

Jennifer establishes an investment account to pay for college expenses for her daughter. She plans to invest  $X$  at the beginning of each month for the next 21 years. Beginning at the end of the 18th year, she will withdraw 20,000 annually. The final withdrawal at the end of the 21st year will exhaust the account. She anticipates earning an annual effective yield of 8% on the investment. Calculate  $X$ .

The answer uses future value but I should be able to use present value so I set it up:

$$\text{First } i = (1.08)^{\frac{1}{12}} - 1 = .006434$$

$$x \frac{1 - (1.006434)^{-252}}{.006434} (1.006434) = 20,000 \frac{1 - (1.08)^{-4}}{.08} (1.08)^{-18}$$

This gives me the wrong answer but if I change  $(1.08)^{-18}$  to  $(1.08)^{-17}$  I get the correct answer of 142.83. It should be brought back 18 years I don't understand why it works with 17. Any help would be great.