

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

**0580 MATHEMATICS**

**0580/43**

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

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3			<p><b>Throughout this question isw any cancelling or changing to other forms, after correct answer seen. Do not accept ratio or worded forms.</b></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

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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>

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<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>

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<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>	