Answer on question #39240, Math, Algebra

Achieve $225,500 at 8.95% compounded continuously for 8 years, 125 days. Find the present value.

Solution:

We have to find the present value, using the present value formula. The continuous compounding formula is used to determine the interest earned on an account that is constantly compounded, essentially leading to an infinite amount of compounding periods.

The effect of compounding is earning interest on an investment, or at times paying interest on a debt, that is reinvested to earn additional monies that would not have been gained based on the principal balance alone. By earning interest on prior interest, one can earn at an exponential rate. The continuous compounding formula takes this effect of compounding to the furthest limit. Instead of compounding interest on a monthly, quarterly, or annual basis, continuous compounding will effectively reinvest gains perpetually.

To determine the general form of the PV equation, first consider the FV formula:

$$FV = PV \cdot e^{r \cdot t}$$

Where FV is the future value;

PV is the present value (the basic premise of present value is the time value of money);

r is the annual interest rate expressed as a proportion (percent divided by 100% = proportion);

t is the number of years the amount is deposited or borrowed for.

We use the continuous compound interest formula with Future value = $225,500, r = 8.95/100 = 0.0895, t = 8 years, 125 days. Note that e is Euler's number (base of the natural logarithm) which is approximately equal to e≈2.718281828. Also we have to express total number of years PV is invested.

$$t = 8 + \frac{125}{365} = 8 + 0.342465753 = 8.342465753$$

From the Continuous Compounding Formula determine the value of the present value:

$$FV = PV \cdot e^{r \cdot t}$$

$$PV = \frac{FV}{e^{r \cdot t}}$$

Substitute the given values in the formula:

$$\text{PV} = \frac{\$225\,500}{2.718281828^{0.0895 \cdot 8.342}} = \frac{\$225\,500}{2.718281828^{0.746650685}} = \frac{\$225\,500}{2.10992138} = \$106\,876.02033$$

This would return a result of $106 876.02.

The current amount needed in the account to achieve this balance in 8 years, 125 days is equal $106 876.02.

Answer: PV $= \$\mathbf{106\,876.02.}$