

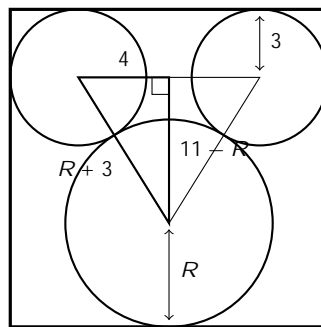
MATHEMATICS ENRICHMENT CLUB.
Problem Sheet 11 Solutions, August 20, 2019

1. Firstly note that

$$\begin{aligned} \frac{n^2 + 11n + 2}{n + 5} &= \frac{n^2 + 11n + 30}{n + 5} - \frac{28}{n + 5} \\ &= \frac{(n + 5)(n + 6)}{n + 5} - \frac{28}{n + 5} \\ &= (n + 6) - \frac{28}{n + 5} \end{aligned}$$

This means that the LHS is an integer if $(n + 5)$ is a factor of 28. The positive factors of 28 are 1; 2; 4; 7; 14; 28, so the positive solutions for n are 2; 9; 23.

2. Let R be the radius of the big circle. Draw a triangle that connects the centre of each circles, then bisect the this triangle into two right-angled triangles; as shown in the diagram.



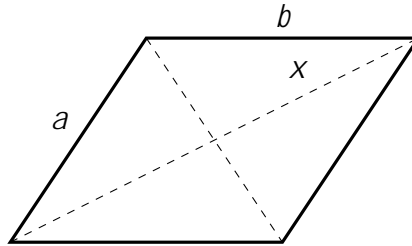
From the diagram, we can see that the hypotenuse of the right-angled triangle has length $R + 3$, and short sides of length 4 and $11 - R$. Now by Pythagoras, we have

$$4^2$$

1;2;

Senior Questions

1. (a) Let one of the internal angles of the parallelogram be x . Then the other internal angle is $180^\circ - x$.



2. The example shows that -4 is in T . We have further that -1 is in T , because $-1 = (5 - 4) = (0 + 1)$. Also 3 is in T , because $3 = (4 - 1) = (0 + 3)$. Continuing in this way, we can eventually obtain $\{ -5, -4, \dots, 4, 5 \} \subset T$; that is the integers from -5 to 5 are all elements of the set T .