MARK SCHEME for the October/November 2011 question paper

for the guidance of teachers

4024 MATHEMATICS (SYLLABUS D)

4024/21 Paper 2, maximum raw mark 100

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
soi   seen or implied

Qu	Answers	Mark	Part marks
1	**(a)** 3.64	2	**M1** for 10tan20 oe
	(b) 8.24 – 8.28	2ft	**M1** for 10(tan50 – tan20) oe
	(c) 24.2, 24.3	3ft	**M1** for $(PC =) \dfrac{10}{\cos 20}$ oe (= 10.64) and **M1** for their **(a)** + 10 + their PC
2	**(a)** 0 –7/3 oe isw	2	**B1** for one correct
	(b) $x = 1$ $y = -½$ oe	3	**B2** for one correct www or **M1** for reaching such as $hx = 11, 11x = k$, or $py = –22, 44y = q$
	(c) $\dfrac{6p + 23}{(p - 2)(2p + 3)}$ final Ans	3	**M1** for $\dfrac{5(2p + 3) - 4(p - 2)}{(p - 2)(2p + 3)}$ soi and **A1** for numerator $10p + 15 - 4p + 8$, condoning one sign error, and correct denominator seen at some stage
	(d) $\dfrac{q + 1}{2q - 1}$ final Ans	3	**B1** for $(q - 1)(q + 1)$ seen and **B1** for $(2q - 1)(q - 1)$ seen
3	**(a)** 60 alternate angles	1	
	(b) **(i)** 130	1	
	(ii) 310	1	
	(iii) 250	1ft	ft 360 – (their **(a)** + 50) or their **(b)(ii)** – their **(a)**
	(c) **(i)** Triangles equiangular	1	
	(ii) 51	3	**M2** for $\dfrac{TQ}{85 - TQ} = \dfrac{3}{2}$ oe or **M1** for $\dfrac{TQ}{TR} = \dfrac{3}{2}$ oe

4	(a)	(i)	$\frac{1}{5}$ oe	1	
		(ii)	1 oe	1	
	(b)	(i)	Correct completion	2	**B1** after up to 3 errors
		(ii)	(a) 0	1ft	ft from their table
			(b) $\frac{6}{25}$ oe	1ft	Both fts dep on at least **B1** scored in **(b)(i)**
	(c)		$\frac{1}{25}$	2	**B1** for 5 × 5 × 5 soi

5	(a)		Convincing explanation	1	
	(b)	(i)	4(π)	1	
		(ii)	$\frac{3}{4}$	2ft	**B1** for 3π
	(c)	(i)	75.4	2	**M1** for $\frac{60}{360} \times \pi \times (\text{their } r)^2$
		(ii)	45.7	3	**M1** for ½ × 6 × 6 × sin60 or ½ × π × 3 × 3 and **M1** for their 75.4 – their ½ × 6 × 6 × sin60 – their ½ × π × 3 × 3 evaluated

6	(a)	(i)	3 : 5	1	
		(ii)	9 600	1	
		(iii)	20 000	2	**M1** for ÷ figs 1125 oe
	(b)	(i)	252.48	1	
		(ii)	110.8(0)	2	**M1** for 395 + kx = 3054.20 soi
		(iii)	33.4	2	**M1** for ÷ figs 2395 soi

7	(a)	(i)	Congruency case complete www	3	**D1** for common angle of 60 and **S1** for $AP=BQ=CR$ or $AR=BP=CQ$
		(ii)	(a) $\frac{16}{25}$ oe	1	
			(b) $\frac{3}{25}$ oe	1	

	(b)	**(i)**	Angle in a semicircle oe	1	
		(ii)	Equal arcs or equal chords subtend equal angles at the circumference	2	**B1** for $AB = BC$
		(iii)	**(a)** 45	1	
			(b) 135	1ft	ft 3 × their **(a)**
		(iv)	98	2	**B1** for an angle correctly identified as 37º, 53º or 127º
8	**(a)**		8 correct plots joined	2	**P1** for at least 5 correct plots joined
	(b)		5.5 – 7.5	2	**M1** for a correct tangent
	(c)	**(i)**	Correct line	2	**L1** for correct freehand line or a ruled line with gradient – 1 or intercept 2
		(ii)	1.3	1ft	
		(iii)	$B = 4$ $C = 5$	3	**B2** for one correct www or **M1** for $2x - \dfrac{5}{2x} = 2 - x$ soi
	(d)	**(i)**	Convincing demonstration	1	
		(ii)	Correct completion of graph	1	
9	**(a)**		122 working seen www	4	**M1** for $\dfrac{\sin ABC}{11} = \dfrac{\sin 25}{5.5}$ and further **M1** for $\sin ABC = \dfrac{11\sin 25}{5.5}$ soi and **A1** for 58 or **B1** for 180 – their 58
	(b)	**(i)**	Correct equation derived www	3	**M2** for $(12^2) = x^2 + (5 + x)^2 - 2x(5 + x)\cos 120$ or **M1** for $(12^2) = x^2 + (5 + x)^2 + 2x(5 + x)\cos 120$
		(ii)	4.276 and –9.276 final answer	4	**B3** for one correct or both not or wrongly corrected or **B1** for $p = -15$ and $r = 6$ and **B1** for $q = 1653$ or $\sqrt{q} = 40.657..$ or **B1** for $\left(x + \dfrac{5}{2}\right)^{(2)}$ and **B1** for $\dfrac{551}{12} = 45.916$ or 6.776

	(iii) 93		1ft	ft from their positive root in **(ii)**
10	**(a)** Correct histogram		3	**H2** for at least 4 correct columns or **H1** for 1 correct column For wrong or no vertical scale award **SC2** for all heights correct 　　and all widths correct **SC1** for all heights correct 　　or all widths correct
	(b) **(i)** 35 65 100 128		1	
	(ii) Correct curve		3	**P2** 　for 7 correct ft plots or **PC2** for 4 correct ft plots and curve or **P1** 　for 4 correct ft plots
	(c) **(i)** (51)		1ft	
	(ii) (10)		2ft	**B1** for reading from the graph at 105
	(d) (16.5)		2ft	**B1** for reading from the graph at 30
11	**(a)** **(i)** **(a)** (−2,3)		1	
	(b) (−3,2)		1ft	
	(c) (−3,2)		2	**B1** for one coordinate correct
	(ii) **(a)** $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$		1	
	(b) M_y		1	
	(b) **(i)** 5		1	
	(ii) 5		2	**B1** for $\sqrt{(4-7)^2 + (4-8)^2}$
	(iii) **(a)** (0, 2)		2	**M1** for appropriate perpendicular bisectors
	(b) 307		1	