

$$u_1 = \frac{1}{5}$$

$$\frac{1}{k+c} = \frac{1}{5}$$

$$c = 5 - k$$

M1

$$u_2 = \frac{10 \times \frac{1}{5}}{1 + 16 \times \frac{1}{5}} = \frac{10}{21}$$

$$u_3 = \frac{10 \times \frac{10}{21}}{1 + 16 \times \frac{10}{21}} = \frac{100}{181}$$

M1

$$u_2 = \frac{a}{ka+c} = \frac{10}{21}$$

$$ka+c = \frac{21a}{10}$$

M1

$$u_3 = \frac{a^2}{ka^2+c} = \frac{100}{181}$$

$$ka^2+c = \frac{181a^2}{100}$$

M1

$$ka + (5 - k) = \frac{21a}{10}$$

$$k(a - 1) = \frac{21a}{10} - 5$$

M1

$$ka^2 + (5 - k) = \frac{181a^2}{100}$$

$$k(a^2 - 1) = \frac{181a^2}{100} - 5$$

M1

$$\frac{k(a^2 - 1)}{k(a - 1)} = \frac{\frac{181a^2}{100} - 5}{\frac{21a}{10} - 5}$$

$$(a + 1) = \frac{181a^2 - 500}{210a - 500}$$

M1

$$210a^2 - 290a - 500 = 181a^2 - 500$$

$$29a^2 - 290a = 0$$

M1

$$a(a - 10) = 0$$

$$a = 10, a \neq 0$$

M1

$$k(10 - 1) = \frac{21(10)}{10} - 5$$

$$k = \frac{16}{9}$$

M1

$$c = 5 - \frac{16}{9}$$

$$c = \frac{29}{9}$$

M1

$$u_n = \frac{10^{n-1}}{\frac{29}{9} + \frac{16}{9} \times 10^{n-1}}$$

B1

[12]

[12 marks]