

**MARK SCHEME for the May/June 2010 question paper  
for the guidance of teachers**

**0581 MATHEMATICS**

**0581/43**

Paper 43 (Extended), maximum raw mark 130

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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 (a)</b>	<b>(i)</b> 2 : 3	1	
	<b>(ii)</b> $30 \div 2 \times 3$ o.e.	E1	Allow 2 : 3 (oe) = 30 : 45
	<b>(iii)</b> 60	2	<b>M1</b> for $3 \div 5 \times 100$ oe
	<b>(b)</b> 31.83	3	<b>SC2</b> for 31.827 as final answer or not spoiled. <b>or M1</b> for $\times 1.03$ twice oe
<b>(c)</b>	1.5	2	<b>M1</b> for $\frac{30 \times r \times 5}{100} = 2.25$ oe or for $2.25 \div 5$ then $\div 30 \times 100$
<b>2 (a)</b>	5.83 (5.830 to 5.831)	2	<b>M1</b> for $3^2 + 5^2$ Any other method must be complete
<b>(b)</b>	113.6 (114 or 113.5 to 113.6) www 4	4	<b>M2</b> for $(\cos C) = \frac{5^2 + 8^2 - 11^2}{2 \times 5 \times 8}$ <b>or M1</b> for correct implicit expression <b>A2</b> ( <b>A1</b> for $-0.4$ or $-\frac{2}{5}$ )
<b>(c)</b>	25.8 (25.77 to 25.85) cao www 3	3	<b>M1</b> for $0.5 \times 5 \times 8 \times \sin$ (their angle $C$ ) o.e must be full method e.g. Hero's formula. <b>M1</b> for $0.5 \times 3 \times 5$ oe

3			<p>Throughout this question isw any cano or changing to other forms, after correct answer seen. Do not accept ratio or worded forms.</p>
(a)	0.4, 0.1 oe	1	
(b) (i)	1	1	
(ii)	0.7 oe ft	1ft	ft their first three probabilities
(c) (i)	0.04 oe	1	
(ii)	0.03 oe ft	2ft	M1 for their $0.1 \times 0.3$
(iii)	0.12 oe ft	3ft	ft their 0.1, their 0.4 and their (c)(i) M2 for their $0.4 \times$ their 0.1 + their 0.1 $\times$ their $0.4 + 0.2 \times 0.2$ (or their (c)(i)) or M1 for any two of these products added or two of each
(d)	0.147 oe ft	2ft	ft their (b)(ii). M1 for their $0.7 \times$ their $0.7 \times (1 -$ their 0.7)
4 (a)	Triangle drawn , vertices (6, 10), (10, 10), (10, 8)	2	SC1 reflects correctly in $x = 6$
(b)	Triangle drawn , vertices (2, 8), (6, 8), (6, 10)	2	SC1 for translation $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 6 \end{pmatrix}$
(c)	Translation $\begin{pmatrix} 4 \\ -6 \end{pmatrix}$ o.e.	2	B1 All part marks spoiled if extra transformation B1 Indep. Allow other clear forms or words
(d) (i)	Enlargement (centre) (4, 6) (factor) 0.5	3	B1 All part marks spoiled if extra transformation B1 Indep. B1 Indep.
(ii)	$\frac{1}{4}$ or 0.25 oe	1	
(e) (i)	Stretch y-axis o.e invariant (factor) 0.5	3	B1 All part marks spoiled if extra transformation B1 Indep B1 Indep
(ii)	$\begin{pmatrix} 0.5 & 0 \\ 0 & 1 \end{pmatrix}$ ft	2ft	ft their factor in (e)(i) only if stretch SC1 (also ft) for left-hand column

5 (a) (i)	Similar	1	Accept enlargement
(ii)	2.7	2	<b>M1</b> for $\frac{PQ}{3.6} = \frac{3}{4}$ oe
(iii)	3.15	2	<b>M1</b> for $\left(\frac{3}{4}\right)^2$ or $\left(\frac{4}{3}\right)^2$ o.e seen If $\frac{1}{2}ab \sin C$ used or base and height used then must be full method for <b>M1</b>
(b) (i)	29	1	
(ii)	61 ft	1ft	ft 90 – their (i) if (i) is acute
(iii)	61 ft	1ft	ft their (ii) if their (ii) is acute, but can recover
(iv)	119 ft	1ft	ft 180 – their (iii)
(c) (i)	20	1	
(ii)	110	3	<b>M1</b> for adding 6 angles going up 4 each time and <b>M1</b> (indep) for 720 seen and not spoiled ( $6A + 60 = 720$ o.e. scores M2)
6 (a)	-2.5, -2, 2, 2.5	2	<b>B1</b> for 3 correct
(b)	4 points correct ft Correct shape curve through at least 9 points over full domain Two branches either side of y-axis and not touching it	P1ft C1ft B1	ft only if correct shape and isw any curve outside domain (including crossing y-axis) Independent
(c)	-1, 0, 1	2	<b>B1</b> for two correct, each extra -1
(d)	$(x) < -1$ and $(x) > 1$ as final answer	2	<b>B1 B1</b> Condone inclusive inequality, allow in words, condone inclusion of - 4 and + 4 as limits. $1 < x < -1$ or $-1 > x > 1$ <b>SC1</b> $-1 < x < 1$ scores <b>0</b> . Each extra -1 if more than two answers.
(e) (i)	Correct ruled line though (-2, -3) to (1, 3)	2	<b>SC1</b> for ruled line gradient 2 or y-intercept 1 from $x = -2$ to 1 or correct line but short or good freehand full line.
(ii)	Some reasonable indication on graph for both points	1	e.g. points of intersection marked, or, lines drawn from point of intersection to x-axis etc
(iii)	$x^2 + 1 = 2x^2 + x$ oe then $x^2 + x - 1 = 0$  or $\frac{1}{x} = x + 1$ then $1 = x^2 + x$ then $x^2 + x - 1 = 0$  1, -1	3	<b>E2</b> Must be intermediate step before answer – no errors or omissions  <b>or E1</b> Either no intermediate step or one error or omission.  <b>B1</b>

<p>7 (a)</p> <p>(Mode) = 11 (Median) = 12.5  (Mean) = 12.8 (0 ....)</p> <p>(b) (i) 15, 27, 30, .....</p> <p>(ii) 9.67 (9.674 to 9.675) cao      www 4</p>		<p>1</p> <p>2</p> <p>3</p> <p>3</p> <p>4</p>	<p><b>B1</b></p> <p><b>M1</b> for evidence of finding mid-value e.g. <math>(126 + 1) \div 2</math> oe, (condone <math>126 \div 2</math>)</p> <p><b>M1</b> for correct use of <math>\Sigma fx</math> (allow one slip)</p> <p><b>M1</b> (dependent) for <math>\div 126</math></p> <p><b>B1 B1 B1</b></p> <p><b>M1</b> for mid-values, condone one error or slip</p> <p><b>M1</b> for use of <math>\Sigma fx</math>, with <math>x</math>'s anywhere in intervals and their frequencies (allow one slip)</p> <p><b>M1</b> (dependent on second M) for <math>\div 126</math> (or their <math>\Sigma f</math>)</p> <p>isw any conversion into hours and minutes</p>
<p>8 (a)</p> <p>40 <math>\div</math> 10 <b>and</b> 12 <math>\div</math> 6 (or 12 <math>\div</math> 3) <b>and</b> 6 <math>\div</math> 3 (or 6 <math>\div</math> 6) oe 4 <math>\times</math> 2 <math>\times</math> 2 = 16 reducing (seen) to 16</p> <p>(b) 180</p> <p>(c) (i) 23 640 (allow 23 600)</p> <p>(ii) 23.64 (or 23.6)      ft</p> <p>(d) (i) 216</p> <p>(ii) 8.64</p> <p>(e) 75.3 (75.26 to 75.33....)</p> <p>(f) 0.842 (0.8419 – 0.8421)</p>		<p>E2</p> <p>1</p> <p>2</p> <p>1ft</p> <p>2</p> <p>3</p> <p>3</p> <p>3</p>	<p><b>M1</b> Allow drawing for <b>M1</b> but must see reaching 16 for E2</p> <p>Reaching 16 without any errors or omissions</p> <p><b>SC1</b> for <math>\frac{40 \times 12 \times 6}{\text{their (b)}}</math> even if = 16</p> <p>or 4 <math>\times</math> 2 <math>\times</math> 2 = 16 or 4 <math>\times</math> 4 <math>\times</math> 1 = 16 without other working</p> <p><b>M1</b> for their 180 <math>\times</math> 8 <math>\times</math> 16 + 600</p> <p><b>ft</b> their (i) <math>\div</math> 1000</p> <p><b>M1</b> for <math>(10 \times 6 + 10 \times 3 + 6 \times 3) \times 2</math> oe</p> <p><b>M1</b> for their (i) <math>\times</math> 16 <math>\times</math> 25</p> <p><b>M1</b>(indep) for <math>\div 100^2</math></p> <p>Figs 864 imply <b>M1</b> only</p> <p><b>M1</b> for <math>\frac{4}{3}\pi \times 0.5^3</math> (0.5235..) Implied also by 104.7....</p> <p><b>then M1</b> (dep) for their (b) – 200 <math>\times</math> their <math>\frac{4}{3}\pi \times 0.5^3</math> must be giving positive answer</p> <p><b>M1</b> for <math>(\frac{4}{3}\pi r^3) = 50 \div 20</math></p> <p><b>then M1</b> for <math>\frac{50 \div 20}{\frac{4}{3}\pi}</math> (0.5966 to 0.5972)</p> <p>After 0 scored <b>SC1</b> for <math>\sqrt[3]{\frac{50}{\frac{4}{3}\pi}}</math> (implied by 2.29)</p>

<p><b>9 (a)</b></p>	<p><math>8w + 2j = 12</math>  <math>12w + 18j = 45</math>          Correctly eliminating one variable          Water 1.05, Juice 1.8(0)</p>	<p>5</p>	<p><b>B1</b> condone consistent use of other variables  <b>B1</b>  <b>M1</b> allow one numerical slip  <b>A1 A1</b> If A0, <b>SC1</b> for 1.80, 1.05</p>
<p><b>(b) (i)</b></p>	<p><math>\frac{2}{y} + \frac{4}{y-4} = \frac{40}{60}</math> oe</p>	<p>M2</p>	<p><b>M2</b> If M0, <b>SC1</b> for <math>\frac{2}{y}</math> or <math>\frac{4}{y-4}</math></p>
	<p><math>\frac{2 \times 3(y-4)}{3y(y-4)} + \frac{3 \times 4y}{3y(y-4)} = \frac{2y(y-4)}{3y(y-4)}</math>          oe or better  <math>6(y-4) + 12y = 2y(y-4)</math> oe  <math>6y - 24 + 12y = 2y^2 - 8y</math> oe  <math>0 = 2y^2 - 26y + 24</math>  <math>y^2 - 13y + 12 = 0</math></p>	<p>E2</p>	<p><b>E2</b> Correct conclusion reached without any errors or omissions including at least 3 intermediate steps.  <b>or E1</b> if any one slip, error or omission that is recovered or correct with only two steps.</p>
<p><b>(ii)</b></p>	<p><math>(y-1)(y-12)</math></p>	<p>2</p>	<p><b>SC1</b> for <math>(y+a)(y+b)</math> where <math>ab = 12</math> or <math>a+b = -13</math></p>
<p><b>(iii)</b></p>	<p>1, 12 ft</p>	<p>1ft</p>	<p>Only <b>ft SC1</b> but can recover to correct answer with new working or if <b>(ii)</b> not attempted</p>
<p><b>(iv)</b></p>	<p>8 ft</p>	<p>1ft</p>	<p><b>ft</b> a positive root <math>-4</math> if positive answer</p>
<p><b>(c)</b></p>	<p><math>\frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-4)}}{2(1)}</math></p>	<p>2</p>	<p><b>B1</b> for <math>\sqrt{(-1)^2 - 4(1)(-4)}</math> or better          If in form <math>\frac{p + \sqrt{q}}{r}</math> or <math>\frac{p - \sqrt{q}}{r}</math>          then <b>B1</b> for <math>-(-1)</math> and <math>2(1)</math> or better          Brackets and full line may be implied later</p>
	<p>-1.56, 2.56</p>	<p>2</p>	<p><b>B1 B1</b> If B0, <b>SC1</b> for <math>-1.6</math> or <math>-1.562</math> to <math>-1.561</math> <b>and</b> <math>2.6</math> or <math>2.561</math> to <math>2.562</math></p>
<p><b>10 (a)</b></p>	<p>Dots all correctly placed in Diagram 4</p>	<p>1</p>	
<p><b>(b)</b></p>	<p>Column 4 16, 25, 16, 41          Column 5 25, 41, 20, 61          Column <math>n</math>: <math>n^2</math>, <math>4n</math>, <math>n^2 + (n+1)^2</math> oe</p>	<p>7</p>	<p><b>B2 or B1</b> for three correct  <b>B2 or B1</b> for three correct  <b>B1 B1 B1</b> oe likely to be <math>(n-1)^2 + n^2 + 4n</math> or <math>2n^2 + 2n + 1</math>          After any correct answer for column <math>n</math>, apply isw</p>
<p><b>(c)(i)</b></p>	<p>79 601 cao</p>	<p>1</p>	
<p><b>(ii)</b></p>	<p>800 ft</p>	<p>1ft</p>	<p><b>ft</b> their <math>4n</math> linear expression only</p>
<p><b>(d)</b></p>	<p>12 cao</p>	<p>1</p>	