Question 4 (25 marks)

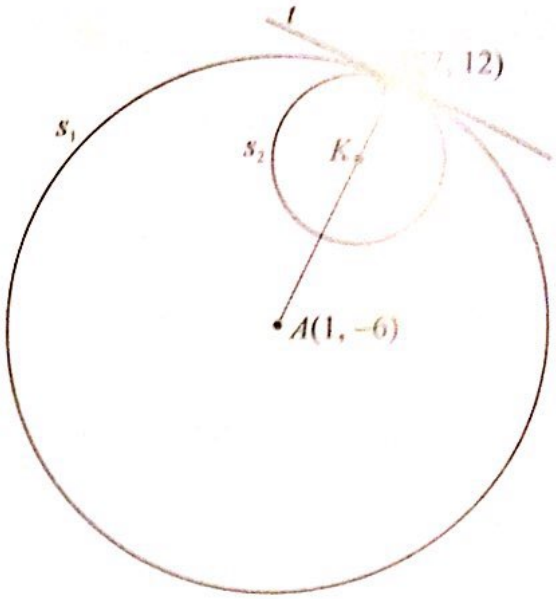
Question 4 (a)

Call A the centre of circle s_1.

$(x-1)^2+(y+6)^2=360$

Centre $A(1,-6)$

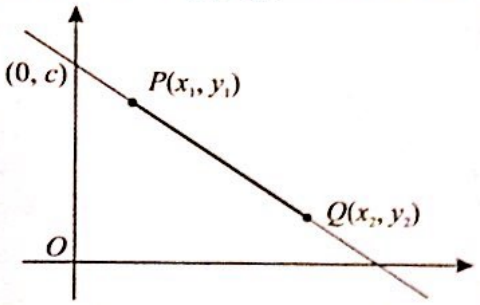
Radius $r_1=\sqrt{360}=6\sqrt{10}$



Marking Scheme Notes
Question 4 (a) [Scale 5B (0, 2, 5)]
2: • Centre or radius

Question 4 (b) (i)

Formulae and Tables Book
Co-ordinate geometry: Line [page 18]
Point dividing $[PQ]$ in the ratio $a:b$



$$\left(\frac{bx_1+ax_2}{b+a}, \frac{by_1+ay_2}{b+a}\right)$$

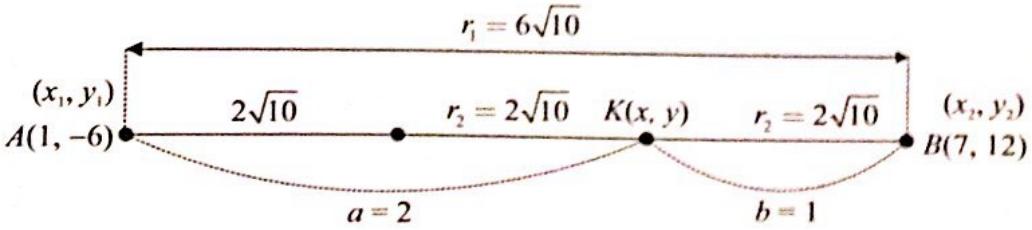
Formulae and Tables Book
Co-ordinate geometry: Circle [page 19]
Given centre (h, k) and radius r

$$(x-h)^2+(y-k)^2=r^2$$

Given equation
$x^2+y^2+2gx+2fy+c=0$

Centre $(-g, -f)$

Radius $\sqrt{g^2+f^2-c}$



$$K(x, y)=\left(\frac{1(1)+2(7)}{1+2}, \frac{1(-6)+2(12)}{1+2}\right)=K(5, 6)$$

Marking Scheme Notes
Question 4 (b) (i) [Scale 5D (0, 2, 4, 5)]
2: • Formula for ratio with some correct substitution
• Effort at setting up translation
4: • Substitution into ratio formula fully correct
• One ordinate only found
• Correct answer without supporting work

Question 4 (b) (ii)

Centre $K(5, 6) = (h, k)$, $r_2 = 2\sqrt{10}$

Equation of s_2: $(x-5)^2 + (y-6)^2 = (2\sqrt{10})^2$

$$(x-5)^2 + (y-6)^2 = 40$$

Marking Scheme Notes
Question 4 (b) (ii) [Scale 10C (0, 4, 8, 10)]
4: • Identifies centre
• Identifies radius
8: • Equation of circle formed but error in substitution

Question 4 (c)

Call t the equation of the common tangent.
Line AB is perpendicular to t.

Finding the slope from the equation of a line:

$l: ax + by + c = 0$

$$m = -\frac{a}{b} \Rightarrow m_{\perp} = \frac{b}{a}$$

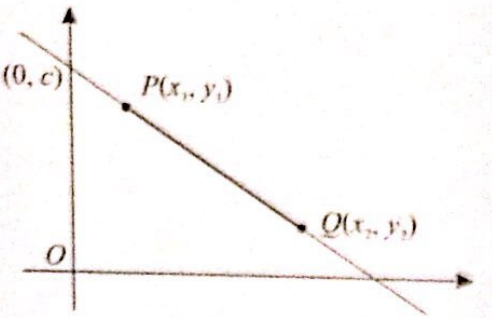
Slope of AB: $m = \frac{12-(-6)}{7-1} = 3$

Slope of t: $m_{\perp} = -\frac{1}{3}$

Equation of t: $B(7, 12) = (x_1, y_1)$, $m = -\frac{1}{3}$

$$y - 12 = -\frac{1}{3}(x-7)$$
$$3(y-12) = -1(x-7)$$
$$3y - 36 = -x + 7$$
$$x + 3y - 43 = 0$$

Formulae and Tables Book
Co-ordinate geometry: Line



Slope of PQ [page 18]

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Equation of PQ [page 18]

$$y - y_1 = m(x - x_1)$$

Marking Scheme Notes
Question 4 (c) [Scale 5C (0, 2, 4, 5)]
2: • Slope AB or slope of tangent
• Some correct substitution into relevant formula
4: • Equation of line fully substituted