

Re: solving CAGR challenge

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- *From:* Noone <noone@xxxxxxxxxxxxxxxx>
 - *Date:* Mon, 28 Jan 2008 20:22:33 -0500
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On Mon, 28 Jan 2008 14:32:28 -0800 (PST), pete <ptgallant@xxxxxxxx> wrote:

On Jan 25, 5:07 pm, quasi <qu...@xxxxxxxx> wrote:

On Fri, 25 Jan 2008 13:38:55 -0800 (PST), pete <ptgall...@xxxxxxxx> wrote:

I want to rearrange the following formula to solve for R
where

$$V = (S * ((1 + R)^{(N+1)} - 1) / (R)) - S.$$

where:

$$S = 10$$

$$V = 39.93375$$

$$N = 3$$

I know the answer is .15.

Essentially, if I compound a starting amount of 10 at a rate of 15% for 3 years, the cumulative sum is 39.93375. How do I solve for the rate if I am given the cumulative sum, the period in years, and the starting amount?

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For the numbers you specified, you can solve exactly using elementary algebra.

Make sure to use rational numbers instead of decimals.

Simply substitute the given numbers in the equation, get all the terms on one side, zero on the other side, then factor.

quasi

Can you walk me through the elementary algebra steps to get to a formula that starts $R = \underline{\hspace{2cm}}$

My algebra is rusty and I'm having trouble rearranging the exponential portions of the equation.

Thanks

Pete

There is no simple algebraic formula of the form " $R =$ ".

Rewriting your formula slightly, we have

$$[(1+R)^{N+1} - 1] / R = (V + S) / S$$

For integer values of $N > 0$, the left hand side is a polynomial in R of degree N . Here are the polynomials for the first few values of N :

$$N = 1: R + 2$$

$$N = 2: R^2 + 3R + 3$$

$$N = 3: R^3 + 4R^2 + 6R + 4$$

$$N = 4: R^4 + 5R^3 + 10R^2 + 10R + 5$$

Thus, given values for V , S , and N , the basic problem to find the roots of a polynomial of degree N . There is no simple "formula" for doing this for values of $N > 4$. Indeed, finding the solution "by hand" for $N > 2$ is a task to be avoided. In general, numerical methods are needed to solve for R .

For the values you gave above, namely

$$S = 10$$

$$V = 39.93375$$

$$N = 3$$

the polynomial is

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$$R^3 + 4 R^2 + 6 R + 4 = (39.93375 + 10) / 10$$

$$R^3 + 4 R^2 + 6 R - 0.993375 = 0$$

This polynomial has one real root, $R = 3/20 = 0.15$

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