



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

MATHEMATICS

0580/04

Paper 4 (Extended)

For Examination from 2015

SPECIMEN MARK SCHEME

2 hours 30 minutes

MAXIMUM MARK: 130

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of 7 printed pages and 1 blank page.

Types of mark

- M** marks are given for a correct method.
A marks are given for an accurate answer following a correct method.
B marks are given for a correct statement or step.
D marks are given for a clear and appropriately accurate drawing.
P marks are given for accurate plotting of points.
E marks are given for correctly explaining or establishing a given result.
SC marks are given for special cases that are worthy of some credit.

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) 4950	2	M1 for 9000×0.55 oe
	(ii) 9 : 11	1	Accept 1 : 1.22 or 0.818 : 1 After 4050 in (a)(i) allow SC1 for 11 : 9 etc
(b)	1504	1	
	564	1	
	188	1	After 0 scored M1 for $2256 \div (8 + 3 + 1)$ soi
(c) (i)	6847.99 or 6848 or 6850	3	M2 for 15000×0.77^3 oe (6847. (..)ww imp M2) or M1 for 15000×0.77^2 oe soi (8893.5) After 0 scored SC1 for art 27913 or 27910 or 27900
	(ii) 54.3 (54.33 to 54.35)	3ft	ft their $(15000 - \text{their (c)(i)})/15000 \times 100$ to 3sf or better but not for negative answer or from 4650 in (c)(i) leading to 69% M2 for $1 - 0.77^3$ (0.543..) or their $(15000 - \text{their (c)(i)})/15000 (\times 100)$ or SC2ft their (c)(i) /15000 $\times 100$ correctly evaluated (45.65 to 45.67 or 45.7) or M1 for 0.77^3 (0.4565..) or their (c)(i) /15000

<p>2</p>	<p>(a) 0, 1, 2, 3</p> <p>(b) $\frac{x-2}{x-5}$ www final answer</p> <p>(c) (i) $5(x+1) + 2(x-3) = 3(x+1)(x-3)$ oe $x^2 - 3x + x - 3$ or better seen $3x^2 - 13x - 8 = 0$</p> <p>(ii) $\frac{-(-13) \pm \sqrt{(-13)^2 - 4(3)(-8)}}{2(3)}$</p> <p>4.88 and -0.55 cao</p>	<p>3 Additional values count as errors B2 for one error/omission or B1 for two errors/omissions After B0, M2 for $-1 < x \leq 3.5$ seen, allow $7/2$ for 3.5 or M1 for $-1 < x$ or $x \leq 3.5$ or $x = -1$ and $x = 3.5$ Allow M2 for $0 \leq x < 4$ or M1 for $x \geq 0$ or $x < 4$</p> <p>4 M3 for $\frac{(x+5)(x-2)}{(x+5)(x-5)}$ or M2 for $(x+5)(x-2)$ seen or M1 for $(x+a)(x+b)$ where $ab = -10$ or $a + b = 3$ and M1 for $(x+5)(x-5)$ seen</p> <p>M1 Allow if still over common denominator</p> <p>B1 Allow $x^2 - 2x - 3$ seen or $3x^2 - 9x + 3x - 9$ or better seen</p> <p>E1 With no errors seen and brackets correctly expanded on both sides</p> <p>B1 In square root B1 for $(-13)^2 - 4(3)(-8)$ or better B1 (265)</p> <p>If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$,</p> <p>B1 for $-(-13)$ and $2(3)$ or better</p> <p>B1B1 SC1 for 4.88 and -0.55 seen or -0.5 and 4.9 or -0.546... and 4.879 to 4.880</p>
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<p>3</p>	<p>(a) (i) $1.6 < h \leq 1.7$</p> <p>(ii) $\{1.35 \times 4 + 1.45 \times 13 + 1.55 \times 33 + 1.65 \times 45 + 1.75 \times 19 + 1.85 \times 6\} \div 120$</p> <p>1.62 or 1.616 to 1.617</p> <p>(b) (i) $\frac{6}{120}$ oe</p> <p>(ii) $\frac{2147}{2380}$ oe (0.902(1..))</p> <p>(c) (i) 95, 120</p> <p>(ii) Plots 7 points correctly exact or in correct square</p> <p>Curve or lines through 7 points</p> <p>(d) (i) 1.61 to 1.63</p> <p>(ii) 1.555 to 1.57</p>	<p>1 Condone alternative notation used for class</p> <p>M3 (194/120)</p> <p>M1 for mid-values soi (allow one slip) and M1 for use of $\sum fx$ with x in correct interval (allow one more slip) and M1 depend on 2nd M for dividing by 120</p> <p>A1 www4</p> <p>1 Accept dec/% to 3 sf or better but not ratio isw cancelling/conversion (also for (ii))</p> <p>3 M2 for $\frac{k}{120} \times \frac{k-1}{119}$ where $\frac{k}{120}$ is 1 – their (b)(i) or if $k = 114$ or M1 for 1 – their (b)(i) or for 114/120 seen After 0 scored SC2 for ans 1/476 oe or SC1 for $6/120 \times 5/119$</p> <p>1</p> <p>P2ft P1ft for 5 or 6 correct plots</p> <p>C1ft ft their increasing curve within 1 mm of points</p> <p>1ft ft their 60th reading on inc. curve to nearest 0.01</p> <p>1ft ft their 36th reading on inc. curve</p>
<p>4</p>	<p>(a) (i) $2.7 \times \frac{20}{12}$ oe = 4.5</p> <p>(ii) $1/3\pi \times 4.5^2 \times 20 - 1/3\pi \times 2.7^2 \times 12$ or $(1 - (3/5)^3) \times 1/3\pi \times 4.5^2 \times 20$ oe</p> <p>332.3 to 332.6 or 332 or 333</p> <p>(b) (i) $8^2 + (4.5 - 2.7)^2$ oe</p> <p>sq root</p> <p>8.2</p> <p>(ii) 185 or 186 or 185.5 or 185.45 to 185.51</p>	<p>E2 M1 for (SF =) 20/12 or 12/20 (but not from 2.7/4.5 or 4.5/2.7)</p> <p>M3 M1 for $1/3\pi \times 4.5^2 \times 20$ (424 ... or 135π) and M1 for $1/3\pi \times 2.7^2 \times 12$ (91.6... or 29.16π)</p> <p>A1</p> <p>M1 e.g. Alt: $20^2 + 4.5^2$ and $12^2 + 2.7^2$</p> <p>M1 Dep on 1st M1 Alt: 20.5 – 12.3</p> <p>Other complete correct methods are M2</p> <p>E1 No errors seen</p> <p>5 M4 for $\pi \times 4.5 \times 20.5 - \pi \times 2.7 \times 12.3$ or other complete correct method or M3 for $\pi \times 4.5 \times 20.5$ or $\pi \times 2.7 \times 12.3$ (290 or 92.25π) (104.3... or 33.21π) or B2 for (slant height of large cone =) 20.5 or (slant height of removed cone =) 12.3 or M1 for $\sqrt{4.5^2 + 20^2}$ or $\sqrt{2.7^2 + 12^2}$ or $12/8 \times 8.2$ oe or $20/8 \times 8.2$ oe</p>

5	<p>(a) 1, -1, 3.5</p> <p>(b) 10 correct points plotted</p> <p>Smooth curve through at least 8 points and correct shape</p> <p>(c) (i) -2.2 to -2.1 -0.65 to -0.45 2.5 to 2.7</p> <p>(ii) ($k <$) -4 to -3.7 ($k >$) 1.7 to 2</p> <p>(d) (i) Ruled line gradient 3 and y-intercept -2 over the range -1 to 3.5</p> <p>(ii) ($a =$) -12, ($b =$) 2</p> <p>(iii) 0.1 to 0.2 and 3.3 to 3.4 cao</p>	<p>1,1,1</p> <p>P3ft</p> <p>C1ft</p> <p>1ft</p> <p>1ft</p> <p>1ft</p> <p>1ft</p> <p>3</p> <p>1,1</p> <p>1,1</p>	<p>P2ft for 8 or 9 correct P1ft for 6 or 7 correct Allow points to be implied from curve</p> <p>Correct cubic shape, not ruled</p> <p>Correct or ft their x values</p> <p>If ft and more than 3 solns then 2 marks maximum</p> <p>Correct or ft their graph for y values at max and min</p> <p>After 0 scored SC1 for both correct but reversed</p> <p>B2 for correct but freehand or short or M1 for a ruled line of gradient 3 or passes through (0, -2) (but not $y = -2$)</p> <p>After 0, M1 for $x^3 - 6x - 6x - 2 + 4 (=0)$ or better</p>
6	<p>(a) $120^2 + 95^2 - 2 \times 120 \times 95 \times \cos 77$ 135.26 ... or 135.3</p> <p>(b) $(\sin B) = \frac{\text{their } 135 \times \sin 26}{79}$ 48.5 to 48.7 isw 131 or 131.3 to 131.5 www4</p> <p>(c) (Angle $A =$) 22.5 to 22.7 'Path' / 79 = sin (their A) oe 30.2 to 30.5 www3</p> <p>(d) $\frac{1}{2} \times 120 \times 95 \times \sin 77$ oe Their area $\div 180$ 30.8 to 30.9 30</p>	<p>M2</p> <p>E2</p> <p>M2</p> <p>A1</p> <p>B1ft</p> <p>B1ft</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>B1ft</p>	<p>M1 for implicit version</p> <p>A1 for 18295 to 18297</p> <p>M1 for $\frac{\sin B}{\text{their } 135} = \frac{\sin 26}{79}$ oe</p> <p>ft for 180 - their 48.5 to 48.7 dep on sine rule or sine used</p> <p>ft 154 - their (b), also accept angle $B = 67.3$ to 67.5 (ft their (b) - 64)</p> <p>Dep on B1 and their $A < 90$ eg $79 \cos 67.4$</p> <p>(5554)</p> <p>Dep on area attempt</p> <p>ft their 30.8 to 30.9 truncated dep on at least M1 earned After M2 answer 30 www scores A1B1 Answer 30 ww scores 0</p>

7 (a)	<p>(a) (i) Reflection only $y = -2$</p> <p>(ii) Enlargement only $\frac{1}{2}$ (1, 4)</p> <p>(iii) Rotation only 90° clockwise oe Around (1, -3)</p> <p>(b) (i) Triangle at (-4, 4), (-1, 4), (-1, 5)</p> <p>(ii) Triangle at (2, 4), (8, 4), (8, 6)</p> <p>(c) Rotation or Enlargement 180 oe or SF -1 origin</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>2</p> <p>3</p> <p>1</p> <p>1</p> <p>1</p>	<p>Spoilt if extras</p> <p>Spoilt if extras</p> <p>Spoilt if extras</p> <p>Accept -90° or (+)270°</p> <p>B1 for translation of $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 2 \end{pmatrix}$</p> <p>After B0, SC1 for translation of 5 small squares to the left and 2 small squares up</p> <p>B1 for each correct co-ordinate (max B2) plotted If no/wrong plots allow SC2 for 3 correct co-ordinates shown in working or SC1 for any 2 correct co-ordinates shown</p> <p>or M1 for $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix} \begin{pmatrix} 1 & 4 & 4 \\ 2 & 2 & 3 \end{pmatrix}$</p> <p>Accept (0, 0) or O</p>
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<p>8</p>	<p>(a) (i) There are up to 5 large coaches oe</p> <p>(ii) $50x + 30y \geq 300$ oe</p> <p>(b)</p> <p>$x = 5$ ruled</p> <p>$x + y = 10$ ruled</p> <p>$5x + 3y = 30$ ruled</p> <p>Correct region indicated cao</p> <p>(c) (i) 5 2</p> <p>(ii) 2950</p>	<p>1 E.g. cannot hire more than 5 large coaches The maximum is 5 large coaches The large coaches are less than or equal to 5</p> <p>E2 No errors Allow in words provided clear e.g. 50 in large coaches and 30 in small coaches must equal 300 seats or more M1 for associating 50 with x or large coaches and 30 with y or small coaches</p> <p>Freehand lines –1 penalise once. All lines must be long enough to make full boundary of their region accept dashed or solid lines</p> <p>L1</p> <p>L1</p> <p>L2 L1 for ruled line with intercepts at (0, 10) or (6, 0) within 2mm by eye at intercepts (extend if line is short)</p> <p>R1 Allow if slight inaccuracy(s) in diagonal lines Allow any clear indication of region</p> <p>1 After 5 and 2 in working ignore attempts to calculate costs</p> <p>1</p> <p>1ft ft their $5 \times 450 +$ their 2×350 provided positive integers</p>
<p>9</p>	<p>(a) (i) 2500</p> <p>(ii) Increase of 2% (per year)</p> <p>(b) 2036 (accept 2035)</p>	<p>1</p> <p>1</p> <p>3 M2 for $t = 35$ to 36 (inclusive) identified e.g. $1.02^{35} = 1.999$, $1.02^{36} = 2.039$ or equivalent with values of P OR M1 for one correct trial of P (or 1.02^t) with $t \geq 20$ (condone t not an integer)</p>
<p>10</p>	<p>(a) 3.028 or 3.029 cao</p> <p>(b) πr^2 their $h =$ their V</p> <p>$(r^2 =) \frac{\text{their } V}{\pi \times \text{their } h}$</p> <p>Sq root</p> <p>Selects 555 or 554.99.. and 11.5</p> <p>3.919 cao</p>	<p>4 B3 for 3.0289(85...) or M1 for their 105/their 34 (their 105 in range 104 to 106 and their 34 in range 33 to 35) and B1 for 104.5 or 34.5 or 34.499.. selected</p> <p>M1 Where V is in range 540 to 560 and h is in range 11 to 13</p> <p>M1 Implies previous method (15.36 implies M2) If using 545 and 12.5 then 13.88 (leading to 3.73) If using 550 and 12 then 14.59 (leading to 3.82)</p> <p>M1 Dep on M2, can be implied from answers</p> <p>B1 Indep</p> <p>A1 If trials then 5 or 0</p>

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