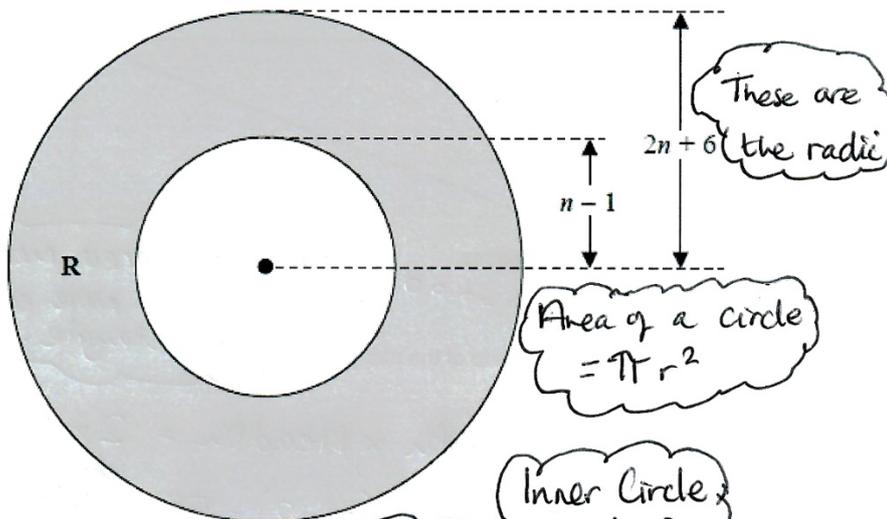**Quadratic Questions**

**Example and Explanation**

**Q1.**

The region **R**, shown shaded in the diagram, is the region between two circles with the same centre.

*These are the radii*

$2n + 6$

$n - 1$

R

*Area of a circle* $= \pi r^2$

*Inner Circle* $\pi(n-1)^2$

The outer circle has radius $(2n + 6)$
The inner circle has radius $(n - 1)$
All measurements are in centimetres.

*Outer Circle* $\pi(2n+6)^2$

*This is* $\pi(n-1)^2$

The area of **R** is greater than the area of a circle of radius $(n + 13)$ cm.

$n$ is an integer.

$Area_O = \pi r^2$

Find the least possible value of $n$.
You must show all of your working.

$\pi(2n+6)(2n+6) - \pi(n-1)(n-1) > \pi(n+13)(n+13)$

$\therefore ((4n^2 + 24 + 36) - (n^2 - 2n + 1))\pi > (n^2 + 26n + 169)\pi$

$\therefore (3n^2 + 26n + 35)\pi > (n^2 + 26n + 169)\pi$

$\therefore$

$\Rightarrow$ *Divide by $\pi$ on both sides*

$(2n^2)\pi > 134\pi$

$2n^2 > 134$

$n^2 > 67$

$8^2 = 64$
$67 > 64$ so the answer must be 9
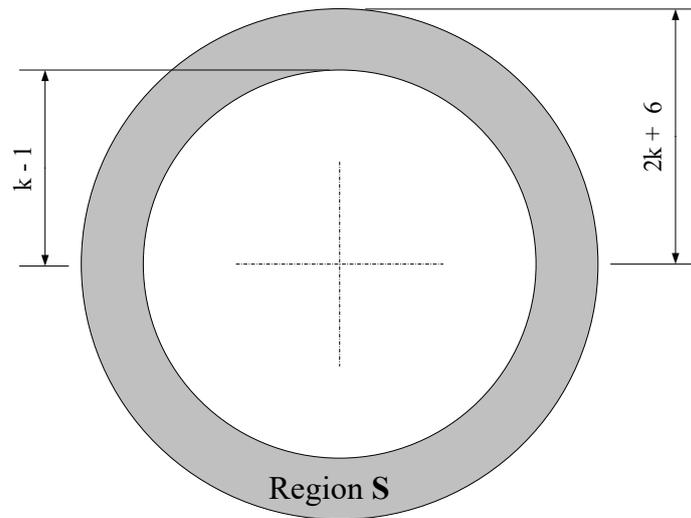
$\Rightarrow$

As $n \in \mathbb{Z}$, $\sqrt{67} > 8$ so $n \geq 9$.

*Means Integers*

9

**(Total for question = 5 marks)**

**Q1**

The region **S** shown in the diagram below is the region between two concentric circles.  Concentric means that the circles have the same centre.



Region **S**

The outer circle has radius (2k+ 6).
The inner circle has radius (k – 1).
All measurements are in metres.

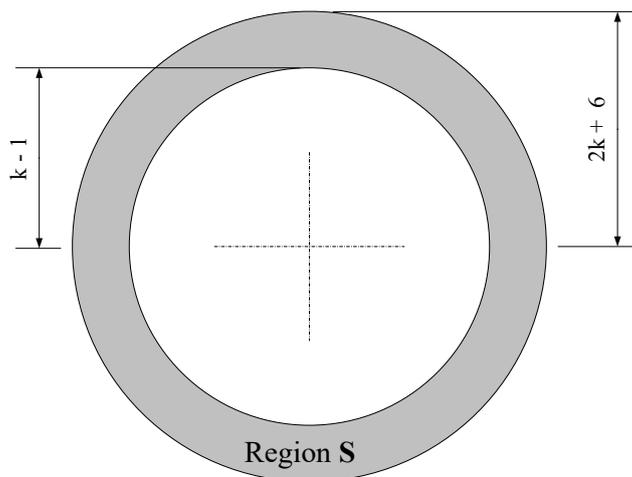The area of **S** is *greater than* the area of a circle of radius (k + 13) m.

k is an integer.

Find the least possible value of k.
You must show all your working.

**Q2**

The region **S** shown in the diagram below is the region between two concentric circles.



The outer circle has radius (2k+ 6).
The inner circle has radius (k – 1).
All measurements are in centimetres.

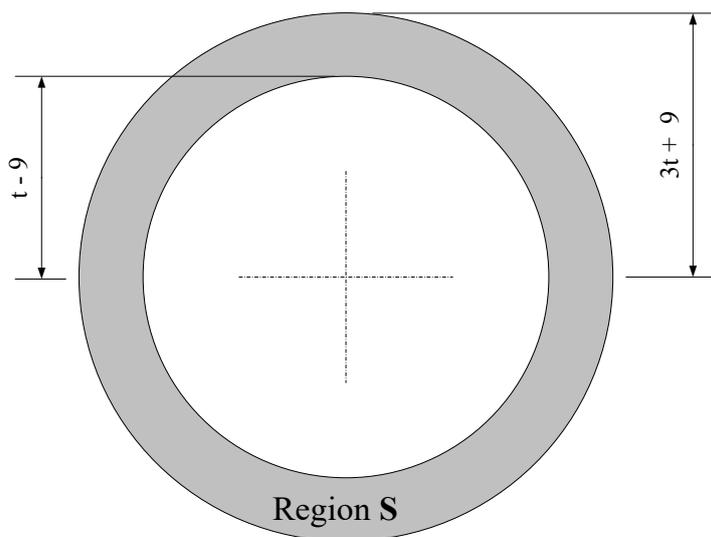The area of **S** is *less than* the area of a circle of radius (k + 13) m.

k is an integer.

Find the maximum possible value of k.
You must show all your working.

**Q3**

The region **S** shown in the diagram below is the region between two concentric circles.



Region S

The outer circle has radius (3t+ 9).
The inner circle has radius (t – 9).
All measurements are in metres.

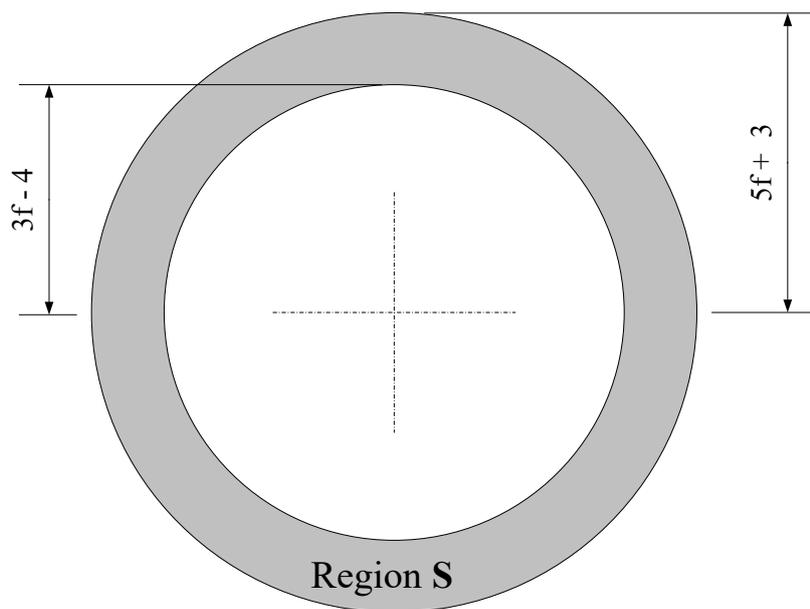The area of **S** is *greater than* the area of a circle of radius (t + 15) m.

t is an integer.

Find the least possible value of t.
You must show all your working.

**Q4**

The region **S** shown in the diagram below is the region between two concentric circles.



Region S

The outer circle has radius (5f + 3).
The inner circle has radius (3f - 4).
All measurements are in centimetres.

The area of **S** is *greater than* the area of a circle of radius (2f - 14) m.

f is an integer.

Find the least possible value of f.
You must show all your working.

**Knowledge Test**

1. Concentric means …

2. What is the name given to equations of the type $3x^4 + 5x^3 - 12x^2 + x - 41 = 12$ ?

3. $(3x + 7)$ is called a b……. .

4. An equation of highest order two is called a _____ _____ .

5. An equation of highest order three is called a _____ _____.

6. Circle the formula for the area of a circle.

$$\pi d \qquad \frac{4}{3}\pi r^3 \qquad 4\pi r^2 \qquad \pi r^2$$