MARK SCHEME for the October/November 2010 question paper

for the guidance of teachers

4024 MATHEMATICS (SYLLABUS D)

4024/22   Paper 2, maximum raw mark 100

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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
art   anything rounding to
soi   seen or implied

1	(a)	(i)	$\dfrac{1}{8}$ Final ans	1	
		(ii)	$5 - 2x$ Final ans	2	**B1** for $3x^2 - 2x - 3x^2 \pm 5$ or better soi
	(b)		17	2	**M1** for $3t - 4 = 7 + 2t + 6$ or better
	(c)		$(5p - 7q)(x + 2y)$	2	**B1** for $(5p \pm 7q)(x \pm 2y)$ or **M1** for $5p(x + 2y) - 7q(x + 2y)$ or $x(5p - 7q) + 2y(5p - 7q)$ or **B1** for the correct extraction of one common factor at any stage
	(d)	(i)	$2 - x$ has the greater value	2	**B1** for $3x + 4 = -2$ or $2 - x = 4$ seen
		(ii)	$x < -0.5$ Final ans	2	**B1** for $3x + x$, $2 - 4$ oe
2	(a)	(i)	($) 935	1	
		(ii)	(€) 600	1	
		(iii)	(€) 550	2	**M1** for Figs $85 \times \dfrac{121}{187}$
	(b)		(Rs) 51.95	2	**M1** for Figs $\dfrac{4}{77}$
	(c)	(i)	($) 375	1	
		(ii)	($) 1087.5(0)	3	**B1** for $\dfrac{15}{100} \times 27\,000$ (= 4050) soi or **M1** for $\dfrac{1}{36}$ (their total interest ÷ 27 000)

3	(a)		144		2	**B1** for $\dfrac{360}{10}$ or $(10-2)180$ or 10×180 oe seen
	(b)		38		3	**B2** for all angles by symmetry or **B1** for any angle deduced by symmetry **M1** for such as $x + $ their$AHC + $ their$HCB + 80 = 360$ oe
	(c)	(i)	$\frac{1}{2}(12+10)h$ or better		2	**B1** for NY $= h$ used as height soi or for $\frac{1}{2}(10+12)$ seen
		(ii)	13		2ft	$\dfrac{221}{k+6}$ ft dependent on their **(c)(i)** $= kh$ or **M1** for their **(c)(i)** $+$ their triangle $= 221$ or **B1** for $\frac{1}{2} \times 12 \times h$
4						Here and elsewhere accept answers rounding to the given 3 significant figure answers.
	(a)	(i)	52.1		2	**M1** for $\tan SPQ = \dfrac{9}{7}$ oe
		(ii)	7.37		2	**M1** for $\dfrac{RS}{9} = \cos 35$ oe
	(b)		147 isw		3	**M1** for $\dfrac{4}{l} = \sin 20$ oe and **A1** for 11.69(5...) or **B1** for $4\pi \times$ their l
5	(a)		$90 < m < 95$		1	
	(b)		$93.2(0)$, $93\frac{7}{36}$		3	**B1** for $10 \times 70 + 16 \times 85 + 20 \times 92.5 + 21 \times 97.5 + 22 \times 105 + 1 \times 120$ and **B1** for $\div$ by $10 + 16 + 20 + 21 + 22 + 1$
	(c)	(i)	4		1	
		(ii)	1	10	2	B1 for either
6	(a)	(i)	Length of line AB 14 cm		1	
		(ii)	**(a)** Perpendicular bisector of AB		1	**(a)** and **(b)** long enough to be convincing loci
			(b) Circular arc, centre B, radius 9 cm		1	
	(b)		Correct region shaded ft		1ft	
	(c)				2ft	**B1** for either or **SC1** for S_1, S_2 on correct bearing from A
		(i)	S_1 S_2 correctly marked ft			
		(ii)	$10°$		1	
		(iii)	$336°$		1	

7	(a)	(i)	$\dfrac{13}{x}$		1	
		(ii)	$\dfrac{13}{x+5}$		1	After $0 + 0$, SC1 for AB and PQ implicit
	(b)		$3x^2 + 15x - 65$		3	**M2** for $\dfrac{13}{x} - \dfrac{13}{x+5} = 3$ or **M1** for their **(i)** – their **(ii)** $= \pm 3$
	(c)		2.78 –7.78		4	**B1** for $p = -15$ and $r = 6$ and **B1** for $q = 1005$ or $\sqrt{q} = 31.7...$ or **B1** for $(x + \dfrac{5}{2})^{(2)}$ and **B1** for $\dfrac{335}{12}$ or 5.28 and **B1** for one correct final ans or both 2.783 and – 7.783 or both 2.8, –7.8 **SC1** + 1 for 2.78 and –7.78 anw.
	(d)	(i)	Accept any correct numerical expression		1	
		(ii)	$(\pm)4$		2	**M1** for their $18.9 - 14.9$
8	(a)		6.9		1	
	(b)		6 points ft plotted and joined.		3	**P2** for 6 correct plots ft or **P1** for at least 4 correct plots and dependent **C1** for a smooth curve
	(c)		2.5 ft		1	
	(d)	(i)	0.4		1	
		(ii)	Tangent drawn parallel to the chord.		1	
	(e)	(i)	Correct straight line		2	**L1** for good freehand or a potenial L2 that has been spoilt.
		(ii)	3.5 ft		1	
		(iii)	$A = 5$ $B = -60$ soi		2	**B1** for one correct www or **M1** for $\dfrac{x^3}{10} - \dfrac{x}{2} = -x + 6$ or better seen

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9	(a)		5		1	
	(b)	(i)	20.8, $20\frac{5}{6}$		2	**B1** for $\frac{1}{2} \times 5 \times 5$
		(ii)	21.6		3	**M2** for $\frac{1}{2}$ their$(\sqrt{5^2 + 5^2})^2 \sin 60$ or **B1** for $x^2 = 5^2 + 5^2$ oe or **M1** for $\frac{1}{2} \times$ their $x^2 \times \sin 60$
		(iii)	2.89 (cm) ft		3ft	ft for $(3 \times$ their **(i)**$) \div$ their **(ii)** evaluated or **M2** for $h = \dfrac{3 \times \text{their } \textbf{(i)}}{\text{their } \textbf{(ii)}}$ or **M1** for $\dfrac{1}{3} \times$ their **(ii)** $\times h =$ their **(i)**
	(c)	(i)	14		1	
		(ii)	24		1	
		(iii)	36		1	
10	(a)	(i)	Complete description		3	**B1** for Rotation or Enlargement **B1** for $180°$ or SF -1 **B1** for centre the midpoint of RS.
		(ii)	Equal and parallel		1	
	(b)	(i)	$\begin{pmatrix} 2 \\ 3 \end{pmatrix}$		1	
		(ii)	(0,0) (2,0) (0,1)		2	**B1** for two correct
		(iii)	(2,3), (4,3) (2,4) ft		1ft	ft from **(ii)** and / or **(i)**
		(iv)	(a)	$\begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix}$	2	**B1** for either column correct or **M1** for $\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 0 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$
			(b)	Complete description	2	**B1** for Stretching **B1** for 2 units in x direction and 3 units in y direction
11	(a)		19.6		4	**M1** for $17^2 + 4^2 \pm 2 \times 17 \times 4\cos 125$ soi **M1** for $\sqrt{17^2 + 4^2 - 2 \times 17 \times 4\cos 125}$ **A1** for $383.0...$ seen or 15.1
	(b)	(i)	3 900 or 3.9 **km**		3	**M1** for $\dfrac{PX}{4} = \tan 44$ oe **A1** for $3.86(27)$ (km)
		(ii)	(a)	14 21	2	**B1** for 42 (mins) or 14 23 and 54 (secs) seen or **M1** for 15 03 – 39 min 6 sec soi
			(b)	352	3	**M2** for $\dfrac{17}{\text{their } 2.9} \times 60$ **M1** for $\dfrac{17}{\text{their } 2.9}$

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