Analyzing Savings Account Options Using Equations and Inequalities

Prerequisite Skills

This lesson requires the use of the following skills:

- plotting points on a coordinate plane
- writing, reading, and evaluating expressions
- determining the rate of change and initial value of a function

Introduction

When choosing a savings account, it can be difficult to navigate the wide array of options available on the market. Offers may boast similar annual interest rates, but give wildly different returns based on the compounding period, the presence or absence of fees, and other factors. Equations can be used to help analyze savings options in order to make the best decision.

Key Concepts

- Recall that the amount of simple interest paid on a principal P is $A = Prt$, where A is the balance, t is the number of interest periods, and r is the interest rate for that period.
- Recall that the compound interest formula is $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where P is the principal, r is the annual interest rate, n is the number of times interest is compounded in a year, and t is years.
- Recall that a savings account accrues interest.
- If no withdrawals or deposits are made to the account, the savings account balance will grow according to the compound interest formula.
- If withdrawals or deposits are made to the account, the savings account balance can be found by applying the simple interest formula for each compounding period. The compound interest formula cannot be used because it does not take into account the changes to the balance.
- In general, the savings account with the higher interest rate is the better choice. However, this calculation can change if periodic account fees are charged.
- If one account charges account fees and the other does not, the amount deposited in the account matters.
    - If the principal deposit is too low, the account charging no fees is the better choice.
    - If the principal deposit is sufficiently high, the account charging a fee may end up being the better choice.

- One of the best ways to compare account options is to compare their growth over time. This can be done by analyzing the equation, or by using tables and graphs.
- Follow the instructions specific to your calculator model to graph equations:

On a TI-83/84:

Step 1: Press [Y =].

Step 2: In the Y_1 space, type the equation. Type subsequent equations in Y_2, Y_3, etc.

Step 3: Press [WINDOW] to change the viewing window.

Step 4: At Xmin, enter the appropriate minimum *x*-value and arrow down 1 level to Xmax.

Step 5: At Xmax, enter the appropriate maximum *x*-value and arrow down 1 level to Xscl.

Step 6: At Xscl, enter the appropriate distance between *x*-axis tick marks and arrow down 1 level to Ymax.

Step 7: At Ymin, enter the appropriate minimum *y*-value and arrow down 1 level to Ymax.

Step 8: At Ymax, enter the appropriate maximum *y*-value and arrow down 1 level to Yscl.

Step 9: At Yscl, enter the appropriate distance between *y*-axis tick marks.

Step 10: Press [GRAPH].

On a TI-Nspire:

Step 1: Press the [home] key.

Step 2: Arrow over to the graphing icon and press [enter].

Step 3: At the blinking cursor to the right of $f1(x)$, type the equation.

Step 4: To type additional equations, press [menu], arrow over to 3: Graph Entry/Edit, and select 1: Function. Then repeat Step 3. Do this until all equations have been entered.

Step 5: To change the viewing window: press [menu], arrow down to number 4: Window/Zoom, and click the center button of the navigation pad.

Step 6: Choose 1: Window settings by pressing the center button.

Step 7: Type in the appropriate Xmin value and press [tab].

Step 8: Type in the appropriate XMax value and press [tab].

Step 9: Leave the XScale set to "Auto." Press [tab] twice to navigate to YMin and enter the appropriate value.

Step 10: Press [tab] to navigate to YMax. Enter the appropriate value. Press [tab] twice to leave YScale set to "Auto" and to navigate to "OK."

Step 11: Press [enter].

Step 12: Press [menu] and select 2: View and 5: Show Grid.

Common Errors/Misconceptions

- incorrectly applying the order of operations
- incorrectly identifying the rate
- forgetting to add 1 after dividing r by n
- forgetting to calculate the number of time periods it takes for a given rate of growth or decay to occur, and simply substituting in the time given