Re: Ed Barbeau's "Pell's Equation"

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- *From*: "Karl M. Bunday" <kmbunday@xxxxxxxxxxxx>
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sttscitrans@xxxxxxxxx wrote, replying to an earlier reply to his thread−opening question:

> |> A reviewer mentions that there is a chapter
> |> on "the cubic analog of Pell's equation"
> |> in Barbeau's book. Could anyone who has
> |> read this chapter tell me what this
> |> analog actually is ?

> Thanks, I suspect the analog is
> probably x^3 +ky^3 +(k^2)z^3 −3kxyz=1

That appears to be what Barbeau had in mind, based on Power Play page 91, where the equation is given as

"The cubic analogue of Pell's equation is

$$x^3 + dy^3 + d^2z^3 − 3dxyz = 1$$

If (x, y, z) is a solution in large positive integers, then from the factorization of the left side, x + d^(1/3)y + d^(2/3)z would be large and of x − d^(1/3)y, y − d^(1/3)z and x − d^(2/3)z would have to be very small. Thus we look for x/y and y/z to be close to the cube root of d."

> The reviewer seems to suggest that Barbeau
> gives a method of solving these higher
> degree Pell analogs and as I have recently
> found a method that seems to work, I
> was wondering what Barbeau's method was.
> Apparently, he also deals with Pell analogs
> in his book "Powerplay", however according
> to the inter−library loan service there isn't

> a single copy available in the GB.

That makes me feel glad to have Power Play in my home library.

Barbeau, Edward J. (1997). Power Play. Washington, DC: Mathematical Association of America.

Barbeau outlines a procedure which he describes on page 92 like this:

"Unlike the quadratic case, the process for the cubic does not seem to have nice structural properties. While it might not work for every value of d, it seems to generate a solution surprisingly often. When it does generate a solution, it does not pick up every solution, but actually misses quite a few. Any reader with access to highpowered computer software like Mathematica is earnestly invited to experiment. See the appendix for further details."

The appendix describes the process in more detail, and begins by saying it is for persons with "university level mathematics."

It's late in my time zone and I need to turn in, but I could type up more by request. I dare not paraphrase as I hardly understand this myself, having only secondary level mathematics except for some recreational reading I've done in the last few years.

> Perhaps, I'll have more luck with "Pell's Equation".

I think that is the more recent and more thorough book by Barbeau on that subject. Good luck.

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