

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the October/November 2015 series**

### **0580 MATHEMATICS**

**0580/41**

Paper 4 (Extended), maximum raw mark 130

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Question	Answer	Mark	Part marks
1 (a)	6	3	<b>B2</b> for $5\frac{1}{4}$ or 5.25 shown in working isw or <b>M1</b> for $\frac{3}{4} \times 7$ soi by answer 5
(b)	21.45 cao final answer	2	<b>M1</b> for $17.16 \times 0.25$ or $17.16 \times 1.25$
(c)	16.5[0] nfw	3	<b>M2</b> for $17.16 \div 1.04$ oe or <b>M1</b> for 17.16 associated with 104[%] oe isw
(d)	1.34 cao final answer	2	<b>M1</b> for $13.32 \div 0.72$ soi by 18.5[0] or for any correct complete longer method If zero scored, <b>SC1</b> for 0.96 [euros] seen
(e) (i)	750	1	
(ii)	4.7 cao	3	<b>B2</b> for 4.658 to 4.66 or <b>M2</b> for $\sqrt{\text{their (e)(i)} \div 11\pi}$ or <b>M1</b> for $11\pi^2 = \text{their (e)(i)}$
(iii)	6	2	<b>M1</b> for $2^3$ or $\frac{1}{2^3}$ oe seen or for $\pi \times (2 \times \text{their (e)(ii)})^2 \times 22$  If zero scored, <b>SC1</b> for answer 6 000
(f)	8950	1	
(g)	210	2	<b>M1</b> for $0.07 \times 3\,000$
(h)	160 000	3	<b>M2</b> for $2 \times 60 \times 100^3 \div 750$ oe or <b>M1</b> for figs 16 as answer or $100^3$ seen
2 (a)	1.62 or 1.62...	1	
(b) (i)	7	1	
(ii)	4	1	
(iii)	7	1	
(iv)	$\frac{1}{3}$ oe	1	

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Qu	Answers	Mark	Part Marks
(c) (i)	0.25 oe and 1	2	<b>B1</b> for each
(ii)	Correct curve	4	<b>B3FT</b> for 6 or 7 correct plots or <b>B2FT</b> for 4 or 5 correct plots or <b>B1FT</b> for 2 or 3 correct plots
(iii)	2.3	1FT	Correct or <b>FT</b> where $y = 5$ on <i>their</i> graph
(iv)	$y = 3x - 1$ oe 3 term equation	3	<b>B2</b> for $3x - 1$ or $y = 3x [+ c]$ oe or for $m = 3$ and $c = -1$ or <b>M1</b> for [gradient =] $\frac{8-2}{3-1}$ oe soi by $3x$ <b>and M1</b> for substitution of (1, 2) or (3, 8) into <i>their</i> $y = mx + c$
(v)	-1.7 to -1.5 and 2	2	<b>B1</b> for either or <b>M1</b> for $y = x + 2$ seen or drawn
3 (a) (i)	25.4 or 25.35... nfw	5	<b>M2</b> for $\sqrt{60^2 - 50^2}$ oe soi by 33.1 to 33.2 or <b>M1</b> for $TB^2 + 50^2 = 60^2$ oe <b>and</b> <b>M2</b> for $\tan = \frac{\text{their}TB}{70}$ oe or <b>B1</b> for recognising angle $TCB$ as required angle
(ii)	109 or 109.0 to 109.1	4	<b>M2</b> for $50^2 + 70^2 - 2 \times 50 \times 70 \times \cos 130$ <b>M1</b> for implicit cos rule <b>A1</b> for 11 899 to 11 900
(iii)	1 340 or 1 340.0 to 1 341	2	<b>M1</b> for $\frac{1}{2} \times 50 \times 70 \times \sin 130$ oe
(b)	51.5 or 51.50 to 51.51	4	<b>M3</b> for $[XY] = \sqrt{45^2 + 22^2 + 12^2}$ or <b>M2</b> for $[XY^2 =] 45^2 + 22^2 + 12^2$ soi by 2 653 or <b>M1</b> for $45^2 + 22^2$ oe or $45^2 + 12^2$ oe or $12^2 + 22^2$ oe

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Qu	Answers	Mark	Part Marks
4	(a) (i)		Condone $5 \leq x \leq 15$ Condone $0 < y \leq 8$
		4	<b>B1</b> for each – 1 for first occurrence of strict inequalities used in first 3 inequalities
	(ii)	1 1 1 1	Allow $y = x + 1$ ruled only after $y \geq x + 1$ in (a)(i)
		1dep	Dependent on all marks for lines earned Accept R written in correct quadrilateral or any other unambiguous indication or accept in triangle if $y = x + 1$ used and all marks for lines earned
(b)	78	2	<b>B1</b> for (7, 8) chosen or <b>M1</b> for a calculation shown of the form $6x + 4.5y$ where (x, y) is clearly in <i>their</i> region and both x and y are integers
5	(a)	1	
		1dep	Dependent on 37 or [angle] <i>BAD</i>
	(b)	1	
	1dep	Dependent on $2 \times 37$ or $2 \times$ [angle] <i>BAD</i> or $2 \times$ [angle] <i>BED</i> Must use the terms circumference, centre and angle	
(c)	1		
	1dep	Dependent on $180 - 37$ or $180 -$ [angle] <i>BAD</i> or $180 -$ [angle] <i>BED</i>	

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Qu	Answers	Mark	Part Marks
6 (a)	1.35 nfw	4	<b>M1</b> for 0.5, 1.5, 2.5, 3.5, 4.5, 5.5 soi, <b>M1</b> for $\Sigma fm$ soi by 162 where $m$ is in correct interval including boundaries <b>M1dep</b> for $\Sigma fm \div 120$ or $\Sigma fm \div \Sigma f$ dependent on <b>second M1</b> earned
(b) (i)	93, 102, 113, 118	2	<b>SC1FT</b> for 1 error
(ii)	Correct diagram	3	<b>B1FT</b> for correct vertical plots and <b>B1</b> for correct horizontal plots and <b>B1FT dep on at least B1</b> for reasonable <u>increasing</u> curve or polygon through <i>their</i> 6 points  If zero scored, <b>SC1FT</b> for 5 out of 6 correct plots
(iii) (a)	0.6 to 0.85	1	
(b)	1.3 to 1.7	2	<b>B1</b> for UQ = 1.7 to 1.9 or LQ = 0.2 to 0.4
(c)	0.3 to 0.6	2FT	Allow in correct range provided there is no evidence of reading at 35 or <b>FT</b> <i>their</i> reading at 42 <b>B1</b> for 42 soi
(c) (i)	30 and 18	2	<b>B1</b> for each
(ii)	0.75 and 0.3	3FT	<b>FT</b> ( <i>their</i> 30) $\div$ 40 and ( <i>their</i> 18) $\div$ 60 <b>B2FT</b> for either 0.75 or 0.3 or <b>M1</b> for <i>their</i> 30 $\div$ 2 or $\div$ 20 or for <i>their</i> 18 $\div$ 3 or $\div$ 20
7 (a)	123 to 127	1	
(b)	288 to 292	1	
(c)	[1:] 1000000	1	

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Qu	Answers	Mark	Part Marks
(d)	Correct ruled perpendicular bisector of $CB$ with correct arcs Correct two pairs of arcs	2	<b>B1</b> for correct perpendicular bisector without/wrong arcs
	Correct ruled bisector of angle $ACB$ with correct pair of arcs	2	<b>B1</b> for correct bisector of angle $ACB$ without/wrong arcs
	Ruled line parallel to $CB$ in triangle	1	Provided this line is not the perpendicular bisector of $AC$
	1.3 to 1.7 cm from $CB$ in triangle	1	
	Correct region indicated	<b>1dep</b>	Dependent on at least B1,B1,1,1 earned
(e)	40	2	<b>M1</b> for $0.4 \times 10^2$ oe
8 (a)	$(x - 5)(x + 2)$ final answer	2	<b>B1</b> for $(x - 5)(x + 2)$ seen and then spoiled or <b>M1</b> for $(x + a)(x + b)$ where $a + b = -3$ or $ab = -10$ [ $a, b$ integers]
	(b) (i) $x(x + 2) + 3(x + 1) = 3x(x + 1)$ or $x^2 + 2x + 3x + 3 = 3x^2 + 3x$  $0 = 2x^2 - 2x - 3$	<b>M2</b>  <b>A1</b>	<b>M1</b> for $x(x + 2) + 3(x + 1)$ or better seen Allow recovery of omitted brackets for M marks but not A mark  Brackets expanded correctly and/or no errors or omission of brackets seen
	(ii) $\frac{[-]2 \pm \sqrt{([-]2)^2 - 4(2)(-3)}}{2(2)}$ or $0.5 \pm \sqrt{1.75}$  - 0.823 and 1.823 final answer	<b>B2</b>  <b>B1 B1</b>	<b>B1</b> for $\sqrt{([-]2)^2 - 4(2)(-3)}$ or $\sqrt{28}$ or $\sqrt{1.75}$ oe in completion of square <b>and B1</b> for in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ , $p = -2$ <b>and</b> $r = 2(2)$ or better or $(x - 0.5)^2$ oe in completion of square  If <b>B0B0</b> for answers, <b>SC1</b> for - 0.82 or - 0.822... and 1.82 or 1.822.. as final answers or - 0.823 and 1.823 seen or -1.823 and 0.823 as final answers

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Qu	Answers	Mark	Part Marks
(c)	$\frac{x^2 + 3x + 3}{(x + 2)(x + 1)}$ or $\frac{x^2 + 3x + 3}{x^2 + 3x + 2}$ final answer nfw	4	<p><b>M1</b> for <math>(2x + 3)(x + 1) - x(x + 2)</math> oe isw</p> <p><b>B1</b> for common denominator = <math>(x + 2)(x + 1)</math> isw or <math>x^2 + 3x + 2</math> isw</p> <p><b>B1</b> for <math>2x^2 + 2x + 3x + 3</math> or better or <math>-x^2 - 2x</math> or <math>x^2 + 3x + 3</math></p>
9 (a) (i)	16	1	
(ii)	$n^2$	1	
(b) (i)	43	1	
(ii)	7	1	
(c)	$a = \frac{5}{2}$ oe, $b = \frac{5}{6}$ oe with supporting working	6	<p><b>M1</b> for any correct substitution eg <math>\frac{2}{3}(2)^3 + 2^2a + 2b</math></p> <p><b>A1</b> for <b>one</b> of eg <math>\frac{2}{3} + a + b = 4</math> or better eg <math>\frac{16}{3} + 4a + 2b = 17</math> or better eg <math>\frac{54}{3} + 9a + 3b = 43</math> or better</p> <p><b>A1</b> for <b>another</b> of eg <math>\frac{2}{3} + a + b = 4</math> or better eg <math>\frac{16}{3} + 4a + 2b = 17</math> or better eg <math>\frac{54}{3} + 9a + 3b = 43</math> or better</p> <p><b>M1</b> for correctly eliminating one variable from two of <i>their</i> equations in <math>a</math> and <math>b</math></p> <p><b>A1</b> for <math>a = \frac{5}{2}</math> oe</p> <p><b>A1</b> for <math>b = \frac{5}{6}</math> oe</p> <p>After zero scored, <b>SC2</b> for 2 correct answers without supporting working or <b>SC1</b> for 2 of 17, 43, 86, 150, 239 seen</p>

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10 (a)	$\mathbf{b - a}$ or $-\mathbf{a + b}$	<b>1</b>	
(b)	$\frac{4}{5}\mathbf{b} - \frac{3}{10}\mathbf{a}$ or $\frac{1}{10}(8\mathbf{b} - 3\mathbf{a})$	<b>4</b>	<p><b>B3</b> for correct unsimplified expression in <b>a</b> and <b>b</b></p> <p>or</p> <p><b>M1</b> for <math>\vec{XA} + \vec{AC} + \vec{CM}</math> or <math>\vec{XB} + \vec{BM}</math></p> <p>or <math>-\frac{1}{5}(\mathit{their}(\mathbf{a})) + \mathbf{b} - \frac{1}{2}\mathbf{a}</math></p> <p>or <math>\frac{4}{5}(\mathit{their}(\mathbf{a})) + \frac{1}{2}\mathbf{a}</math></p> <p><b>and M1</b> indep for <math>\pm\frac{1}{5}</math> oe or <math>\pm\frac{4}{5}</math> oe used</p> <p>After zero scored, <b>SC2</b> for answer <math>\frac{1}{4}(3\mathbf{b} - \mathbf{a})</math> or <math>\frac{3}{4}\mathbf{b} - \frac{1}{4}\mathbf{a}</math></p>