Shorter Solution (using congruences)

$a_1 = 14$, $a_2 = 14^2-1 = 196-2 = 194$.

Now $a_2 = 194 \equiv 8 \pmod{31}$ (since $194 = (6.31)+8$)

Therefore $a_2 \equiv 8^2 \pmod{31}$

$a_2^2-2 \equiv 8^2-2 \equiv 64-2 \equiv 62 \equiv 0 \pmod{31}$

$a_3 \equiv 0 \pmod{31}$. Therefore M_5 divides a_3, and M_5 is prime.

SECONDARY SCHOOL MATHEMATICS

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There has been quite an amount of discussion for some time now on the content of mathematics courses in secondary schools. Many people feel that there has been a general decline in the level of computational skill and ability to solve problems in students who leave school. Various attempts are being made to identify the reasons for this and to find remedies. Among the reasons suggested are the following:-

(1) The "New Math",

(2) Over-emphasis on teaching "concepts" and a feeling that as long as the "concepts" are O.K., the answer doesn't matter,

(3) The more abstract presentation of material, particularly geometry, with the result that the students are not taught to relate mathematics to commonsense and experience,

(4) An unwillingness on the part of teachers and pupils to spend large amounts of time going through, perhaps somewhat dull and repetitive routines, in order that students get to know these techniques thoroughly.

At present, there is a great deal of debate going on throughout the world on the value of the so-called New Math. (i.e. sets, relations

nd functions done abstractly, geometry based on axioms about mappings, etc) and there appears to be a growing feeling against its being appropriate material for secondary school curricula. While very many mathematicians would not lament if students never heard the word set or group in a mathematical context before coming to Third Level courses, completely reversing curricula to what they were twenty years ago would not necessarily solve the problem. In the U.K. similar difficulties in relation to computational ability have been encountered, despite the fact that relatively little of the New Math. has been introduced in curricula there.

In relation to (2),(3) above, many remedies are being suggested, such as that pupils (particularly pass level students) should only be subjected to Mathematics which is immediately applicable in non-mathematical areas (e.g. calculation of area, volume, compound interest, etc.). However, to concentrate on teaching students formulae and results (without proofs) and applying them in the most obvious way, is very far from the ideal of mathematics as a precise logical structure. Also, the type of mathematics which is applicable depends very much on the area of application and also on the sophistication of the applier. For example, the "non-applicable" binomial theorem becomes important in later applications of probability. The teaching of geometry in schools has always created problems. Weaker students have often just succeeded in learning off proofs by heart. The new geometry (using mappings) was to some extent intended to remove the constructive element in Euclidean geometry and make the subject more amenable to algebraic techniques. However, it appears to be generally felt that it has not succeeded and that the weaker students now know even less geometry than they did before.

Many people think that (4) is symptomatic of a general feeling in society that things should always be "easy" and "not boring". There is also an emphasis on "discovery" as a method of teaching rather than teacher stating the facts. While many mathematicians view the teachings of educational theorists and sociologists with cynicism if not outright amusement, these theorists have quite an influence on the design of curricula etc., particularly at primary level and their views should be considered and challenged if that is felt appropriate.

In Great Britain, a core syllabus for A Level Mathematics has been proposed recently and it is reasonable to expect that in the next few years here, many proposals to change the existing structures will also be put forward. I feel that mathematicians should express their views on this matter, since the future mathematical life of the country depends very much on fostering and developing an interest in, and knowledge of, mathematics in schools.