)	[0]13[.1] or 13.08 to 13.09	2	M1 for 180 + 142 oe
(iii)	17.8 or 17.77 to 17.78	1FT	FT their (b) – 38
(d)	30.7 or 30.73 to 30.74...	3	M1 for $74 \div 2.25$ oe soi by 32.888... to 3 sf or better M1 for dist or speed $\div 1.85$
(e)		3	M2 for $58 \sin \text{their } P$ oe or $39.5 \sin \text{their (b)}$
			or M1 for $\frac{x}{58} = \sin \text{their } P$ oe
			or $\frac{x}{39.5} = \sin \text{their (b)}$
9 (a)	28 45 17 21 45 66	1,1	
(b) (i)	$4n - 3$ oe	1	
(ii)	237	1	M1 for $4n + k$
(iii)	50	2FT	FT their (b)(i) = 200 solved and then answer truncated dep on linear expression of form $an + k$ M1 for $\text{their } 4n - 3 = 200$ or $\text{their } 4n - 3 \leq 200$

Page 7	Mark Scheme Cambridge IGCSE – October/November 2014	Syllabus 0580	Paper 42
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(c)	$p = 2$ and $q = -5$ with some correct supporting working leading to the solutions	5	<p>M2 for any 2 of $p + q + 3 = 0$ oe, $2^2 p + 2q + 3 = 1$ oe, $3^2 p + 3q + 3 = 6$ oe, $4^2 p + 4q + 3 = 15$ oe , $5^2 p + 5q + 3 = \text{their } 28$ oe, etc. or M1 for any one of these M1 indep for correctly eliminating p or q from pair of linear equations A1 for one correct value If 0 scored SC1 for 2 values that satisfy one of their original equations After M0, 2 correct answers SC1</p>
(d)	$2n^2 - n$ or $n(2n - 1)$	2	<p>B1 for answer $2n^2 + k[n]$ or M1 for <i>their quadratic</i> from (c) + <i>their linear</i> from (b)(i)</p>
10 (a) (i)	$\frac{1}{36}$ final answer	2	<p>M1 for $\frac{1}{6} \times \frac{1}{6}$</p>
(ii)	$\frac{1}{12}$ final answer	3	<p>M2 for $3\left(\frac{1}{6} \times \frac{1}{6}\right)$ oe</p>
(b)	7	1	<p>Dependent on previous mark</p>
(c)	Refers to most combinations oe	1	<p>M4 for $\frac{2}{36} + \left(\left[1 - \frac{3}{36}\right] \times \frac{2}{36}\right) + \left(\frac{1}{36} \times \frac{3}{36}\right)$ oe</p>
	$\frac{141}{1296}$ oe $\left[\frac{47}{432}\right]$	5	<p>or M3 for 2 correct probabilities shown <u>added</u> from those above</p>
			<p>or M1 for $\left(1 - \frac{3}{36}\right) \times \frac{2}{36}$ seen oe</p>
			<p>And M1 for $\frac{1}{36} \times \frac{3}{36}$ seen oe</p>
			<p>or $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}$ oe alone or added to a</p>
			<p>probability not of the form $\frac{n}{36}$</p>

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0580 MATHEMATICS

0580/22

Paper 2 (Extended), maximum raw mark 70

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Page 2	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2014	0580	22

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Qu		Answers	Mark	Part Marks
1		1.49 or 1.491...	1	
2	(a)	570 000	1	
	(b)	5.69×10^5	1	
3		[x =] 2, [y =] – 3	2	B1 B1 or SC1 for reversed answers
4		7.06 or 7.063 to 7.064	2	M1 for $\frac{[]}{8} = \cos 28$ or better
5	(a)	(0, 5)	1	
	(b)	– 1	1	
6		101.4, 102.6	2	M1 for 8.45 and 8.55 seen If 0 scored, SC1 for one correct value in correct position on answer line or for two correct reversed answers
7		$2\frac{1}{2}\%$, 0.2, $\frac{43}{201}$, $\sqrt{0.1}$	2	B1 for 0.3..., 0.21... and 0.025 seen or for three in correct order
8		$\left[\frac{1}{2} \times 1\frac{1}{2} = \right] \frac{3}{4}$ oe $\frac{5 \times 2}{6 \times 2}$ and $\frac{3 \times 3}{4 \times 3}$ oe or better $\frac{1}{12}$ oe working must be shown	B1 M1FT A1	

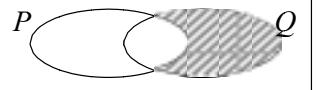
Page 3	Mark Scheme		Syllabus	Paper
	IGCSE – May/June 2014		0580	22

9		3.17 or 3.174 to 3.175	3	M2 for $\frac{63-61}{63} \times 100$ oe or $100 - \frac{61}{63} \times 100$ oe or M1 for $\frac{63-61}{63}$ oe or $\frac{61}{63} \times 100$
10	(a)	35	1	
	(b)	$\frac{3V}{A}$ or $3VA^{-1}$	2	M1 for multiplying by 3 or for dividing by $\frac{1}{3}$ or M1 for dividing by A
11		460	3	M2 for $\frac{391 \times 100}{(100-15)}$ oe or M1 for recognising 391 as $(100-15)\%$ soi
12		$-\frac{3}{5}$ oe	3	B2 for $5x + 3 = 0$ oe or B1 for a numerator of $3(x+1) + 2x [= 0]$ seen
13		1.6 oe	3	M1 for $w = \frac{k}{\sqrt{x}}$ A1 for $k = 8$ Alternative method: M2 for $w\sqrt{25} = 4\sqrt{4}$ oe
14	(a)	$\mathbf{p} + \mathbf{r}$	1	
	(b)	$\frac{3}{2} \mathbf{p} + \frac{1}{2} \mathbf{r}$	2	M1 for correct route from O to M or M1 for $\mathbf{p} + \frac{1}{2}\text{their(a)}$
15	(a)	$\begin{pmatrix} 22 & 18 \\ 27 & 31 \end{pmatrix}$	2	B1 for any correct column or row
	(b)	14	1	

Page 4	Mark Scheme		Syllabus	Paper
	IGCSE – May/June 2014		0580	22

16	(a)	$2pq(2p - 3q)$	2	B1 for $pq(4p - 6q)$ or $2q(2p^2 - 3pq)$ or $2p(2pq - 3q^2)$
	(b)	$(u + 4t)(1 + x)$	2	B1 for $1(u + 4t) + x(u + 4t)$ or $u(1 + x) + 4t(1 + x)$
17	(a)	$5t^{25}$	2	B1 for $5t^k$ or mt^{25} ($m \neq 0$)
	(b)	-2	1	
	(c)	64	1	
18		576	4	M1 for $\frac{1458}{3456}$ or $\frac{3456}{1458}$ M1 dep for $\sqrt[3]{\text{their fraction}}$ M1 for $(\text{their cube root})^2$
19		$\frac{x-1}{3}$ final answer	4	B2 for $(x-1)(x+7)$ or SC1 for $(x+a)(x+b)$ where $ab = -7$ or $a + b = 6$ B1 for $3(x+7)$
20	(a)	-3	1	
	(b)	$39 - 7n$ oe	2	M1 for $-7n [+ k]$
	(c)	53	2	M1 for $\text{their (b)} = -332$ shown provided their(b) is linear and their answer for (c) is a positive integer
21	(a)	4.47 or 4.472[...]	3	M2 for $\sqrt{6^2 - 4^2}$ or M1 for $[PM]^2 + 4^2 = 6^2$ or $6^2 - 4^2$
	(b)	48.2 or 48.18 to 48.19	3	M2 for $\cos[\text{correct angle}] = \frac{4}{6}$ oe or M1 for recognising a correct angle

Page 5	Mark Scheme		Syllabus	Paper
	IGCSE – May/June 2014		0580	22

22	(a)	i, j i, j, k, m, n	1 1	
		2	1	
	(b)	$\frac{2}{3}$	1	
	(c)		1	
	(d)	\subset or \subseteq	1	

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

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Page 2	Mark Scheme IGCSE – May/June 2014	Syllabus 0580	Paper 42
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Abbreviations

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FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Qu		Answers	Mark	Part Marks
1	(a)	$240 \div (5 + 7) \times 7$ [=140] oe	M2	M1 for $240 \div (5 + 7)$ or 240×7
	(b)	2 : 3 final answer	2	B1 for ratio of form $2x : 3x$ seen or SC1 for 3 : 2
	(c)	144	3	M2 for $120 + \frac{120 \times 4 \times 5}{100}$ oe or M1 for $\frac{120 \times 4 \times 5}{100}$
	(d)	89.99 cao mark final answer	3	B2 for 89.9[8...] shown but not spoiled or answer 90[.0..] nfww or M1 for $80 \times \left(\frac{104}{100}\right)^3$ oe If M1 spoiled by adding 80 or subtracting 80 then SC1 for answers 169.99 or 9.99
	(e)	4.08	3	M2 for $\frac{200 \times r \times 2}{100} = 200 \times 1.04^2 - 200$ oe or M1 for 200×1.04^2 [216.3[2]] oe or $\frac{200 \times r \times 2}{100}$ oe

Page 3	Mark Scheme IGCSE – May/June 2014	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Qu		Answers	Mark	Part Marks
2	(a)	3, 3, -1	3	B1 B1 B1
	(b)	Complete correct curve	5	B3FT 11 points or B2FT for 9 or 10 points or B1FT for 7 or 8 points And B1indep two separate branches not touching or crossing y -axis
	(c)	0.5 to 0.6	1	
	(d)	Correct line and 0.4 to 0.5 or no line and 0.4 to 0.5 nfw	3	Must check line - not if wrong line B2 for $y = 2x + 3$ ruled correctly or SC1 for correct freehand line or ruled line with either gradient 2 or y -intercept 3 but not $y = 3$
	(e) (i)	Tangent at $x = -1.5$	1	No daylight at $x = -1.5$. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.7$ and -1.3
	(ii)	-2 to -1	2	Dependent on tangent mark awarded Allow integer/integer if in range Or M1 for rise/run also dep on any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent

Page 4	Mark Scheme IGCSE – May/June 2014	Syllabus 0580	Paper 42
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Qu		Answers	Mark	Part Marks
3	(a)	86.8 or 86.83....	3	M2 for $\frac{80 \sin 55}{\sin 49}$ or M1 for $\frac{80}{\sin 49} = \frac{x}{\sin 55}$ oe
	(b)	51.2 or 51.15 to 51.16	4	M2 for $[\cos =] \frac{95^2 + 90^2 - 80^2}{2.95.90}$ oe or M1 for $80^2 = 95^2 + 90^2 - 2.90.95.\cos BCD$ A1 for $\frac{10725}{17100}$ or $\frac{143}{228}$ etc. or 0.627.....
	(c)	6700 or 6698 to 6703	3	M2 for $0.5 \times 80 \times \text{their}(a) \times \sin(180-55-49)$ oe [3368 – 3370...] [If AB used then $AB = 102.8$ to 103] + $0.5 \times 90 \times 95 \times \sin(\text{their}(b))$ oe [3329 – 3332] or M1 for one of these triangle area methods oe
	(d)	2180 or 2176 to 2179	3FT	FT $\text{their } (c) \times 0.325$ correctly evaluated to 3 sf or better M2 for $\text{their } (c) \times \frac{3250}{10000}$ or SC1 FT for figs 218 or figs 2176 to 2179

Page 5	Mark Scheme IGCSE – May/June 2014	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Qu		Answers	Mark	Part Marks
4	(a)	Image at $(-3, 2), (-5, 2), (-5, 4), (-3, 3)$	2	SC1 reflection in $y = -1$ or $x = k$ or 4 correct points not joined
	(b) (i)	Image at $(-2, -4), (-6, -4), (-6, -8), (-2, -6)$	2	SC1 other enlargement of scale factor -2, correct size and correct orientation or 4 correct points not joined
	(ii)	$\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$	2	SC1 for $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$, k may be algebraic or numeric but not 0 or 1
	(c) (i)	Image at $(1, 4), (3, 4), (3, 8), (1, 6)$	2	SC1 for trapezium with vertices at $(1, 6)$ and $(3, 8)$ or correct stretch with y -axis invariant or 4 correct points not joined
	(ii)	$\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$	2	SC1 for $\begin{pmatrix} 1 & 0 \\ 0 & k \end{pmatrix}$ k may be algebraic or numeric but not 0 or 1 or for $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$
	(iii)	$\frac{1}{2} \begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ oe isw	2FT	FT inverse of their (c)(ii) (algebraic or numeric) B1FT their (c)(ii) for $\frac{1}{2} \begin{pmatrix} a & c \\ b & d \end{pmatrix}$ or $p \begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ ie FT their correct fraction or their transposed matrix FT for 2 and 1 mark dependent on $\det \neq 0$
	(iv)	Stretch, [factor] $\frac{1}{2}$, invariant [line] x -axis oe	3	B1 B1 B1 each independent cao

Page 6	Mark Scheme IGCSE – May/June 2014	Syllabus 0580	Paper 42
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Qu		Answers	Mark	Part Marks
5	(a) (i)	2412 to 2413....	B2	Must be at least 4 figures shown M1 for $\pi \times 8^2 \times 12$ oe
	(ii)	2.41[0]	B1	
	(b)	1 min 24 s	4	B3 for 83.76 to 83.8[0] or 84 or 1.396 to 1.397 or 1.4 or 1 min 23.76 to 1 min 23.8 seen or M2 for $\frac{1}{3} \pi \times 4^2 \times 10 \div 2$ [80/3 π] or M1 for $\frac{1}{3} \pi \times 4^2 \times 10$ [160/3 π or 167.5 to 167.6]
	(c)	14	3	M1 for $\frac{2410}{\frac{1}{3} \pi \times 4^2 \times 10}$ or $\frac{2410}{\text{their cone vol from part (b)}}$ A1 for 14.3 to 14.4....
6	(a) (i)	[x =] 21, [y =] 42	2	B1 B1
	(ii)	3.79 or 3.8[0] or 3.792 to 3.802	2	M1 for $\frac{3.31}{TQ} = \frac{8.23}{9.43}$ oe or $\frac{\sin 21 \text{ or } \sin \text{ their } x}{TQ} = \frac{\sin 117}{9.43}$ oe
	(b)	40	4	B3 for angle between HE and tangent = 25 or $GFH = 40$ or $EGH = 25$ and angle $EHG = 115$ (accept 90 and 25 at H for 115) B2 for angle $EGH = 25$ or angle $EHG = 115$ (accept 90 and 25 at H for 115) B1 for angle $FEG = 25$ or angle $EFG = 65$
	(c)	38	5	B4 for angle $ADC = 104$ or M4 for $x + 14 + 20 + x + 70 = 180$ or better or B3 for angle $OBA = 20$ and angle $OBC = 56$ or angle $CBA = 76$ or reflex angle $AOC = 208$ or B2 for angle OAB or $OBA = 20$ and angle $ACB = 70$ or obtuse angle $AOC = 152$ or angle $BOC = 68$ or B1 for angle OAB or $OBA = 20$ or angle $ACB = 70$

Page 7	Mark Scheme IGCSE – May/June 2014	Syllabus 0580	Paper 42
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Qu		Answers	Mark	Part Marks
7	(a) (i)	$(100 - 70) \times 0.4 [= 12]$ or better	1	Accept $\frac{24}{78} \times 39$ oe
	(ii)	60.9 or 60.89... nfww	5	B1 for 3 or 4 correct extra frequencies 3, 6, 10, 8 soi M1 for at least 4 of mid-interval values 15, 40, 55, 65, 85 soi M1 for $\sum fx$ where x is any value in each interval allow <i>their</i> frequencies provided integers and they must be shown [$3 \times 15 + 6 \times 40 + 10 \times 55 + 8 \times 65 + 12 \times 85$] [2375]
	(b)	60.5	3	M1 (dependent on second M1) for $\div 39$ or $\div (3 + 6 + 10 + 8 + 12)$ M2 for $20 \times 70 - 19 \times 70.5$ oe or M1 for either 20×70 or 19×70.5
8	(a) (i)	$\frac{600}{x}$	1	Not $x = \frac{600}{x}$
	(ii)	$\frac{600}{x+1}$	1	Not $x = \frac{600}{x+1}$
	(b) (i)	$\frac{600}{x} - \frac{600}{x+1} = 20$ oe $600(x+1) - 600x = 20x(x+1)$ or better	M1FT	FT <i>their</i> (a)(i) – <i>their</i> (a)(ii) = 20 oe If M0 , SC1FT for <i>their</i> (a)(ii) – <i>their</i> (a)(i) = 20 oe
		$600x + 600 - 600x = 20x^2 + 20x$ $0 = 20x^2 + 20x - 600$ $x^2 + x - 30 = 0$	A1	May still be over common denominator and can be implied by third line. Allow recovery if bracket omitted
			A1	Dep on M1A1 and conclusion reached with at least one of the interim lines and without any errors or omissions

Page 8	Mark Scheme IGCSE – May/June 2014	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Qu		Answers	Mark	Part Marks
	(ii)	$x = 5$	B3	B2 for $(x + 6)(x - 5) [= 0]$ oe or SC1 for $(x + a)(x + b)$ where $ab = -30$ or $a + b = 1$ or B2 for $\frac{-1 + \sqrt{1^2 - 4.1.-30}}{2.1}$ or $\sqrt{30 + \left(\frac{1}{2}\right)^2} - \frac{1}{2}$ or B1 for $\frac{-1 + \sqrt{q}}{2.1}$ or $\sqrt{1^2 - 4.1.-30}$ or $\left(x + \frac{1}{2}\right)^2$
		100	B1FT	FT $600 \div (\text{their } x + 1)$ if $x > 0$ correctly evaluated
9	(a)	$\frac{1}{4}, \frac{9}{10}, \frac{1}{3}, \frac{2}{3}$	3	B1 for $\frac{1}{4}$ B1 for $\frac{9}{10}$ B1 for $\frac{1}{3}$ and $\frac{2}{3}$
	(b)	45	1	
	(c)	$\frac{3}{40}$ oe	2	M1 for $\frac{3}{4} \times \frac{1}{10}$ oe
	(d)	$\frac{101}{120}$ oe	3	M2 for $\frac{3}{4} \times \frac{9}{10} + \frac{1}{4} \times \frac{2}{3}$ only or $1 - \text{their (c)} - \frac{1}{4} \times \frac{1}{3}$ only or M1 for $\frac{3}{4} \times \frac{9}{10}$ or $\frac{1}{4} \times \frac{2}{3}$ or $\text{their (c)} + \frac{1}{4} \times \frac{1}{3}$
	(e)	$\frac{781}{1024}$ oe	2	M1 for $1 - \left(\frac{3}{4}\right)^5$ oe

Page 9	Mark Scheme IGCSE – May/June 2014	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Qu		Answers	Mark	Part Marks
10	(a)	2	2	B1 for $g\left(\frac{1}{2}\right) = \frac{1}{2}$ soi or $[fg=] \frac{1}{1-x}$
	(b)	$1-x$	1	Accept equivalents e.g. $-(x-1)$
	(c)	$x^2 - 2x + 2$	3	M1 for $(1-x)^2 + 1$ B1 for $\left[(1-x)^2 = \right] 1-x - x + x^2$ or better
	(d)	-6	1	
	(e)	$\sqrt{(-3)^2 - 4(1)(1)}$ or better $p = -(-3)$ and $r = 2 \times 1$ oe	B1	or for $\left(x - \frac{3}{2}\right)^2$ Must see $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or both or for $\frac{3}{2} + or - \sqrt{\left(\frac{3}{2}\right)^2 - 1}$
		0.38, 2.62	B1B1	SC1 for answers 0.4 and 2.6 or 0.3819 to 0.3820 and 2.618... or 0.38 and 2.62 seen in working or for -0.38 and -2.62 as final ans
	(f)	$f(x)$ and $g(x)$	1	Accept f and g or $1/x$ and $1-x$

Page 10	Mark Scheme IGCSE – May/June 2014	Syllabus 0580	Paper 42
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Qu	Answers	Mark	Part Marks
11	$\frac{1}{3}$ $\frac{72}{360}$ oe $\frac{1}{4}$ $\frac{1}{6}$ $\frac{\pi - 2}{\pi}$ or $1 - \frac{2}{\pi}$ or 0.363 or 0.3630 to 0.3635	1 1 2 2 4	Allow equivalent decimal throughout (3sf or better where necessary) M1 for $\left(\frac{1}{2}\right)^2$ or $(2)^2$ or $1^2 : 2^2$ or $2^2 : 1^2$ oe seen M1 for $[X = 6 \times] 0.5 \times l^2 \times \sin 60$ or $[X = 6 \times] 0.5 \times l^2 \times \sin 120$ Or recognition that the area of the obtuse-angled triangle shaded is equal to the area of one of the 6 equilateral triangles from the centre If fraction given as answer, check if it falls into range B1 for [sector =] $\frac{1}{4}\pi r^2$ oe B1 for [triangle =] $\frac{1}{2}r^2$ oe M1dep for $\frac{\text{their sector} - \text{their triangle}}{\text{their sector}}$ dep on B1B1 earned

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0580/22

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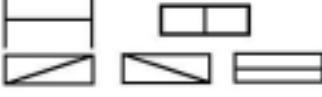
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Page 2	Mark Scheme IGCSE – October/November 2013	Syllabus 0580	Paper 22
---------------	--	--------------------------------	---------------------------

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isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1	$19\% \quad 0.719^5 \quad \sqrt{0.038} \quad \sin 11.4 \quad 1/5$	2	B1 for decimals [0.19], [0.2], 0.194..., 0.197..., 0.192... seen Or for four in correct order
2	(a) -447 (b) 2	1 1	
3	15.7 or 15.70 to 15.71	2	M1 for $2 \times \pi \times 2.5$
4	160	2	M1 for $\frac{8}{18} \times 360$ oe
5	(a)  (b) Some possible answers: 	1 1	
6	$[\pm] \sqrt{y-4}$ final answer	2	M1 for first move completed correctly M1 for second move completed correctly on answer line
7	170	2	M1 for $\frac{1}{2} \times (12 + 22) \times 10$ oe
8	3619 to 3620	2	M1 for $\frac{1}{2} \times \frac{4}{3} \times \pi \times 12^3$ or better
9	decagon	3	M1 for $360 \div 36$ oe A1 for 10
10	10.1[0]	3	M1 for 1.3199 and 1.3401 seen and M1 for 500×1.3199 or 500×1.3401 or for $500 \times (\text{their highest} - \text{their lowest})$ oe
11	120	3	M1 for $v = \frac{k}{\sqrt{d}}$ A1 for $k = 600$

Page 3	Mark Scheme	Syllabus	Paper
	IGCSE – October/November 2013	0580	22

12	$p = 71.4025$ cao $q = 73.1025$ cao	3	B1 for 8.45 and 8.55 seen M1 for <i>their LB</i> ² [π] or <i>their UB</i> ² [π] If 0 scored, SC1 for one correct.
13	10[.00]	3	M2 for 1.90 and 2.90 and 5.20 only or M1 for two of 1.90, 2.90, 5.20 in a list of three or two values from the table or SC1 FOR 1.90, 2.90, 4.30 $\left[\text{from } \frac{3.40 + 5.20}{2} \right]$
14	52	3	B2 for $AOB = 104$ or B1 for OAB or $OBA = 38$
15	(8, 2)	3	M1 for correctly eliminating one variable A1 for $x = 8$ A1 for $y = 2$ If 0 scored, SC2 for correct substitution and correct evaluation to find the other value.
16	$x < 6.8$	4	B3 for 6.8 with wrong inequality or equal as answer. Or M1 for first move completed correctly and M1 for second move completed correctly and M1 for third move completed correctly
17	(a) $\begin{pmatrix} 11 & 5 \\ 26 & 30 \end{pmatrix}$ (b) $\frac{1}{8} \begin{pmatrix} 6 & -1 \\ -4 & 2 \end{pmatrix}$ oe	2 2	SC1 for one correct row or column B1 for $k \begin{pmatrix} 6 & -1 \\ -4 & 2 \end{pmatrix}$ or B1 for $\frac{1}{8} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$
18	(a) (1.5, 12.5) oe (b) $y = 3x + 8$ oe (c) Most common methods: Correctly substituting $P(3, 17)$ into $y = 3x + 8$ Showing the gradient of AP or $BP = 3$ Other methods possible.	2 3 1	B1 for either coordinate B2 for $y = mx + 8$ or $y = 3x + c$ or $3x + 8$ or B1 for gradient (or m) = 3 and B1 for $c = 8$ If 0 scored, SC1 for $23 = \text{their } m \times 5 + c$ or for 2 = <i>their m</i> $\times -2 + c$ or for 12.5 = <i>their m</i> $\times 1.5 + c$

Page 4	Mark Scheme	Syllabus	Paper
	IGCSE – October/November 2013	0580	22

19	(a) $-2\mathbf{a} - 2\mathbf{c}$ oe (b) $2\mathbf{a} + \mathbf{c}$ (c) $-\mathbf{a} - \mathbf{c}$ oe	2 2 2FT	M1 for $\mathbf{BO} = -\mathbf{a} - \mathbf{c}$ or for any correct route or correct unsimplified expression M1 for any correct route or correct unsimplified expression FT <i>their (a)</i> or correct answer Or M1 for a correct non direct route from O to E or for correct unsimplified expression or for correct FT unsimplified
20	(a) 4.05 to 4.2 (b) 2.6 to 2.75 (c) 2.05 to 2.25 (d) $\frac{5}{48}$	1 2 2 2	
21	(a) 37.2 or 37.17 to 37.19 (b) 11.7 or 11.72 to 11.74	3 3	M2 for $\sin[] = \frac{4 \times \sin 65}{6}$ or M1 for $\frac{4}{\sin[]} = \frac{6}{\sin 65}$ oe M1 for $[B =] 160 - 65 - \text{their (a)}$ M1 for $\frac{1}{2} \times 4 \times 6 \times \sin 77.8$

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the October/November 2013 series

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

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Page 2	Mark Scheme IGCSE – October/November 2013	Syllabus 0580	Paper 42
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Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
art	anything rounding to
soi	seen or implied

	Correct answer	Mark	Part marks
1	<p>(a) (i) 3216 Final answer (ii) 1307 Final answer</p> <p>(b) 4.5[%] nfww</p> <p>(c) A by 31.05... or 31.04 to 31.05 or 31.[0] 31.1[0]</p>	2 2FT 2 5	M1 for $(18900 - 5500) \times 0.24$ oe FT $(18900 - \text{their (a)(i)}) \div 12$ correctly evaluated M1 for $(18900 - \text{their (a)(i)}) \div 12$ M1 for $\frac{19750.50[-18900]}{18900} \times 100$ or $\frac{19750.50 - 18900}{18900}$ M1 for $1500 \times 4.1/100 \times 3$ [+ 1500] oe M1 for $1500 \times 1.033^3 [-1500]$ oe A1 for 1684.5 or 184.5 or 1653[.45..] or 153[.45..] and M1dep for subtraction of <i>their</i> amounts or <i>their</i> interests
2	<p>(a) 36.9° or 36.86 to 36.87</p> <p>(b) (i) $1.8^2 + 2.4^2$ leading to $\sqrt{9}$ (ii) $[\cos ABD] = \frac{6.46^2 + 3^2 - 8.6^2}{2 \times 6.46 \times 3}$ 127 or 126.8...</p> <p>(c) 39.6 or 39.7 or 39.59 to 39.68</p>	2 2 M2 A2 3	M1 for $\tan[DBC] = 1.8/2.4$ oe M1 for $1.8^2 + 2.4^2$ or better M1 for correct cos rule but implicit version A1 for $-0.599\dots$ After 0 scored, SC2 nfww for answer 127 or 126.8 to 126.96 from other methods or no working shown M2 for $\frac{1}{2}(2.4 + 8.6) \times 1.8 \times 4$ oe Or M1 for $\frac{1.8}{2}(2.4 + 8.6)$ oe soi by 9.9 to 9.92

Page 3	Mark Scheme IGCSE – October/November 2013	Syllabus 0580	Paper 42
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3	(a) $\frac{4x-7}{10}$ final answer nfww	3	M2 for $\frac{5(2x-1)-2(3x+1)}{2 \times 5}$ or $\frac{5(2x-1)}{5 \times 2} - \frac{2(3x+1)}{5 \times 2}$ or M1 for attempt to convert to common denominator of 10 or multiple of 10 with one error in numerator
	(b) $x^2 + 9$ final answer nfww	4	B3 for $4x^2 - 6x - 6x + 9 - 3x^2 + 12x$ or correct answer given and then spoilt or B1 for $4x^2 - 6x - 6x + 9$ seen and B1 for $-3x^2 + 12x$ or $-(3x^2 - 12x)$ seen
	(c) (i) $(2x-1)(x+3)$ isw solving	2	M1 for $(2x+a)(x+b)$ where $ab = -3$ or $2b+a = 5$ with integers a and b
	(ii) $\frac{2x-1}{2(x-3)}$ or $\frac{2x-1}{2x-6}$ final answer nfww	3	M2 for $2(x+3)(x-3)$ or $(2x-6)(x+3)$ or $(2x+6)(x-3)$ seen or M1 for $2(x^2 - 9)$ seen
4	(a) (i) $90 \div (42/360 \times \pi \times 8^2)$ o.e. 3.836 to 3.837	M3	M2 for $42/360 \times \pi \times 8^2 \times h = 90$ or M1 for $42/360 \times \pi \times 8^2$
	(ii) 131 or 130.75 to 130.9 nfww	A1	
		5	M2 for $42/360 \times \pi \times 2 \times 8 \times 3.84$ oe [22.48 to 22.53] or M1 for $42/360 \times \pi \times 2 \times 8$ oe soi [5.86 to 5.87] and M1 for $2 \times (8 \times 3.84)$ [61.37 to 61.44] and M1 for $2 \times (42/360 \times \pi \times 8^2)$ [46.88 to 47]
	(b) 2.42 or 2.416 to 2.419	3	M2 for $3.84 \times \sqrt[3]{\frac{22.5}{90}}$ oe or $h = \sqrt[3]{\frac{3.84^3 \times 22.5}{90}}$ or M1 for $\sqrt[3]{\frac{22.5}{90}}$ oe or $\sqrt[3]{\frac{90}{22.5}}$ oe seen or $\frac{3.84^3}{h^3} = \frac{90}{22.5}$ oe

Page 4	Mark Scheme IGCSE – October/November 2013	Syllabus 0580	Paper 42
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5	<p>(a) 7, 11.5, 4.5</p> <p>(b) Correct curve cao</p> <p>(c) (i) $0.69 < x < 0.81$</p> <p>(ii) $-2.3 < x < -2.2$ $-0.8 < x < -0.6$ $0.35 < x < 0.5$</p> <p>(d) (i) $y = 10 - 3x$ ruled correctly</p> <p style="text-align: center;">$-0.55 < x < -0.45$ $0.35 < x < 0.45$</p> <p>(ii) $\begin{array}{rrr} 10 & 1 & -2 \\ \text{or } -10 & -1 & 2 \end{array}$</p>	<p>1,1,1</p> <p>5</p> <p>1</p> <p>3</p> <p>B2</p> <p>B1dep</p> <p>B1dep</p> <p>3</p>	<p>B3FT for 10 correct plots, on correct vertical grid line and within correct 2 mm square vertically Or B2FT for 8 or 9 correct plots Or B1FT for 6 or 7 correct plots and B1 indep for two separate branches on either side of y-axis</p> <p>B1 for each correct After 0 scored, allow SC1 for drawing line $y = 7.5$ long enough to cross curve at least once long enough to cross curve twice.</p> <p>B1 for ruled line gradient -3 or y intercept at 10 but not $y = 10$ Or B1 for ‘correct’ but freehand</p> <p>Dependent on at least B1 scored for line</p> <p>After 0 scored, SC2 for -0.5 and 0.4 [from solving equation]</p> <p>B2 for $2 - x - 10x^2 [= 0]$ oe Or B1 for $\frac{2}{x^2} - \frac{1}{x} - 10 = 0$ oe Correctly eliminating $-3x$ Or B1 for $2 - x - 3x^3 = 10x^2 - 3x^3$ oe Correctly clearing fractions</p>
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Page 5	Mark Scheme IGCSE – October/November 2013	Syllabus 0580	Paper 42
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6	(a) (i) $\frac{1}{110}$ oe	2	M1 for $\frac{1}{11} \times \frac{1}{10}$
	(ii) $\frac{6}{110}$ oe $\left[\frac{3}{55} \right]$	2	M1 for $\frac{3}{11} \times \frac{2}{10}$
	(iii) $\frac{8}{110}$ oe $\left[\frac{4}{55} \right]$	2FT	FT their (a)(ii) + $\frac{2}{11} \times \frac{1}{10}$ correctly evaluated or M1 their (a)(ii) + $\frac{2}{11} \times \frac{1}{10}$
	(b) (i) $\frac{6}{990}$ oe $\left[\frac{1}{165} \right]$	2	M1 for $\frac{3}{11} \times \frac{2}{10} \times \frac{1}{9}$
	(ii) $\frac{336}{990}$ oe $\left[\frac{56}{165} \right]$	2	M1 for $\frac{8}{11} \times \frac{7}{10} \times \frac{6}{9}$
	(iii) $\frac{198}{990}$ oe $\left[\frac{1}{5} \right]$	5	M4 for $3\left(\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}\right) + 3\left(\frac{2}{11} \times \frac{1}{10} \left[\times \frac{9}{9} \right]\right)$ oe or M3 for $3\left(\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}\right)$ or $3\left(\frac{2}{11} \times \frac{1}{10} \left[\times \frac{9}{9} \right]\right)$ oe Or M1 for $\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}$ oe seen and M1 for $\frac{2}{11} \times \frac{1}{10} \left[\times \frac{9}{9} \right]$ oe seen

Page 6	Mark Scheme IGCSE – October/November 2013	Syllabus 0580	Paper 42
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7	(a) 14 10 or 2 10 pm final answer	2	M1 for (0) 8 10 oe or answer 14 hours and 10 minutes or answer 2 10 [am]
	(b) 5 hours 45 minutes cao	2	M1 for 345 [mins] seen or for $805 / 7 \times 3$ oe or 5.75 seen
	(c) (i) 798 or 798.2 to 798.4....	2	M1 for $10712 / 13 \frac{25}{60}$ or $10712 \div 13.4\dots$
	(ii) 1.82×10^5 or 1.815×10^5 to 1.816×10^5	4	B3 for 182000 or 181500 to 181600 seen or M2 for $10712000 / 59$ oe or M1 for figs 10712/figs 59 soi by figs 182 or figs 1815 to 1816 and B1 FT for their number of litres correctly converted to standard form rounded to 3sf or better
	(d) 8600	3	M2 for $10148 \div 1.18$ oe or M1 for 10148 associated with 118[%]
8	(a) (i) -6	1	
	(ii) 2.75 oe	2	M1 for $[g(x) =] 0.5$ or $7/14$ Or $\left(\frac{7}{x+1}\right)^2 + 5\left(\frac{7}{x+1}\right)$ oe
	(b) $\frac{x-3}{4}$ or $\frac{x}{4} - \frac{3}{4}$ Final answer	2	M1 for $y - 3 = 4x$ or better or $x = 4y + 3$ or better or $\frac{y}{4} = \frac{3}{4} + x$ or flowchart with -3 then $\div 4$
	(c) (i) 5	2	M1 for $4x = 23 - 3$ or $x + \frac{3}{4} = \frac{23}{4}$ or better
	(ii) $x^2 + 5x - 7 = 0$	B1	May be implied by correct values in formula
	$\frac{-5 \pm \sqrt{5^2 - 4(1)(-7)}}{2(1)}$ oe	B1 B1	B1 for $\sqrt{5^2 - 4(1)(-7)}$ or better [53] If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$, B1 for -5 and 2(1) or better No recovery of full line unless seen
	1.14 and -6.14 final answers	B1 B1	Or SC1 for 1.1 or 1.140.... and -6.1 or -6.140 ... Or answers -1.14 and 6.14

Page 7	Mark Scheme IGCSE – October/November 2013	Syllabus 0580	Paper 42
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9	(a) (i) Reflection $x = -2$ oe	2	B1 for either
	(ii) Translation $\begin{pmatrix} -7 \\ 2 \end{pmatrix}$ oe	2	B1 for either
	(iii) Stretch $x\text{-axis}$ oe invariant [factor] 3	3	B1 for each
	(b) (i) Triangle with coords at (8, 2) (7, 3) and (7, 5)	2	B1 for rotation about (6, 0) but 90° anticlockwise Or for rotation 90° clockwise around any point
	(ii) Triangle with coords at (-2, -5) (-6, -5) and (-8, -7)	2	B1 for 2 correct points or for enlargement of SF -2 any centre
	(iii) Triangle with coords at (1, -1) (4, -6) and (3, -5)	2	B1 for 2 correct points or coordinates of 2 points shown
	(c) $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$	2	B1 for one row or one column correct but not identity matrix. Or SC1 for $\begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix}$

10	(a) 48 and 57, $9n + 3$ oe	1 2	B1 for $9n + k$ oe
	(b) 56 and 50, $86 - 6n$ oe	1 2	B1 for $k - 6n$ oe
	(c) 125 and 216, n^3 oe	1 1	
	(d) 130 and 222 $n^3 + n$ oe	1 1FT	FT <i>their (c)</i> + n dep on expression in n in (c)

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MARK SCHEME for the May/June 2013 series

0580 MATHEMATICS

0580/22

Paper 2 (Extended), maximum raw mark 70

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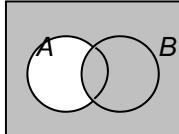
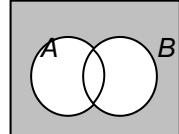
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Page 2	Mark Scheme IGCSE – May/June 2013	Syllabus 0580	Paper 22
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Abbreviations

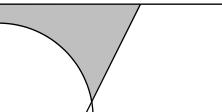
cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
soi	seen or implied

Qu	Answers	Mark	Part Marks
1	 	1 1	
2	$(p + 3)(k + m)$	2	B1 for $k(p + 3) + m(p + 3)$ or $p(k + m) + 3(k + m)$
3	$17 - 4n$	2	B1 for $\pm 4n$ seen
4	4.55×10^8	2	B1 for figs 455 seen
5	10.5 www	2	M1 for $42 = \frac{1}{2} \times BC \times 8$ or better
6	$2.2[0\dots]$	2	M1 for $11.99 \div 0.626$ soi by 19.2 or 19.15...
7 (a)	5.17225...	1	
(b)	5.2	1FT	FT their (a)
8	6.1 final answer	2	M1 for $[\sqrt{37.8225}]$ 6.15
9	40.3 or 40.31 to 40.32	3	M2 for $4.4 \times \sqrt[3]{\frac{0.05}{65}}$ soi or M1 for $\sqrt[3]{\frac{0.05}{65}}$ soi or $\sqrt[3]{\frac{65}{0.05}}$ soi
10 (a)	95	1	
(b)	77	2	B1 for [angle] $ACD = 58^\circ$ or [angle] $BAC = 19^\circ$ or [angle] $ANB = 103^\circ$ or [angle] $CAE = 66^\circ$

Page 3	Mark Scheme IGCSE – May/June 2013	Syllabus 0580	Paper 22
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Qu	Answers	Mark	Part Marks
11	with 2 correct steps seen $\frac{18k}{35k}$	3	B1 for $\frac{5k}{3k}$ and M1 for $\frac{6}{7} \times \text{their } \frac{3}{5}$
12	14.5 oe	3	M2 for complete correct method or M1 for one correct step
13	6632.55 cao final answer	3	M2 for $6250 \times (1 + \frac{2}{100})^3$ oe or M1 for $6250 \times (1 + \frac{2}{100})^2$ oe SC2 for answer 382.55 final answer
14	0.625 oe	3	M1 for $y = \frac{k}{x^3}$ A1 for $k = 40$
15	$\frac{-7 \pm \sqrt{7^2 - 4(2)(-3)}}{2 \times 2}$ 0.39, -3.89 cao	B2 B1,B1	B1 for $\sqrt{7^2 - 4(2)(-3)}$ or better seen B1 for $p = -7$ and $r = 2 \times 2$ or better as long as in the form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ After B0B0 for the two answers, SC1 for 0.4 or 0.386[0009...] and -3.9 or -3.886[0009...] or SC1 for -0.39 and 3.89
16	15	4	M2 for $\frac{1}{2} \times 40 \times (26 + 19)$ oe or M1 for one valid area calculation Indep M1 for $\div 60$ SC3 for answer 900
17 (a)	7 correct plots	2	P1 for 5 or 6 correct
(b)	Negative	1	
(c)	ruled line of best fit within tolerance	1	

Page 4	Mark Scheme IGCSE – May/June 2013	Syllabus 0580	Paper 22
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Qu	Answers	Mark	Part Marks
18	-1 -2 -3 -4	4	B3 for $x < -\frac{3}{5}$ and $x > -4.5$ oe or B2 for $x < -\frac{3}{5}$ or $x > -4.5$ oe or B1 for $5x < -3$ or $-9 < 2x$ oe Or mark on answer line -1 oe
19 (a)	arc centre A radius 5 cm	2	B1 arc with centre A
(b)	ruled perpendicular bisector of DB with 2 pairs of correct arcs	2	B1 correct ruled line B1 2 pairs of correct arcs
(c)	cao	1	
20 (a)	$10 < h \leq 13$	1	
(b)	$12.1[2]$ www	4	M1 for at least 5 correct mid-values seen M1 for $\sum fx$ where x is in the correct interval
(c)	70, 115, 153, 185, 200	2	M1 for their $\sum fx \div 200$ B1 for 3 or 4 correct
21 (a)	4.5 oe	2	B1 for $[g(5) =] 0.1$ oe
(b)	x	2	M1 for $\frac{1}{2(\frac{1}{2x})}$ seen oe
(c)	$\frac{x-4}{5}$ oe	2	M1 for a correct first step e.g. $y - 4 = 5x$ or $\frac{y}{5} = x + \frac{4}{5}$ or $x = 5y + 4$
(d)	-3	2	M1 for $\left(\frac{1}{2}\right)^{-3} = 8$ or $\left(\frac{1}{2}\right)^x = \left(\frac{1}{2}\right)^{-3}$ or $2^x = \frac{1}{8}$ oe or $2^{-x} = 2^3$

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MARK SCHEME for the May/June 2013 series

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

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Page 2	Mark Scheme IGCSE – May/June 2013	Syllabus 0580	Paper 42
---------------	--	--------------------------------	---------------------------

Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
art	anything rounding to
soi	seen or implied

Qu	Answers	Mark	Part Marks
1 (a) (i)	$\frac{6}{5+6+3} \times 560 [= 240]$	2	Accept ‘of’ used instead of \times M1 for $560 \div (5 + 6 + 3)$
(ii)	120	1	
(b)	90	2	M1 for $\frac{3}{8} \times 240$ oe
(c) (i)	96120 final answer	2	M1 for <i>their(a)(ii)</i> $\times 75 + (560 - \text{their (a)(ii)}) \times 198$ oe
(ii)	187.5[0] final answer	3	M2 for $\frac{198}{1 + 0.056}$ oe or M1 for $(100 + 5.6)[\%] = 198$ oe seen
(d)	184[.2....]	3	M2 for $\frac{36 \times 0.75 - 9.5}{9.5} \times 100$ oe or M1 for $\frac{36 \times 0.75}{9.5} \times 100$ or $36 \times 0.75 - 9.5$ [17.5] used implied by answer 84.2 or SC1 for final answer 284[.2..]
(e)	69.4 and 69[.0] cao	3	SC2 for one correct or both correct but reversed M1 for two of 10.85, 10.95, 23.65 or 23.75 seen or $2(23.7 + 10.9) + 4(0.05)$ or $2(23.7 + 10.9) - 4(0.05)$

Page 3	Mark Scheme IGCSE – May/June 2013	Syllabus 0580	Paper 42
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2	(a) (i)	Translation, $\begin{pmatrix} -5 \\ 8 \end{pmatrix}$ oe	1,1	Brackets needed for vector Not $(-5, 8)$, $(-5 \ 8)$
	(ii)	correct trapezium at $(2, 2)$ $(4, 3)$ $(4, 5)$ $(2, 5)$	2	SC1 for reflection in $x = -1$ or vertices only
	(iii)	correct trapezium at $(4, 2)$ $(5, 4)$ $(7, 4)$ $(7, 2)$	3	M2 for 4 correct vertices on grid or in working or M1 for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 2 & 2 & 4 & 4 \\ -4 & -7 & -7 & -5 \end{pmatrix}$ or SC1 for 3 vertices correct or complete shape in correct orientation but wrong position
	(b) (i)	Shear	1	
		x -axis (oe) invariant	1	
		2	1	
	(ii)	rectangle at $(-3, 2)$ $(1, 2)$ $(1, 8)$ $(-3, 8)$	2	SC1 for all vertices only or correct orientation and size, wrong position
	3 (a)	$0, 2, 0, -3$	3	B2 for 3 correct or B1 for 2 correct
	(b)	Correct curve	B4	B3FT for 8 points B2FT for 7 or 6 points B1FT for 5 or 4 points
3	(c)	$y = -1$ indicated	B1	e.g. Could be mark[s] on curve isw other lines if not clearly used
		$x = 1.3$ to 1.4 and 4.1 to 4.2	B1	
	(d) (i)	line drawn from $(0, 2)$ to touch curve	M1	No daylight at point of contact If short, must cross at $(0, 2)$ within $\frac{1}{2}$ small square when extended
		$(2.5$ to $2.75, 3$ to $3.4)$	A1	
	(ii)	rise/run e.g. $(\text{their } y - 2)/\text{their } x$	M1	dep on attempt at a tangent from $(0, 2)$ in (d)(i) and uses scales correctly Can be implied from answer – check on tangent for their rise for a run of 1 ($\frac{1}{2}$ small square)
		0.4 to 0.48	A1	ww2 dep on attempt at a tangent from $(0, 2)$ in (d)(i)

Page 4	Mark Scheme IGCSE – May/June 2013	Syllabus 0580	Paper 42
--------	--------------------------------------	------------------	-------------

4	(a) 227 or 226.95 to 227.01	2	M1 for $\pi \times 8.5^2$
	(b) 5.35	1	
	(c) 39.0[0] to 39.0[1]	2	M1 for $\sin [MOB] = \frac{\text{their } b}{8.5}$ oe Dep on their $b < 8.5$
	(d) 30.2 or 30.3 or 30.24 to 30.27	3	M2 for $\frac{360 - 4 \times 39}{360} \times 2 \times \pi \times 8.5$ oe or M1 for $\frac{a}{360} \times 2 \times \pi \times 8.5$ oe where $0 < a < 360$ Implied by 5.78 to 5.79 or 11.5 to 11.6 or 23.14 to 23.15 or 23.1 or 23.2 or 41.83 to 41.84 or 41.8
	(e) $AB = BC$ $TA = TC$ $TB = TB$	1 1 1	isw comments or reasons If 0 scored SC1 for “all <u>three sides</u> the same” oe [SSS] and no mention of angles
5	(a) $\frac{27}{x}$ final answer	1	
	(b) $\frac{25}{x-2}$ final answer	1	
	(c) $\frac{25}{x-2} - 4 = \frac{27}{x}$ oe $25x - 4x(x-2) = 27(x-2)$ oe	M1 M1	FT their (b) – 4 = their (a) oe must be eqn in x FT $\frac{25}{x-2} + 4 = \frac{27}{x}$ oe only for 2 nd and 3 rd M mark If all on one side then condone omission of ‘= 0’ Dep on 2 nd M1 Must see brackets expanded before this award and terms on one side of eqn
	$4x^2 + 27x - 25x - 8x - 54 = 0$ oe	M1dep	
	$2x^2 - 3x - 27 = 0$ without error seen	A1	Must see $4x^2 - 6x - 54 = 0$ first
(d)	-3, 4.5	3	B2 for $(2x-9)(x+3)$ or SC1 for $(2x+a)(x+b)$ where a and b are integers and $a + 2b = -3$ or $ab = -27$
(e)	6 cao	1	

Page 5	Mark Scheme IGCSE – May/June 2013	Syllabus 0580	Paper 42
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6 (a) (i)	$\frac{12^2 + 21^2 - 15^2}{2 \times 12 \times 21}$ 44.41 to 44.42	M2 A2	M1 for $15^2 = 12^2 + 21^2 - 2 \cdot 12 \cdot 21 \cos M$ A1 for $[\cos =] 0.714$ or 0.7142 to 0.7143 or $\frac{360}{504}$ oe
	(ii) 88.2 or 88.15 to 88.19	2	M1 for $0.5 \times 12 \times 21 \times \sin(44.4)$ oe
	(b) 7.74 or 7.736 to 7.737.... www	4	B1 for 55 soi M2 $\frac{6.4}{\sin(\text{their } R)} \times \sin 82$ oe or M1 for $\frac{6.4}{\sin(\text{their } R)} = \frac{PR}{\sin 82}$ oe
7 (a) (i)	$\begin{pmatrix} 15 \\ 21 \end{pmatrix}$	1	
	(ii) not possible oe	1	
	(iii) (2) final answer	2	M1 for 30 – 28
	(iv) $\begin{pmatrix} 4 & 13 \\ 0 & 0 \end{pmatrix}$	1	
	(v) $\begin{pmatrix} -5 & -9 \\ 1 & 0 \end{pmatrix}$	2	B1 for one correct row or column
	(b) $\frac{1}{2} \begin{pmatrix} 3 & -4 \\ -1 & 2 \end{pmatrix}$ or better isw	2	B1 for $k \begin{pmatrix} 3 & -4 \\ -1 & 2 \end{pmatrix}$ seen or implied or $\frac{1}{2} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ seen
8 (a)	hat $\frac{5}{8}, \frac{3}{8}$ scarf $\frac{2}{3}, \frac{1}{3}$ $\frac{1}{6} \frac{5}{6}$	1 1 1	1 mark per pair in correct place
	(b) (i) $\frac{15}{48}$ oe	$\left[\frac{5}{16} \right]$ 2FT	FT their $\frac{3}{8} \times \frac{5}{6}$ correctly evaluated M1 $\frac{3}{8} \times \frac{5}{6}$ FT from their tree
	(ii) $\frac{5}{24}$	2FT	FT their $\frac{5}{8} \times \frac{1}{3}$ correctly evaluated M1 $\frac{5}{8} \times \frac{1}{3}$ FT from their tree

Page 6	Mark Scheme IGCSE – May/June 2013	Syllabus 0580	Paper 42
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(iii) (c)	$\frac{13}{48}$ cao $\frac{170}{240}$ or $\frac{85}{120}$ or $\frac{34}{48}$ or $\frac{17}{24}$ cao	2 3	<p>M1 for their $\frac{3}{8} \times \frac{1}{6}$ + their (b)(ii) soi</p> <p>M2 for $1 - \frac{5}{8} \times \frac{2}{3} \times \frac{7}{10}$ FT their tree or $\frac{3}{8} + \frac{5}{8} \times \frac{1}{3} + \frac{5}{8} \times \frac{2}{3} \times \frac{3}{10}$ oe</p> <p>or M1 for [“wears all” =] $\frac{5}{8} \times \frac{2}{3} \times \frac{7}{10}$ FT their tree seen</p>
9 (a) (b) (i) (ii)	371 or 371.1... 1740 or 1743.6 to 1744.2 87 cao www 5	4 4 5	<p>M3 for $(6 \times 4 \times 12) + (2 \times 6 \times 0.5 \times 4 \times 4 \times \sin 60)$ oe or M2 for area of 1 or 2 hexagons</p> <p>or M1 for area of one relevant triangle or trapezium or rectangle within hexagon</p> <p>If 0 scored SC1 for 288 shown</p> <p>M3 for $\frac{12000}{4} \div (\pi \times 0.74^2)$ oe or SC2 for figs 174[3..] or 174[4..]</p> <p>or B1 for $\pi \times 0.74^2$ seen [1.72..]</p> <p>or B1 for $12000 / 4$ soi by 3000</p> <p>B4 for 87.39 to 87.43 or M3 for $[r =] \sqrt{\frac{\text{figs } 12}{\pi \times \text{figs } 5}}$ oe or M2 for $[r^2 =] = \frac{\text{figs } 12}{\pi \text{ figs } 5}$ oe or M1 for $\text{figs } 12 = \pi r^2 \times \text{figs } 5$</p>
10 (a) (i) (ii) (b)	final answer $\frac{25-8x}{20}$ final answer $\frac{2x^2+5x+9}{3(x+3)}$ $x = \frac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667 $y = -3$	2 3 3	<p>M1 for $\frac{5 \times 5 - 4 \times 2x}{5 \times 4}$ or better seen</p> <p>B1 for $2x^2 + 6x - x - 3$ soi</p> <p>and B1 for denom $3(x+3)$ or $3x+9$ seen</p> <p>M1 for correct method to eliminate one variable A1 for $x = \frac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667 or $y = -3$</p>

Page 7	Mark Scheme IGCSE – May/June 2013	Syllabus 0580	Paper 42
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(c)	final answer $\frac{7}{2x+3}$ www	4	B1 for $7(x+3)$ in numerator and B2 for $(2x+3)(x+3)$ in denominator or SC1 for $(2x+a)(x+b)$ where a and b are integers and $a + 2b = 9$ or $ab = 9$ After B1 scored, SC1 for final answer $\frac{7}{2(x+1.5)}$ or $\frac{3.5}{x+1.5}$
11 (a)	$3^2 + 1^2$	1	Ignore attempt to evaluate $\sqrt{10}$
(b) (i)	$\frac{\sqrt{10}}{3}$ final answer	1	
(ii)	$\frac{10}{3}$ final answer	2	M1 for their $\frac{\sqrt{10}}{3} \times \sqrt{10}$ or their $\left(\frac{\sqrt{10}}{3}\right)^2 + (\sqrt{10})^2$ implied by 3.33 seen
(c)	$\frac{100}{27}$ or $3\frac{19}{27}$ isw conversion or 3.7[03] to 3.7[04]	2	M1 for $3 \times \left(\frac{\sqrt{10}}{3}\right)^n$ oe where n is 3 or 4 or for $[OP_4 =] \sqrt{\frac{1000}{81}}$ or for their (b)(ii) $\times \left(\frac{\sqrt{10}}{3}\right)^n$ where n is 1 or 2
(d) (i)	18.43...	2	M1 for $\tan [P_1OP_2] = \frac{1}{3}$ oe
(ii)	18.4[3...]	1	
(iii)	20	3	SC2 for 19 or M1 for $\frac{360}{18.4[3...]}$