

Retirement Planning

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1) Goal-Seek Approach

Assuming the model is already built, the first step in calculating the required annual deposit via the Goal-Seek approach is to use What-If Analysis and access the Goal-Seek tool. The structure of the retirement plan displays the account balance increasing during the first five years due to deposits, then decreasing from Year 6 to Year 13 due to withdrawals. Using the Goal-Seek function, the final ending balance of Year 13 (\$-344,627) is set to a value of 0 by changing the variable cell containing the unknown annual deposit amount (current blank cell). Setting the ending balance to zero allocates the retirement plan savings to last through all withdrawal periods with no money carrying over by the end of the retirement. After Goal-Seek is executed, the deposit cell is adjusted until the final account balance in the table reaches zero, thus achieving a required annual deposit of **\$29,386.55**. This value represents the sufficient amount needed to sustain planned annual withdrawals of \$-30,000 until the retirement account depletes.

2) Cash Flow Approach

Assuming the table is already created, the first step in calculating the required annual deposit via the Cash Flow approach is finding the present value (PV_W_5) of the 8 withdrawals at Year 5 by using the following Excel formula: $PV(0.08, 8, -30000)$. The “0.08” represents the rate, the “8” represents the number of withdrawals after Year 5, and “-30000” represents the withdrawal amount (outflow), so the final result is **\$172,399.17**. The second step is calculating today’s present value (PV_W_0) of these withdrawals by using the following Excel formula: $PV(0.08, 5, \$172,399.17)$. The “0.08” represents the rate, the “5” represents the number of years until the first withdrawal, PMT is skipped, and \$172,399.17 represents the present value of the withdrawals at Year 5, so the final result is **\$117,331.98**. Lastly, to find the annual deposits required, the following Excel formula was used: $PMT(0.08, 5, \$172,399.17)$. The “0.08” represents the rate, the “5” represents the number of deposits, and “\$172,399.17” represents the present value of withdrawals (also equal to the present value of deposits). Thus, the amount that

needs to be deposited into the account annually for 5 years is **\$29,386.55**. This value is the same as the value found through the Goal-Seek approach.

3) Cases with Annual Interests of 8%, 10%, 12%

At the beginning of this project, the required deposit amount was calculated with an interest rate of 8%. However, what happens if interest rates are increased to 10% and 12%? By first changing the interest rate to 10% and using both the Goal-Seek and Cash Flow approaches, the required deposit amount was calculated to be **\$26,215.42**, which is \$3,171.13 less compared to the deposit amount at 8%. Now changing the rate to 12%, the required deposit amount was calculated to be **\$23,458.65**, which is \$2,756.77 less compared to the deposit amount at 10% and \$5,927.90 less compared to the deposit amount at 8%. It is observed that there is a negative correlation between the rates and deposit amount. As the rates increased, the deposit amount decreased. This means that as the account is able to earn more from an increase in interest, the amount needed to deposit for the first 5 years will be less and less. The **present value of withdrawals** also decreased as the rate increased.