

**MARK SCHEME for the October/November 2011 question paper  
for the guidance of teachers**

**0580 MATHEMATICS**

**0580/31**

Paper 3 (Core), maximum raw mark 104

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
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

Qu.	Answers	Mark	Part Marks
<b>1</b>	<b>(a)</b> 25 000 000 cao	<b>1</b>	
	<b>(b)</b> $0.6 < 65\% < \frac{2}{3}$	<b>1</b>	
	<b>(c)</b> 20%	<b>3</b>	<b>B1</b> for 50 seen <b>M1</b> for $\frac{\text{their } 50}{250} \times 100$ or <b>B1</b> for 0.8 or 80 seen <b>M1</b> for 1 – their 0.8 or 100 – their 80
	<b>(d)</b> <b>(i)</b> 30 <b>(ii)</b> 40	<b>1</b> <b>2</b>	<b>M1</b> for 360 – (90 + 150) implied by 120 seen
<b>2</b>	<b>(a)</b> $1.5(0) \times 10^2$ cao	<b>1</b>	
	<b>(b)</b> 100 cao	<b>1</b>	
	<b>(c)</b> 2 hours 15 minutes cao	<b>1</b>	
	<b>(d)</b> 16(:) 25 (pm) or (0)425 <b>pm</b>	<b>2</b>	<b>M1</b> for 2.5 (oe), 2hrs 30 min
	<b>(e)</b> $145 \leq d < 155$	<b>2</b>	<b>B1</b> for each value in correct place
<b>3</b>	<b>(a)</b> <b>(i)</b> 36, 10	<b>1</b>	
	<b>(ii)</b> 29, 41, 13 any two	<b>2</b>	<b>B1</b> for each
	<b>(iii)</b> 36	<b>1</b>	
	<b>(iv)</b> 45, 15, 10 any two	<b>2</b>	<b>B1</b> for each
	<b>(b)</b> <b>(i)</b> 27	<b>2</b>	<b>B1</b> for 36 + 29 + ... + 13 seen implied by 189
	<b>(ii)</b> 29	<b>2</b>	<b>M1</b> for attempting to order the numbers
	<b>(iii)</b> 35 cao	<b>1</b>	
	<b>(c)</b> <b>(i)</b> $\frac{2}{7}$ oe	<b>1</b>	
	<b>(ii)</b> $\frac{3}{7}$ oe	<b>1ft</b>	Their denominator from <b>(c)(i)</b>

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4	<p>(a) (i) 70 cao</p> <p>(ii) 1.11(11...)</p> <p>(b) (i) 15 cao</p> <p>(ii) <math>(1500 - 15) \times 1.04</math></p> <p>(c) 561.92</p>	<p>1</p> <p>2</p> <p>1</p> <p>2</p> <p>3</p>	<p><b>B1</b> for <math>100 \div 90, 10 \div 9, 1\frac{1}{9}</math></p> <p><b>B1</b> for <math>\times 1.04, 1560, 15.60</math></p> <p><b>M1</b> for <math>1544.40 - 950 - 10 (584.40)</math> oe <b>M1</b> indep for <math>\div 1.04</math></p>
5	<p>(a) <math>-\frac{4}{3}</math> oe, -1.2 to -1.4</p> <p>(b) (i) 3, 2, 6</p> <p>(ii) Correct continuous line</p> <p>(c) <math>x = -2, y = 4</math></p>	<p>2</p> <p>3</p> <p>2ft</p> <p>2ft</p>	<p><b>B1</b> for attempt at <math>\frac{\text{rise}}{\text{run}}</math></p> <p><b>B1</b> for each value</p> <p>Minimum length (0,3) to (6,0) <b>B1</b> for plotting their 3 points</p> <p><b>B1</b> for their <math>x</math>, <b>B1</b> for their <math>y</math> from their intersections</p>
6	<p>(a) (i) Correct construction</p> <p>(ii) <math>47^\circ</math> (45 – 49)</p> <p>(iii) Correct construction</p> <p>(iv) 4 (3.8 – 4.2)</p> <p>(v) Correct construction</p> <p>(vi) Correct region shaded</p> <p>(b) (i) Correct scale drawing of <math>PQ</math></p> <p>(ii) Correct scale drawing of their <math>QR</math></p> <p>(iii) 35 to 37</p> <p>(iv) 264 to 268</p>	<p>2</p> <p>1ft</p> <p>2ft</p> <p>1ft</p> <p>2ft</p> <p>1ft</p> <p>2</p> <p>2</p> <p>1ft</p> <p>1ft</p>	<p><b>B1</b> for two lines or <b>B1</b> for accurate arcs seen or <b>B1</b> for one correct line with two arcs <b>SC1</b> for <math>AC = 6</math> and <math>BC = 7</math> with arcs</p> <p><b>Strict</b> ft their (a)(i)</p> <p>Their (a)(i) <b>B1</b> for accurate arcs no line or <b>B1</b> for accurate line drawn no arcs or <b>B1</b> for accurate line with arcs bisecting another angle</p> <p><b>Strict</b> ft their (iii) with intersection on opposite side of triangle</p> <p><b>B1</b> for accurate arcs no line or <b>B1</b> for accurate line drawn no arcs or <b>B1</b> for accurate line with arcs, bisecting <math>AB</math> or <math>AC</math></p> <p>ft is for boundaries of correct perpendicular bisector of <b>their</b> <math>BC</math> and correct angle bisector of <b>their</b> <math>ABC</math>, with or without arcs</p> <p><b>B1</b> for accurate angle <math>40^\circ</math>, <b>B1</b> for <math>PQ</math> 8cm</p> <p><b>B1</b> for accurate angle <math>160^\circ</math>, <b>B1</b> for <math>QR</math> 6cm</p> <p>Measure <math>\times 5 \pm 1</math>km</p>

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7	<p>(a) <math>-6</math> www</p> <p>(b) <math>\frac{3-b}{a}</math> or <math>\frac{3}{a} - \frac{b}{a}</math></p> <p>(c) 3</p> <p>(d) (i) <math>x + x + 2x - 5 + 2x - 5 = 6x - 10</math></p> <p>(ii) 10</p>	<p>3</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p>	<p><b>M2</b> for <math>8 = x + 6 + 8</math> or better or <math>-x + 8 = 6 + 8</math> or better <b>M1</b> for <math>2x + 8</math> or <math>3x + 6</math> or <math>3x + 14</math></p> <p><b>B1</b> for <math>3 - b</math> seen or <math>z + \frac{b}{a} = \frac{3}{a}</math></p> <p><b>B1</b> for <math>\frac{54}{2}</math> or better <b>SC1</b> for embedded answer ie <math>2 \times 3^3 = 54</math> or <math>2 \times 3 \times 3 \times 3 = 54</math></p> <p><b>M1</b> accept <math>2x + 2(2x - 5)</math> or <math>2(x + 2x - 5)</math> <b>E1</b> dep</p> <p><b>M1</b> for <math>6x - 10 = 50</math></p>
8	<p>(a) Translation <math>\begin{pmatrix} 0 \\ -6 \end{pmatrix}</math></p> <p>(b) Correct line drawn</p> <p>(c) (i) Correct reflection (ii) Correct enlargement</p>	<p>2</p> <p>1</p> <p>1ft</p> <p>2</p>	<p><b>B1</b> for translation <b>B1</b> for column vector</p> <p>Continuous full line. Accept freehand. Their <b>(b)</b></p> <p><b>B1</b> for any other enlargement scale factor 2</p>
9	<p>(a) <math>3x(x + 4)</math></p> <p>(b) 20</p> <p>(c) <math>6x^7</math></p>	<p>2</p> <p>2</p> <p>2</p>	<p><b>B1</b> for <math>3(x^2 + 4x)</math> or <b>B1</b> for <math>x(3x + 12)</math> or <b>B1</b> for <math>3x(x + 4)</math> seen (if not final answer)</p> <p><b>B1</b> for 8 or 12 seen</p> <p><b>B1</b> for <math>kx^7</math> or for <math>6x^k</math>, <math>k \neq 0</math></p>
10	<p>(a) 5.4 cao</p> <p>(b) 5</p> <p>(c) 50</p> <p>(d) 134</p> <p>(e) 301.5(0)</p>	<p>3</p> <p>2</p> <p>1ft</p> <p>3ft</p> <p>1ft</p>	<p><b>M1</b> for <math>2^2 + 5^2 (= x^2)</math> implied by 29 <b>A1</b> 5.38(51..) or <math>\sqrt{29}</math> or 5.39 <b>B1</b> indep for rounding their answer to 1 decimal place</p> <p><b>M1</b> for <math>0.5 \times 5 \times 2</math> oe</p> <p><math>10 \times</math> their <b>(b)</b></p> <p><b>M2</b> for <math>2 \times</math> their <b>(b)</b> + <math>10 \times</math> their <b>(a)</b> + <math>2 \times 10</math> + <math>5 \times 10</math> or better <b>M1</b> for any 3 faces correct</p> <p>Their <b>(d)</b> <math>\times 2.25</math></p>
11	<p>(a) Correct shape drawn</p> <p>(b) 16, 21, 26</p> <p>(c) 41</p> <p>(d) <math>5n + 1</math></p> <p>(e) 501</p> <p>(f) 13</p>	<p>1</p> <p>3</p> <p>1</p> <p>2</p> <p>1ft</p> <p>2ft</p>	<p><b>B1</b> for each <b>SC1</b> "their 16" + 5 <b>SC1</b> "their 21" + 5</p> <p><b>B1</b> for <math>5n</math>, <b>B1</b> for +1</p> <p>Their <b>(d)</b> if linear</p> <p>Their <b>(d)</b> if linear <b>B1</b> for their <b>(d)</b> = 66</p>