

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

**0580 MATHEMATICS**

**0580/41**

Paper 41 (Extended), maximum raw mark 130

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 (a)</b>	11:14	1	
<b>(b)</b>	50	2	<b>M1</b> for $(220 + 280) \div 10$ o.e.
<b>(c)</b>	12	2	<b>M1</b> for $21 \div (4 + 3) \times 4$ (or 3) o.e.
<b>(d)</b>	280	3	<b>M1</b> for $0.35 \times$ their 500 (175) <b>M1</b> dependent $\times 1.60$
<b>(e)</b>	240	2	<b>M1</b> for dividing 264 by 1.1 oe
<b>2 (a) (i)</b>	4	1	
<b>(ii)</b>	5	1	
<b>(iii)</b>	4.75	3	<b>M1</b> for $1 \times 2 + 1 \times 3 + 17 \times 4 + 12 \times 5 + 6 \times 6 + 3 \times 7$ condone one slip <b>then M1</b> dependent result $(190) \div 40$
<b>(b)</b>	$\frac{190 + 3n}{40 + n}$	2	<b>SC1</b> for their $190 + 3n$
<b>3 (a)</b>	Triangle drawn with co-ords at (1, 4), (4, 2), (4, 4)	2	<b>SC1</b> for 2 correct vertices or an enlargement sf $\frac{1}{2}$ with wrong centre
<b>(b) (i)</b>	$\begin{pmatrix} -8 & -8 & -2 \\ 4 & 8 & 8 \end{pmatrix}$	2	<b>B1</b> each row
<b>(ii)</b>	Triangle drawn at (–8, 4), (–8, 8), (–2, 8) ft <b>(i)</b>	2ft	<b>SC1</b> for 2 correct ft vertices. Can also be correct regardless of <b>(i)</b>
<b>(iii)</b>	Reflection cao  $y$ – axis or $x = 0$ cao	2	<b>B1</b> Independent of <b>(i)</b> or <b>(ii)</b> Extra transformations lose all marks <b>B1</b> Independent of <b>(i)</b> or <b>(ii)</b>
<b>(c) (i)</b>	Translation  $\begin{pmatrix} -10 \\ -10 \end{pmatrix}$ o.e.	2	<b>B1</b> Extra transformations lose all marks <b>B1</b>
<b>(ii)</b>	Rotation (0, 0) 90° clockwise oe	3	<b>B1</b> Extra transformations lose all marks <b>B1</b> Allow word origin for (0, 0) <b>B1</b> Allow – 90° or 270° (anti-clockwise)
<b>(d)</b>	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	2	<b>B1</b> each column

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<b>4</b>				<p><b>In (b) and (c) isw any cancelling or changing to other forms, after correct answer seen. Penalty of – 1 for 2 sf decimals or percentages. Do not accept ratio or worded forms.</b></p>
<b>(a)</b>	B and $\frac{2}{5}, \frac{1}{4}$ oe		1	Allow any reasonable explanation, e.g. 2 out of 5 greater than 1 out of 4.
<b>(b) (i)</b>	$\frac{1}{3}, \frac{3}{4}, \frac{2}{5}, \frac{3}{5}$		4	<b>B1 B1 B1 B1</b>
<b>(ii)</b>	$\frac{6}{12}$ oe    cao    www 2		2	$\frac{1}{2}, 0.5$ etc <b>M1</b> for $\frac{2}{3} \times$ their $\frac{3}{4}$ i.e. product of correct branches on their tree
<b>(iii)</b>	$\frac{42}{60}$ oe    cao    www2		2	$\frac{7}{10}, 0.7$ etc <b>M1</b> for their <b>(ii)</b> + their $\frac{1}{3} \times$ their $\frac{3}{5}$ from their tree
<b>(c)</b>	$\frac{2}{60}$ oe    cao    www2		2	$\frac{1}{30}, 0.0333(3\ldots)$ etc <b>M1</b> for $\left(\frac{2}{3} \times \frac{1}{4} \times 0\right) + \frac{1}{3} \times \frac{2}{5} \times \frac{1}{4}$
<b>5 (a)</b>	200.5... to 201    www 2		2	<b>M1</b> for $0.5 \times 24 \times 26 \sin 40$ oe <b>A1</b>
<b>(b)</b>	17.2 (0....)    www 4		4	<b>M2</b> for $26^2 + 24^2 - 2 \times 26 \times 24 \cos 40$ <b>or M1</b> for $\cos 40 = \frac{26^2 + 24^2 - BD^2}{2 \times 24 \times 26}$ <b>A2 or A1</b> for 295.976..
<b>(c)</b>	12.8 (12.77...)    www 4		4	<b>B1</b> for Angle $C = 110$ soi    accept on diagram <b>M2</b> for $(BC) = \frac{24 \sin 30}{\sin 110}$ oe <b>or</b> <b>M1</b> $\frac{\sin 110}{24} = \frac{\sin 30}{BC}$ oe    i.e. a correct implicit statement    soi <b>A1</b>
<b>(d)</b>	8.208 to 8.230    www 2		2	<b>M1</b> for their <b>(c)</b> $\times \sin 40$ oe

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<b>6 (a)</b>	32.5      cao      www4	4	<b>M1</b> for mid-values seen <b>M1</b> for use of $\Sigma fx$ with $x$ 's anywhere in each interval $(10 \times 15 + 30 \times 30 + 20 \times 45)$ <b>M1</b> $\div 60$ dependent on second M1
<b>(b)</b>	Histogram drawn	3	<b>B1</b> Bars correct positions and widths – no gaps <b>B2</b> Heights of bars 1, 1.5 and 2 ( <b>B1</b> for any two correct or for heights in the ratio 2:3:4)
<b>7 (a)</b>	4.53 or 4.526 – 4.530....	3	<b>SC2</b> for figs 453 or 4526 – 4530 If SC0, <b>M1</b> for $\pi \times (\text{figs } 31)^2 \times 15$
<b>(b)</b>	3.62 to 3.624    ft	2ft	<b>M1</b> for their <b>(a)</b> $\times$ figs 8    oe
<b>(c) (i)</b>	$360 - 2 \times 90 - 60$ oe	2	<b>E2</b> The 90's and the 60 must be clearly justified. Accept in diagram. <b>SC1</b> for 60 or two 90's soi in correct positions oe e.g $360 \div 3$ scores 0
<b>(ii)</b>	0.649 (0.6492 to 0.6493)	2	<b>M1</b> for $\pi \times \text{figs } 62 \div 3$
<b>(iii)</b>	7.53 (7.527 or 7.528....)	3	<b>M1</b> for their <b>(ii)</b> $\times 3$ <b>M1</b> (indep) for $18 \times \text{figs } 31$ This M is spoiled by extra lengths.
<b>(iv)</b>	112.9 to 113    ft	1ft	<b>ft</b> their <b>(iii)</b> $\times 15$
<b>8 (a)</b>	0.25, 8, 16	3	<b>B1 B1 B1</b>
<b>(b)</b>	– 5, 4	2	<b>B1 B1</b>
<b>(c) (i)</b>	7 points plotted    ft Curve through all 7 points exponential shape	P2ft C1ft	<b>P1</b> for 5 or 6 points ft <b>ft</b> only if exponential shape
<b>(ii)</b>	6 points plotted    ft Curve through all 6 points parabola shape	P2ft C1ft	<b>P1</b> for 5 points ft <b>ft</b> only if parabola shape
<b>(d) (i)</b>	3.2 to 3.4	1	
<b>(ii)</b>	0.3 to 0.4 and 2	2	<b>B1 B1</b>
<b>(iii)</b>	3.1 to 3.4	1	
<b>9 (a) (i)</b>	–2.5    oe	2	<b>M1</b> for $5(w + 1) = 3w$
<b>(ii)</b>	–3 or 1	2	<b>B1 B1</b> (If 0, <b>SC1</b> for $y + 1 = \pm 2$ )
<b>(iii)</b>	9.5    oe	B3	<b>M2</b> for $5x + 5 - 3x + 6 = 2 \times 15$ Condone one slip (sign or numerical) on left hand side <b>or M1</b> for $\frac{5(x+1)}{15} - \frac{3(x-2)}{15}$ or better, condoning one sign or numerical slip.

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<b>(b) (i)</b>	$(u - 10)(u + 1)$	2	<b>SC1</b> for $(u + a)(u + b)$ where $ab = -10$ or $a + b = -9$
<b>(ii)</b>	-1, 10	1ft	Only <b>ft B2</b> or <b>SC1</b> in <b>(i)</b> but can recover to correct answer only if new working or if <b>(i)</b> not attempted
<b>(c) (i)</b>	$\frac{(x+1)(x+2)}{2} = x^2$ oe	M1	
	$((x+1)(x+2) = x^2 + x + 2x + 2$	B1	Allow $3x$ for $x + 2x$
	$x^2 + x + 2x + 2 = 2x^2$		
	$x^2 - 3x - 2 = 0$	E1	Established without any omissions or errors
<b>(ii)</b>	$\frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-2)}}{2(1)}$	2	<b>B1</b> for $\sqrt{(-3)^2 - 4(1)(-2)}$ or better seen anywhere. If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ then <b>B1</b> for $-(-3)$ and $2(1)$ or better Brackets and full line may be implied later
	-0.56, 3.56	2	<b>B1 B1</b> <b>SC1</b> for -0.6 or -0.562 to -0.561 and 3.6 or 3.561 to 3.562
<b>(iii)</b>	12.7 or 12.67 to 12.69 ft	1ft	<b>ft</b> their positive $x$ squared
<b>10 (a)</b>	$20x + 100y \leq 1200$	1	
<b>(b)(i)</b>	$x + y \geq 40$	1	
<b>(ii)</b>	$y \geq 2$	1	
<b>(c)</b>	$x + y = 40$ cao	L1	Each line ruled and long enough to enclose required region.
	$y = 2$ cao	L1	If <b>L0</b> , <b>SC1</b> if freehand but otherwise accurate and enclose region
	Required region only region left not shaded or otherwise clearly indicated cao	R2	<b>SC1</b> if one boundary error – see diagrams
<b>(d)</b>	5 cao	1	
<b>(e)</b>	50 cao, 2 cao	2	<b>B1 B1</b>
	270 <b>ft</b>	1ft	<b>ft</b> $5 \times$ their $x + 10 \times$ their $y$
<b>11 (a)</b>	Reasonable diagram, 25, 13, 62	4	<b>B1 B1 B1 B1</b> diagram may be freehand
<b>(b)</b>	64, 19, 146	3	<b>B1 B1 B1</b>
<b>(c)</b>	$n^2$ oe	2	<b>B1</b>
	$2n + 3$ oe	2	<b>B1</b>
<b>(d)(i)</b>	2	1	
<b>(ii)</b>	20202 <b>ft</b>	1ft	<b>ft</b> 10101 $\times$ their $k$