			(3)
			Total 8

Question Number	Scheme	Notes	Marks
9(i)	$u_n = 5\times 2^{n-1} - n\times 2^n$		
	$n=1 \Rightarrow u_1 = 5\times 2^0 - 1\times 2 = 3$ (Shows the result is true for $n = 1$)		B1
	Assume true for $n = k$ so that $u_k = 5\times 2^{k-1} - k\times 2^k$		
	$u_{k+1} = 2\left(5\times 2^{k-1} - k\times 2^k\right) - 2^{k+1}$	Attempts u_{k+1} using the recurrence relationship	M1
	$= 5\times 2^k - k\times 2^{k+1} - 2^{k+1}$	Correct expanded expression	A1
	$= 5\times 2^k - (k+1)2^{k+1}$	Achieves this result with no errors	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.		A1cso
	The final mark depends on all except the B mark, though a check for $n = 1$ must have been attempted.		
			(5)
(ii)	$f(n) = 5^{n+2} - 4n - 9$		
	$f(1) = 125 - 4 - 9 = 112 = 16\times 7$	Shows f(1) is divisible by 16 Either of 112 or 16×7 must be seen	B1
	Assume true for $n = k$ so that $5^{k+2} - 4k - 9$ is divisible by 16		
	$f(k+1) = 5^{k+3} - 4(k+1) - 9$	Attempts f(k + 1)	M1
	$= 5\times\left(5^{k+2} - 4k - 9\right) + ...$	Attempts to express in terms of f(k)	dM1
	$= 5\times\left(5^{k+2} - 4k - 9\right) + 16k + 32$	Correct expression for f(k + 1)	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.		A1cso
	The final mark depends on all except the B mark, though a check for $n = 1$ must have been attempted		**(5)**
			Total 10

ii ALT 1	$f(1)=125-4-9=112=16\times 7$	Shows f(1) is divisible by 16 Either of 112 or 16×7 must be seen	B1
	Assume $5^{k+2}-4k-9$ is divisible by 16		
	$f(k+1)-mf(k)=5^{k+3}-4(k+1)-9-m\left(5^{k+2}-4k-9\right)$ Attempt f(k+1) – mf(k)		M1
	$=(5-m)\left(5^{k+2}-4k-9\right)+...$	Attempts to express in terms of f(k)	dM1
	$f(k+1)=5\times\left(5^{k+2}-4k-9\right)+16k+32$	Correct expression for f(k + 1)	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.		A1cso
	The final mark depends on all except the B mark, though a check for $n = 1$ must have been attempted		
ii ALT 2	$f(1)=125-4-9=112=16\times 7$	Shows f(1) is divisible by 16 Either of 112 or 16×7 must be seen	B1
	Assume $5^{k+2}-4k-9$ is divisible by 16		
	$f(k+1)-f(k)=5^{k+3}-4(k+1)-9-\left(5^{k+2}-4k-9\right)$ Attempt f(k+1) – f(k)		M1
	$f(k+1)-f(k)=5\times 5^{k+2}-5^{k+2}-4k-4-9+4k+9$ $=4\times 5^{k+2}-4=4\left(5^{k+2}-1\right)$ Obtains a simplified expression for the difference **and** attempts to prove $\left(5^{k+2}-1\right)$ is divisible by 4 using induction		dM1
	Correct proof for $\left(5^{k+2}-1\right)$ being divisible by 4 and states that thus as the difference is divisible by 16, $f(k+1)$ is divisible by 16		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.		A1 cso
	The final mark depends on all except the B mark, though a check for $n = 1$ must have been attempted		
ii ALT 3	$f(1)=125-4-9=112=16\times 7$	Shows f(1) is divisible by 16 Either of 112 or 16×7 must be seen	B1
	f(k) is divisible by 16 so set $f(k)=16\lambda$		
	$5^{k+2}=16\lambda+4k+9$		M1
	$f(k+1)=5^{k+3}-4(k+1)-9$ $=5\times 5^{k+2}-4k-13=5(16\lambda+4k+9)-4k-13$	Expresses f(k + 1) in terms of λ and k and collects terms	dM1
	$=80\lambda+16k+32$	Correct expression May have factor of 16 taken out	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.		A1cso
	The final mark depends on all except the B mark, though a check for $n = 1$ must have been attempted		

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