MX SP 12 MX 1	**12 d 12 a**	Use mathematical induction to prove that $2^{3n} - 3^n$ is divisible by 5 for $n \geq 1$.	**3**

Test $n = 1$: $2^3 - 3^1 = 8 - 3$

$= 5$, which is divisible by 5 $\therefore$ true for $n = 1$

Let $n = k$ be a value for which the result is true.
Let $2^{3k} - 3^k = 5M$, where M is an integer.

Now prove true for $n = k + 1$

$$2^{3(k+1)} - 3^{k+1} = 2^{3k+3} - 3^{k+1}$$
$$= 2^{3k}.2^3 - 3^k.3$$
$$= 8 \times 2^{3k} - 3.3^k$$
$$= 5 \times 2^{3k} + 3 \times 2^{3k} - 3.3^k$$
$$= 5 \times 2^{3k} + 3(2^{3k} - 3^k)$$
$$= 5 \times 2^{3k} + 3(5M)$$
$$= 5[2^{3k} + 3M]$$, which is divisible by 5 $\therefore$ true for $n = k + 1$

$\therefore$ by the principle of mathematical induction, the result is true for all integers $n \geq 1$.

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