3. A sequence $\{u_n\}$ is given by

$$u_1 = k$$
$$u_{2n} = u_{2n-1} \times p \qquad n \geqslant 1$$
$$u_{2n+1} = u_{2n} \times q \qquad n \geqslant 1$$

where k, p and q are positive constants with $pq \neq 1$

(a) Write down the first 6 terms of this sequence.

(3)

(b) Show that $\displaystyle\sum_{r=1}^{2n} u_r = \frac{k(1+p)\left(1-(pq)^n\right)}{1-pq}$

(6)

In part (c) $[x]$ means the integer part of x, so for example $[2.73] = 2$, $[4] = 4$ and $[0] = 0$

(c) Find $\displaystyle\sum_{r=1}^{\infty} 6 \times \left(\frac{4}{3}\right)^{\left[\frac{r}{2}\right]} \times \left(\frac{3}{5}\right)^{\left[\frac{r-1}{2}\right]}$

(4)