Question Number	Scheme	Notes	Marks
8 **Way 1 f(*k*+1)=...** **Way 2 overleaf**	$f(n)=3^{2n+4}-2^{2n}$ May see subtle variations e.g., replacing f(*k*) with "5α" Accept a proof that is done in terms of another variable including *n*		
	$f(1)=3^6-2^2=725$	Correct value (or 5 x 145) for $n=1$	**B1**
	Assume true for $n=k$ so that $3^{2k+4}-2^{2k}$ is divisible by 5		
	$\{f(k+1)=\}3^{2(k+1)+4}-2^{2(k+1)}$	Attempts $f(k+1)$.	**M1**
	$\{f(k+1)=\}3^{2k+6}-2^{2k+2}=9\times3^{2k+4}-9\times2^{2k}+5\times2^{2k}$ or $4\times3^{2k+4}-4\times2^{2k}+5\times3^{2k+4}$	Obtains a 3 term expression which includes terms of the form $...\times3^{2k+4}$ & $...\times2^{2k}$ which might be implied by introduction of f(*k*). 3rd term must include a function of *k* as a power	**dM1**
	$f(k+1)=9f(k)+5\times2^{2k}$ or $f(k+1)=4f(k)+5\times3^{2k+4}$ Accept e.g., $f(k+1)=4f(k)+405\times3^{2k}$ or $f(k+1)=5(9\alpha+2^{2k})$ Correctly expresses $f(k+1)$ in terms of $f(k)$ with $f(k)$ isolated. Allow $f(k+1)=9(3^{2k+4}-2^{2k})+5\times2^{2k}$ or $f(k+1)=4(3^{2k+4}-2^{2k})+5\times3^{2k+4}$ $f(k+1)$ must be explicitly seen at some point. Allow recovery from poor bracketing.		**A1**
	If the result is **true for *n* = *k* then** it is **true for *n* = *k* + 1**. As the result has been shown to be **true for *n* = 1**, then the result is **true for** (all) ***n*** Correct conclusion or narrative. Minimum in bold. Accept surrogates for "true". Accept e.g., "$n\in Z$" for "$n\in Z^+$" but not "$n\in R$". If "assume true for $n=k$" is seen the "if...then" is not required. There is no requirement to say or demonstrate that e.g., 725, 405, 45 etc are divisible by 5. Requires all previous marks.		**A1**
			(Total 5 marks)

Question Number	Scheme	Notes	Marks
8 **Way 2** **f(k+1) -mf(k)=...** **Note: It is not essential to choose a value for m**	$f(n)=3^{2n+4}-2^{2n}$ May see subtle variations e.g., replacing f(k) with "5α" Accept a proof that is done in terms of another variable including n		
	$f(1)=3^6-2^2=725$	Correct value (or 5 x 145) for n = 1	**B1**
	$f(k+1)-mf(k)=3^{2(k+1)+4}-2^{2(k+1)}-m\left(3^{2k+4}-2^{2k}\right)$ If $m=1$: $f(k+1)-f(k)=3^{2(k+1)+4}-2^{2(k+1)}-\left(3^{2k+4}-2^{2k}\right)$ If $m=-1$: $f(k+1)+f(k)=3^{2(k+1)+4}-2^{2(k+1)}+3^{2k+4}-2^{2k}$	Attempts $f(k+1)$, can be scored as Way 1 but is likely to be within an attempt at $f(k+1)-m\,f(k)$	**M1**
	$f(k+1)-mf(k)=(9-m)\times\left(3^{2k+4}-2^{2k}\right)+5\times2^{2k}$ or $f(k+1)-mf(k)=(4-m)\left(3^{2k+4}-2^{2k}\right)+5\times3^{2k+4}$ If $m=1$: $f(k+1)-f(k)=8\times\left(3^{2k+4}-2^{2k}\right)+5\times2^{2k}$ or $3\left(3^{2k+4}-2^{2k}\right)+5\times3^{2k+4}$ If $m=-1$: $f(k+1)+f(k)=10\times\left(3^{2k+4}-2^{2k}\right)+5\times2^{2k}$ or $5\left(3^{2k+4}-2^{2k}\right)+5\times3^{2k+4}$ If $m=4$: $f(k+1)-4f(k)=5\times3^{2k+4}$ or $5\times\left(3^{2k+4}-2^{2k}\right)+5\times2^{2k}$ If $m=9$: $f(k+1)-9f(k)=5\times2^{2k}$ or $-5\times\left(3^{2k+4}-2^{2k}\right)+5\times3^{2k+4}$ Obtains a 3 term expression (**but see note below**) which includes terms of the form $...\times3^{2k+4}$ or $...\times2^{2k}$ but allow only seeing 1 of these if 4 or 9 is used for m and allow e.g., $5\times3^{2k+4}$ as 405×3^{2k}. 3rd term must include a function of k as a power. **Note** that it is possible that the expression on the RHS could be written as a multiple of 5 without involving f(k) e.g., $f(k+1)+f(k)=3^{2k+6}-2^{2k+2}+3^{2k+4}-2^{2k}=9\times3^{2k+4}-4\times2^{2k}+3^{2k+4}-2^{2k}=10\times3^{2k+4}-5\times2^{2k}$ In such cases the work must be correct.		**dM1**
	$f(k+1)=9f(k)+5\times2^{2k}$ or $f(k+1)=4f(k)+5\times3^{2k+4}$ Accept e.g., $f(k+1)=4f(k)+45\times3^{2k+2}$ Correctly expresses $f(k+1)$ in terms of $f(k)$ with $f(k)$ isolated. Must make $f(k+1)$ the subject unless there is mention of e.g., "RHS is divisible by 5 so $\Rightarrow f(k+1)-m\,f(k)$ is divisible by 5" oe. Allow $f(k+1)=9\left(3^{2k+4}-2^{2k}\right)+5\times2^{2k}$ or $f(k+1)=4\left(3^{2k+4}-2^{2k}\right)+5\times3^{2k+4}$ $f(k+1)$ must be explicitly seen at some point. Allow recovery from poor bracketing.		**A1**
	If the result is **true for $n=k$ then** it is **true for $n=k+1$**. As the result has been shown to be **true for $n=1$**, then the result is **true for** (all) n Correct conclusion or narrative. Minimum in bold. Accept surrogates for "true". Accept e.g., "$n\in Z$" for "$n\in Z^+$" but not "$n\in R$". If "assume true for $n=k$" is seen the "if...then" is not required. There is no requirement to say or demonstrate that e.g., 725, 405, 45 etc are divisible by 5. Requires all previous marks.		**A1**
			(Total 5 marks)