3. Let R be the radius of the big circle. Draw a triangle that connects the centre of each

x_1 has remainder 1 when divided by 5, then x_1 must be one of $1, 6, 11, \ldots$.

4. First we write

$$\frac{n^2 + 11n + 2}{n + 5} = \frac{n^2 + 10n - 3}{n + 5} + 1;$$

and then we complete the square on the nominator of the fraction appearing in the RHS of the above equation,

$$\frac{n^2 + 10n - 3}{n + 5} + 1 = \frac{(n + 5)^2 - 28}{n + 5} + 1$$
$$= n + 5 - \frac{28}{n + 5} + 1:$$

Now to get an integer on the last line of the above equation, the second term tells us that 28 must be divisible by $n+5$. Since the factors of 28 are $\pm 1; \pm 2; \pm 4; \pm 7; \pm 14; \pm 28$, we conclude that $n = 2; 9$ or 23 (here we eliminated the factors that gives a negative n value).

5. 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 $\{-5; -4; \dots; 4; 5\} \in T$; that is the integers from -5 to 5 are all elements of the set T.

Now to show that every integer is in T, we argue with induction as follows: suppose the set of integers $\{-n; \dots; n\}$ is in T, since we already know that the case of $n = 5$ is true by the above, it remains to show that $-n-1$ and $n+1$ is also in T. $n+1$ is in T, because $n+1 = -[(-1)+(-n)] = -[(-2)+(-n+1)]$. It follows that $-n-1$ is also in T, because $-n-1 = -[n+1+0] = -[(n-1)+2]$.

Senior Questions

1].

3. Rewrite the equation in the form $a(c \quad b) = (10b + c)d$, then since a and d are co-prime, we can conclude that $(c \quad b)$ is positive and divisible by d. Thus $c = \quad b + kd$, where k is a positive integer. Substituting the last equation of c back into the original equation gives (