Question 4   **(25 marks)**

(a)   Scale 5B (0, 2, 5)
   Partial Credit:
   ▪ Centre or radius

(b)(i)   Scale 5C (0, 2, 4, 5)
   Low *Partial Credit:*
   ▪ Formula for ratio with some correct substitution
   ▪ Effort at setting up translation

   High Partial Credit:
   ▪ Substitution into ratio formula fully correct
   ▪ One ordinate only found
   ▪ Correct answer without supporting work

(b)(ii)   Scale 10C (0, 4, 8, 10)
   Low Partial Credit:
   ▪ Identifies centre
   ▪ Identifies radius

   High Partial Credit:
      ▪ Equation of circle formed but error in substitution

(c)   Scale 5C (0, 2, 4, 5)
   Low Partial Credit:
   ▪ Slope *AB* or slope of tangent
   ▪ Some correct substitution into relevant formula

   High Partial Credit:
   ▪ Equation of line fully substituted

Question 4   **(25 marks)**

Two circles s and c touch internally at B, as shown.
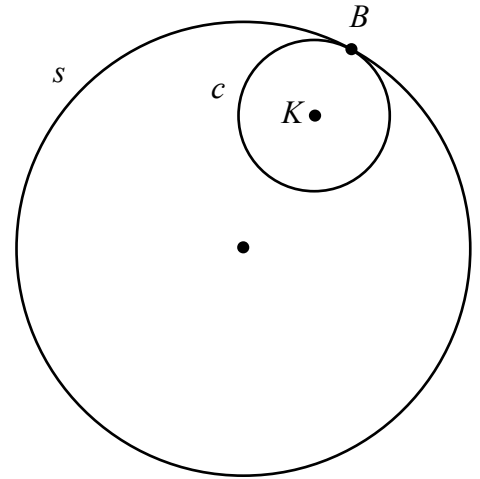
(a) The equation of the circle s is
$$(x-1)^2 + (y+6)^2 = 360.$$
Write down the co-ordinates of the centre of s.

> Centre: $(1, -6)$

Write down the radius of s in the form $a\sqrt{10}$, where $a \in \mathbb{N}$.

> Radius: $\sqrt{360} = 6\sqrt{10}$

(b) **(i)** The point K is the centre of circle c.
The radius of c is one-third the radius of s.
The co-ordinates of B are $(7, 12)$.
Find the co-ordinates of K.

	or
$\|AK\|:\|KB\| = 2:1$ $K\left(\dfrac{2\times 7 + 1\times 1}{2+1}, \dfrac{2\times 12 + 1\times -6}{2+1}\right) = (5, 6)$	Centre of s to B (translation) X ordinate goes up by 6 Y ordinate goes up by 18 $\dfrac{2}{3}(6)+1 = 5$ $\dfrac{2}{3}(18)-6 = 6$

(ii) Find the equation of c.

> $(x-5)^2 + (y-6)^2 = \left(2\sqrt{10}\right)^2 = 40$

(c) Find the equation of the common tangent at B.
Give your answer in the form $ax + by + c = 0$, where $a, b, c \in \mathbb{Z}$.

> Slope $AB = \dfrac{12+6}{7-1} = \dfrac{18}{6} = 3$
>
> Slope of tangent $= -\dfrac{1}{3}$
>
> Equation: $y - 12 = -\frac{1}{3}(x-7) \implies x + 3y - 43 = 0$

Question 4 **(25 marks)**

(a) **Scale 5B (0, 2, 5)**
Partial Credit:
- Centre or radius

(**b)(i)** **Scale 5C (0, 2, 4, 5)**
Low *Partial Credit:*
- Formula for ratio with some correct substitution
- Effort at setting up translation

High Partial Credit:
- Substitution into ratio formula fully correct
- One ordinate only found
- Correct answer without supporting work

(b)(ii) **Scale 10C (0, 4, 8, 10)**
Low Partial Credit:
- Identifies centre
- Identifies radius

High Partial Credit:
- Equation of circle formed but error in substitution

(c) **Scale 5C (0, 2, 4, 5)**
Low Partial Credit:
- Slope *AB* or slope of tangent
- Some correct substitution into relevant formula

High Partial Credit:
- Equation of line fully substituted