

2. The sequence  $u_1, u_2, u_3, \dots$  is defined by

$$u_{n+1} = pu_n + q$$

where  $p$  and  $q$  are constants.

Given that  $u_1 = 4$

(a) write down  $u_2$  in terms of  $p$  and  $q$ .

(1)

Given also that

•  $u_2 = 10$

•  $\sum_{r=1}^3 u_r = 42$

(b) find the value of  $p$  and the value of  $q$ .

(3)

(a)  $u_2 = pu_1 + q = 4p + q$  (1 mark)

(b) Given  $u_2 = 10$ ,  $4p + q = 10$  (1 mark)

Given  $u_1 + u_2 + u_3 = 42$

$$4 + 10 + u_3 = 42 \Rightarrow u_3 = 42 - 4 - 10 = 28$$

But  $u_3 = pu_2 + q = 10p + q$

So,  $10p + q = 28$

Solving Simultaneous Equations,  
(could use Calculator)

$$\begin{array}{r} 10p + q = 28 \\ - (4p + q = 10) \\ \hline 6p = 18 \end{array} \Rightarrow p = 3$$

$$4(3) + q = 10$$

$$\Rightarrow q = -2$$

(2 marks)