1. Alexandra invests 8400 into an investment fund at the end of each year for the next 10 years. This fund earns an annual effective interest rate of 7%. Each year the interest is paid out and deposited in Bian Bank. Bian Bank pays an annual effective interest rate of 5%.

Taking into account both the amount in the fund and the amount in the bank, how much does Alexandra have at the end of 10 years.

**Solution:**

Payments in reinvestment fund = 0.07(8400)=588 for 9 years

P&Q Formula PV = \(588d_7^9 + \frac{588}{0.05}(a_7^9 - 9v^9)\)

\[= 588\left(\frac{1-1.05^{-9}}{0.05}\right) + 11760\left(\frac{1-1.05^{-9}}{0.05}\right) - 9(1.05)^{-9}\]

\[= 4179.399145 + 11760(7.107821676 - 5.801480246)\]

\[= 19541.97436\]

At the end of 10 years, Alexandra has the accumulated value of the interest payments and the sum of the payments in the original fund

\[AV = 8400*10 + 19541.97436(1.05)^9 = 114,316.0162\]
2. Sammie is repaying a loan with quarterly payments for 30 years. The payments in the first year are 25 each. The payments in the second year are 50 each. The payments in the third year are 75 each. The payments continue to increase in the same pattern until the payments in the 30th year are 750 each.

The loan has a nominal interest rate of 6% compounded quarterly.

Calculate the amount of Sammie’s loan.

Solution:

Formula that doesn’t follow the rules: $P \frac{\bar{a}_n}{i^m} - n v^n$

$PV = 25 \left( \frac{(1 + \frac{0.06}{4})^4 - (1 + \frac{0.06}{4})}{(0.061363551)^{30}} (1.061363551 - 30(1.061363551)^{-30}) \right) \frac{0.06}{4}$

$= 25\left( \frac{14.3987845 - 5.025695598}{0.015} \right) = 15,621.81484$
3. Sandra is receiving payments from a continuous annuity at an annual rate of $X$ per year for the next ten years.

At a force of interest of 8%, the present value of Sandra’s payments is $84,975.42$.

Calculate $X$.

**Solution:**

$$PV = 84975.42 = \int_{0}^{10} x\overline{a}_{\overline{10}|} dt = x\overline{a}_{\overline{10}|} = x\left(\frac{1-e^{-0.08(10)}}{0.08}\right)$$

$$84975.42 = x(6.883387949)$$

$$X = 12,345$$