Name: key Date: _____ Period: _____

Decision Making in Finance: Present Value of an Investment

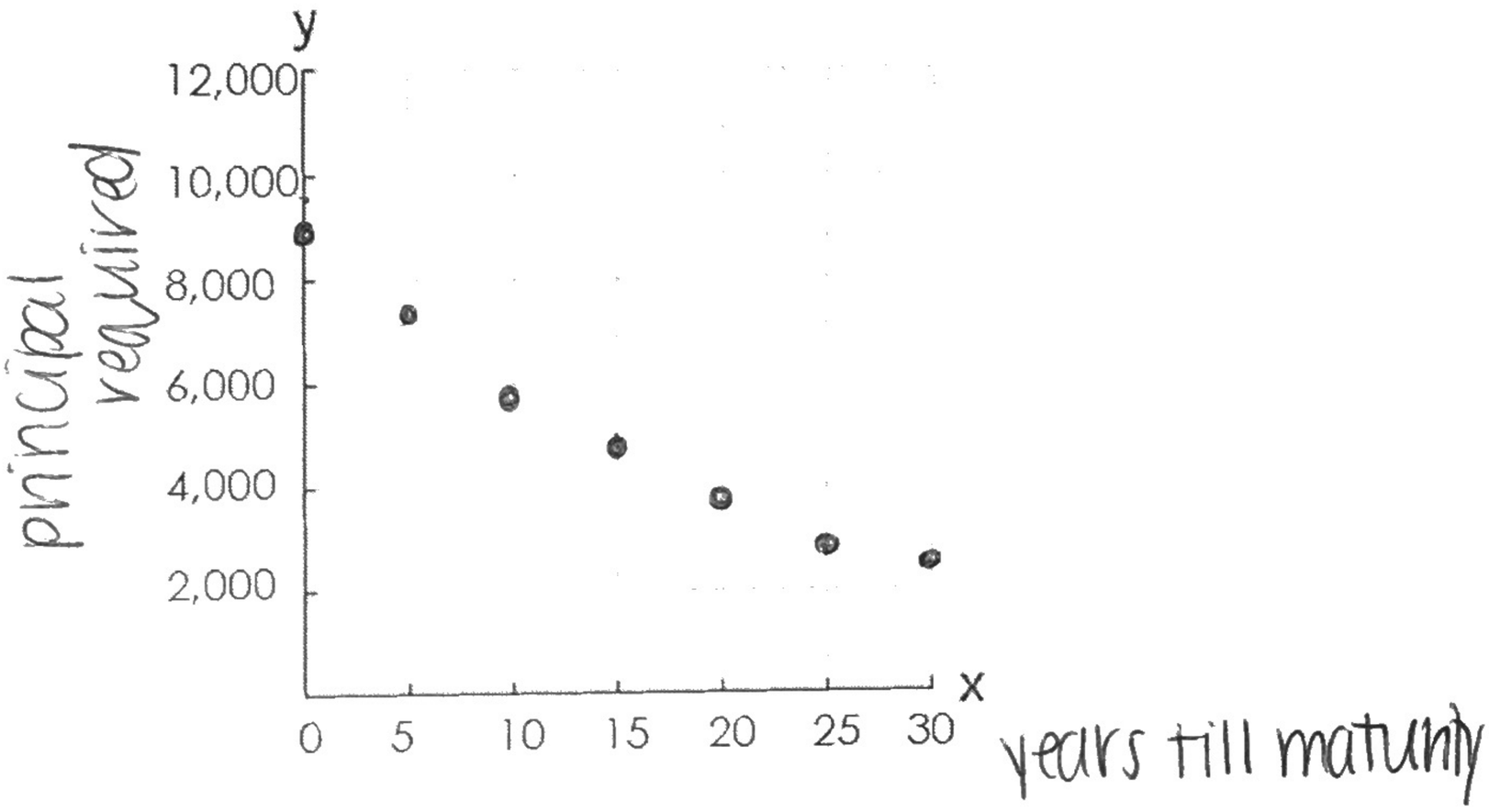
VI.B SAS 4: Road to $1 Million

In Student Activity Sheet 3, you analyzed the future value of an investment over time. You began with $2,600 invested in a savings account for 30 years. After 30 years, your initial investment would be worth $9.062.70. In this activity, you will look at the same investment in a different way. The question relates to the **time value of money** (TVM). *What is that $9,062.70 future value worth at various times in the 30-year investment?*

The following table in number 1 lists the principal required to obtain the same future value of $9,062.70 for various investment lengths. So, in the table, the 30-year investment is the one you have already explored. The other values in the table show how much principal you would need to invest and the length of time of the investment for the same yield. This can be thought of as the **present value** of the investment.

1. Create a scatterplot of the given data. Label the axes and scales, and provide a title.

L1 Years Till Maturity	L2 Principal Required
0	$9,062.70
5	$7,359.95
10	$5,977.16
15	$4,854.16
20	$3,942.20
25	$3,201.50
30	$2,600.00



2. Calculate the regression equation for the given data. Graph the regression equation on the scatterplot. Explain why the function model you used makes sense in the problem situation.

stat → calc → expreg

$y = 9062.69(0.959)^x$

Exponential decay makes sense because the data points are decreasing at a decreasing rate.. the greater # of years, the less you initially have to invest.

3. Josephine is 20 years old and wants to save $1 million for retirement in 50 years. Assume she invests in a savings account that earns at least the current rate of inflation. Determine how much Josephine must save today to reach her retirement goal.

1.3790 = 0.0137

Recall the future-value formula:

$$FV = PV\left(1 + \frac{i}{n}\right)^{nt}$$

- ***FV*** for future value
- ***t*** for time (years)
- ***i*** for interest rate (in decimal form)
- ***n*** for number of compound periods per year
- ***PV*** for the principal or present value

$1{,}000{,}000 = PV(1+0.0137)^{50}$

$PV = \frac{1{,}000{,}000}{(1+0.0137)^{50}} = \$506{,}439.62$

4. Suppose Josephine does not want to begin saving for her retirement immediately. Fill in the following table to show the amount of money that Josephine must invest to retire 50 years from now with $1,000,000 based on the number of years that she waits to start saving.

Years of Waiting to Save	Principal Required
0	506,439.62
10	590,259
20	664,839
30	761,749
40	872,782
50	1,000,000

$\frac{1,000,000}{(1.0137)^{40}}$ ← only have 40 years to save

5. REFLECTION: Suppose Josephine believes in spending now and saving later. How could you use the table from Question 4 to convince her otherwise?

the longer she waits to save, the more money she needs for her initial deposit/investment.

6. Blaine wants to have $1,000 in 10 years. The following are the choices in which he can invest:

- a savings account earning 3% compounded quarterly,
- a checking account earning 1% compounded monthly, or
- a money market account earning 4.5% compounded semiannually.

Blaine plans on making no withdrawals or deposits for 10 years. Rewrite the formula from Question 3 for present value and allow for any compounding period (***n***).

$$PV = \frac{FV}{\left(1+\frac{i}{n}\right)^{nt}}$$

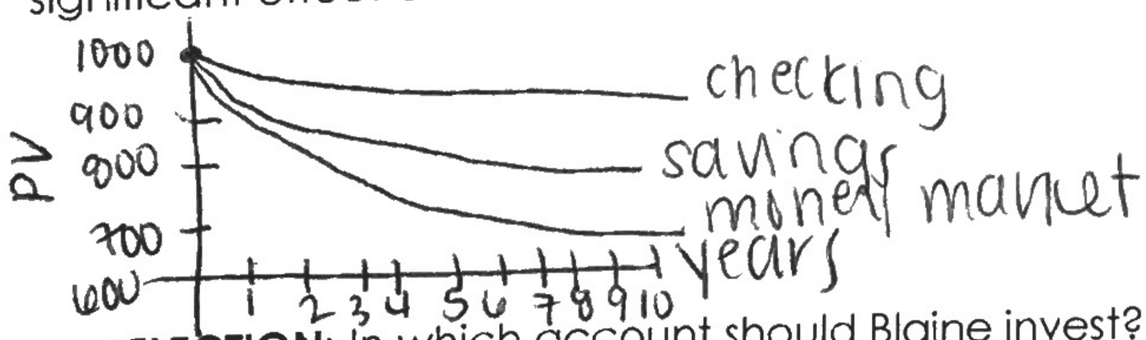
7. Rewrite the present-value formulas for each account that Blaine is considering. Make sure that the formulas include compounding periods other than annual and incorporate the different rates.

savings $PV = \frac{1000}{\left(1+\frac{0.03}{4}\right)^{4(t)}}$

checking $PV = \frac{1000}{\left(1+\frac{0.01}{12}\right)^{12(t)}}$

money market $PV = \frac{1000}{\left(1+\frac{0.045}{2}\right)^{2(t)}}$

8. Graph the present-value formula for each account on your graphing calculator. Which factor has the most significant effect on the curve: the interest rate or compounding periods? Why?



interest rates because the present value or 10 yrs is ordered by interest rates.

9. REFLECTION: In which account should Blaine invest? Why?

Money market because it has the lowest principal investment required to have 1,000 in 10 years.