

# Plan Ahead Exponentially Portfolio Worksheet

## PRECALCULUS

### Part 1: Dream Big!

It's never too early to plan for your future. Even though you are just starting out in life, it is valuable to learn something about planning for your retirement now.

There are a variety of accounts you can use to save for retirement. Once you are working full time, your employer may offer a program of contributions to a retirement account of your choice. Individual retirement accounts (IRAs) and 401(k) accounts have become very popular. There are several factors that help you choose the right account for you, including the taxability of the account and whether you can use some of the money if you need to at any time.

At this point in your life, certificates of deposit (CDs) may be more practical. You may save for several years and then decide to use some or all of your money for something before retirement, possibly a house.

You, the depositor, agree to leave your money, the **principal**, in the account for a specific length of time, the **term**. In return, the bank pays you a percentage of your principal, the **rate**, in interest. When the term is over, you can most often keep the account open and continue growing your money.

Very rarely will you see interest calculated annually (once a year). In today's banking world, interest is calculated more frequently. Interest may be added to accounts quarterly (four times a year), monthly (twelve times a year), or even daily (365 times a year). The amount of interest you receive each time **compounds** because the rate is calculated on the total in the account, the sum of your principal and all interest payments you have received to date.

In this portfolio, you will explore the growth of a savings account through time and come to appreciate how long it takes to reach your goal.

How much money do you want to have available when you retire?

At what age would you like to retire?

Keep these amounts in mind as you go through the next parts of this project.

## Part 2: Research Certificates of Deposit

Inquire at a local bank or conduct an online search for “certificate of deposit interest rates.” Gather the basic details for an actual CD account in today’s economy. There will be many different accounts available. Choose one that you think will grow quickly through time or that will suit your planning needs.

Research Topics for CDs	Notes
minimum balance	
rate of interest	
compound period	
required term to keep account open	
fees, if any	
other notes	
information source (bank or website)	

Compound interest is calculated with an exponential calculation. Since interest is deposited directly back into the account so the total account value grows, the value

of the account can be found with this formula:  $A = P \left( 1 + \frac{r}{n} \right)^{nt}$

The following are the variables in the exponential function:

- $A$ , the amount in the account after interest is added
- $P$ , the principal originally deposited in the account
- $r$ , the annual rate of interest
- $n$ , the number of times, or frequency, that interest is compounded during the year
- $t$ , the term (number of years) the account is open

For the account you chose, record the values of  $r$  and  $n$ .

Variables	Values
rate of interest ( $r$ )	
compound period ( $n$ )	

## Part 3: Your Investment Over the Years

Suppose you are able to open a certificate of deposit account with an initial principal of \$1,000.00. Complete the table to see the value of the CD account you chose for various terms. Use the rate of interest in its decimal form, not as a percentage. Show all work.

CD Account Term ( <i>t</i> )	Calculations $A = P \left( 1 + \frac{r}{n} \right)^{nt}$	CD Account Value ( <i>A</i> )
0 years		\$1,000.00
5 years		
10 years		
15 years		
20 years		
25 years		
30 years		
40 years		
50 years		

Name \_\_\_\_\_ Date \_\_\_\_\_

## Part 4: Will You Be Able to Retire When You Want?

Will your CD rate enable you to meet your goals for retirement with an initial principal of \$1,000.00? Write a paragraph with your conclusions.

Which variable has the most impact on growing your money? If you could increase one of the variables in the compound interest formula, which would have the most impact on growing your money? Before you complete the next set of calculations, predict whether an increase in the principal, the rate, or the frequency of compounding will increase your account balance more.

Name \_\_\_\_\_ Date \_\_\_\_\_

Using a term of 50 years in all cases, calculate the account balance in each case to see which variable has the most impact on the amount.

You should use your calculator for these calculations.  $A = P \left( 1 + \frac{r}{n} \right)^{50n}$

### Increase Principal ( $P$ )

Principal	Interest Rate	Compound Frequency	Account Balance
$P = \$1,000.00$	$r = 1\%$	$n = 4$	$A =$
$P = \$2,000.00$	$r = 1\%$	$n = 4$	$A =$
$P = \$3,000.00$	$r = 1\%$	$n = 4$	$A =$

### Increase Rate ( $r$ )

Principal	Interest Rate	Compound Frequency	Account Balance
$P = \$1,000.00$	$r = 1\%$	$n = 4$	$A =$
$P = \$1,000.00$	$r = 2\%$	$n = 4$	$A =$
$P = \$1,000.00$	$r = 3\%$	$n = 4$	$A =$

### Increase Compound Frequency ( $n$ )

Principal	Interest Rate	Compound Frequency	Account Balance
$P = \$1,000.00$	$r = 1\%$	$n = 4$	$A =$
$P = \$1,000.00$	$r = 1\%$	$n = 12$	$A =$
$P = \$1,000.00$	$r = 1\%$	$n = 365$	$A =$

Name \_\_\_\_\_ Date \_\_\_\_\_

Was your prediction accurate? What surprised you about the results?

What initial principal would you need to invest in the CD account in order to meet your retirement goals?